Draft Supplemental Watershed Plan #3 and Environmental Assessment

Ferron Watershed
Rehabilitation of Millsite Dam

A supplement to the original 1971 watershed plan
and 1976 supplemental plan

Emery County, Utah
January 2016

Prepared By:

United States Department of Agriculture
Natural Resources Conservation

In Cooperation With:

Ferron Canal and Reservoir Company
U.S. Bureau of Land Management
Utah Division of Water Resources
SUPPLEMENTAL WATERSHED PLAN #3 AND ENVIRONMENTAL ASSESSMENT
for the
Rehabilitation of Millsite Dam
Ferron Watershed - Emery County, Utah
3rd Congressional District

ABSTRACT

Lead Agency: U.S. Department of Agriculture, Natural Resources Conservation Service, Utah (USDA-NRCS)
Cooperating Agency: U.S. Department of Interior-Bureau of Land Management (BLM)
Sponsoring Local Organization (SLO): Ferron Canal and Reservoir Company (FCRC)
Prepared by: USDA-Natural Resources Conservation Service (NRCS)

Authority: The original watershed work plan was prepared, and works of improvement have been installed, under the Authority of Public Law 83-566 (as amended) – Watershed Protection and Flood Prevention Act of 1954. This supplement is prepared under the Authority of Public Law 83-566 (as amended) – Watershed Protection and Flood Prevention Act of 1954 as further amended by Section 313 of Public Law 106-472 and in accordance with Section 102 (2) © of the National Environmental Policy Act of 1969, Public Law 91-190, as amended (42 U.S.C. 43221 et seq).

This rehabilitation plan was developed in response to concerns of the lead Local Sponsoring Organization, Ferron Canal and Reservoir Company. Project benefits include sustained irrigation, municipal and industrial water supplies, and recreation, land, and fish and wildlife habitat values. The preferred alternative would involve rehabilitating Millsite Dam to current NRCS structural requirements in order to meet NRCS and State Dam Safety and performance criteria. These activities would also extend the life of the dam to approximately the year 2071.

Rehabilitation actions proposed:
1) Embankment-Downstream Toe: Loose sand and silt materials in the downstream foundation will be excavated and replaced with compacted materials to remove the top zone of potentially liquefiable materials; 2) Embankment-Seismic Protection: The downstream slope will be flattened and a berm placed at the downstream dam toe to improve stability of the dam; 3) Embankment-Zone Modification: Downstream slope protection rock will be removed so that a filter and drain zones can be constructed on the slope and in the foundation to collect seepage through the dam, slope protection rock will then be replaced on the new downstream slope; 4) Embankment-Drainage: Pipes will be installed in conjunction with the drain materials to collect and monitor seepage through the dam; 5) Embankment-Raise: The dam crest will be raised four feet to restore the original reservoir capacity; 6) Principal Spillway Outlet Works: Downstream work will necessitate the extension of the existing principal spillway outlet works; 7) Auxiliary Spillway: The existing concrete spillway will be removed and replaced with a new concrete labyrinth weir spillway with the capacity to pass the design flood event; 8) Structure Monitoring: Piezometers, seepage flow weirs, survey monuments, and other necessary instrumentation will be installed to improve long-term monitoring of the dam; 9) Mitigation: Repairs will be made to Millsite State Park located near the reservoir, and Millsite Golf Course located downstream of the dam, to mitigate the construction impacts.

Total project installation cost = $29,808,100. Estimated amount paid through USDA-NRCS Public Law 566 funds = $19,375,265. Amount paid by the Sponsor and the State of Utah = $10,432,835. This document is intended to fulfill requirements of the National Environmental Policy Act (NEPA) and to be considered for authorization of Public Law 566 funding.

Comments: USDA-NRCS has completed this Draft Plan-EA in accordance with the NEPA and USDA-NRCS guidelines and standards. Reviewers should provide comments to NRCS during the allotted Draft Plan-EA review period. Comments need to be submitted by February 22, 2016 to become part of the Administrative Record.

Please send comments to:
USDA – Natural Resources Conservation Service (Attn: Norm Evenstad)
Wallace F. Bennett Federal Building, Room 4420
125 South State Street, Salt Lake City, UT 84138-1100
Telephone (801) 524-4569; Email: Norm.Evenstad@ut.usda.gov

Further information may also be obtained by contacting the following NRCS personnel: (same address)

Bronson Smart, State Conservation Engineer, NRCS
Phone: 801-524-4559; Email: Bronson.Smart@ut.usda.gov

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CHAPTER 1 - PURPOSE AND NEED FOR ACTION

1.1 INTRODUCTION

This Watershed Plan Supplement and Environmental Assessment for the Ferron Watershed project are combined into this single document. The purpose of the project is to continue to provide water supply and flood control in a manner that minimizes the risk of loss of human life, is cost efficient, and environmentally acceptable. Due to the changes in the State of Utah and U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) dam design criteria, Millsite Dam does not currently meet the NRCS safety and performance standards for a High Hazard Class structure.

Millsite Dam is a multi-purpose structure located approximately 3 miles west of the town of Ferron, Utah and is bounded by U.S. Forest Service (USFS) lands, Bureau of Land Management (BLM) lands, private lands and State Parks & Recreation lands. The dam is a zoned embankment dam that stands 115 feet high, has a crest length of 4,150 feet, and has a current reservoir storage capacity of 16,230 acre-feet of water at the normal operating pool elevation. The auxiliary spillway is a 50-foot long by 60-foot wide duckbill reinforced concrete structure with a discharge chute. The principal spillway outlet works consist of a 54-inch main conveyance pipe and an 8-inch culinary pipeline that are enclosed in a reinforced concrete tunnel through the embankment.

The Ferron Canal and Reservoir Company, hereafter referred as the Sponsoring Local Organization (SLO), requested assistance from the USDA-NRCS to rehabilitate Millsite Dam to meet current design criteria. The SLO coordinates operations with Ferron City, San Rafael Conservation District, Emery County Water Conservancy District, Emery County, Utah State Division of Parks & Recreation, and the Utah State Division of Wildlife Resources. The Ferron Canal and Reservoir Company is the lead organization and is responsible for the operation and maintenance of the dam.

Millsite Dam is a multi-purpose structure located approximately 3 miles west of the town of Ferron, Utah and is bounded by U.S. Forest Service (USFS) lands, Bureau of Land Management (BLM) lands, private lands and State Parks & Recreation lands. The dam is a zoned embankment dam that stands 115 feet high, has a crest length of 4,150 feet, and has a current reservoir storage capacity of 16,230 acre-feet of water at the normal operating pool elevation. The auxiliary spillway is a 50-foot long by 60-foot wide duckbill reinforced concrete structure with a discharge chute. The principal spillway outlet works consist of a 54-inch main conveyance pipe and an 8-inch culinary pipeline that are enclosed in a reinforced concrete tunnel through the embankment.

The Ferron watershed is comprised of predominantly USFS and State managed lands. The rehabilitation project area includes the existing dam embankment, the auxiliary spillway area, and immediately downstream of the embankment.

This document was prepared under the authority of the Watershed Protection and Flood Prevention Act, Public Law 830-566, as amended by Section 313 of Public Law 106-472; Small Watershed Rehabilitation Amendments of 2000; National Environmental Policy Act (NEPA), as amended and pursuant to the implementing regulations for NEPA (40 CFR parts 1500-1508); USDA Departmental Policy for the...

This chapter explains the purpose and need for the proposed action based on the objectives set forth by the NRCS and the SLO. Sufficient detail is provided to allow for the formulation of alternatives necessary to meet the desired objectives.

1.2 PROJECT OVERVIEW AND NEED FOR SUPPLEMENTAL PLAN

Millsite Dam was originally built in 1971 as a High Hazard Class structure with a 100-year project life. Due to changes in engineering safety and performance criteria, Millsite Dam does not meet the current criteria for High Hazard Class according to current NRCS Technical Release 60 (TR-60), *Earth Dams and Reservoirs* (NRCS 2005) and State of Utah Dam Safety regulations (UDWRt 2007). The intent of this document is to evaluate potential rehabilitation alternatives eligible through the NRCS Watershed Rehabilitation Program and prepare an Environmental Assessment (EA). This document represents a Supplemental Watershed Plan for the January 1965 Watershed Work Plan (see Appendix E - Other Supporting Information).

Millsite Dam is located in Emery County in the Ferron Watershed on the main channel of Ferron Creek. Ferron Creek continues downstream through the town of Ferron, Utah and joins the San Rafael River approximately 17 miles from the dam.

1.3 PURPOSE OF THE PROJECT

The purpose of this project is to reduce the risk of loss of life and damage from flooding associated with a catastrophic dam failure while providing economic benefits to the area through irrigation, municipal, industrial and recreational water storage.

1.4 NEED FOR THE PROJECT

Rehabilitation of Millsite Dam is needed to address public health and safety issues surrounding a multi-purpose dam that does not meet existing safety criteria and engineering performance standards for a High Hazard Class dam. Furthermore, the project is needed to address diminishing storage capacity of the reservoir.

Engineering Performance Standards

Millsite Dam was originally designed as a High Hazard Class dam. Present conditions at the site and downstream have not changed. The NRCS State Conservation Engineer maintains that the dam continues to be a High Hazard class dam.

Hazard classification documentation was prepared for this study and is included in Appendix D – Investigation and Analysis Report. The analysis determined that the structure is a High Hazard Class Dam (NRCS 2010a). NRCS defines a High Hazard Class as “Dams located where failure may cause loss of life, serious damage to homes, industrial and commercial buildings, important public utilities, main highways, and railroads.” The State of Utah also lists the original and current hazard rating for the dam as High (UDWRt 2007). Given the High Hazard class, the dam is required to safely convey flows equivalent to the probable maximum flood\(^1\) (PMF).

\(^1\) The probable maximum flood hydrograph is developed from the probable maximum precipitation (PMP) for a given duration. In this study, the 6-hour PMF was developed from a 6-hour PMP with a local storm distribution and the 24-hour PMF was...
It has been determined that liquefiable (unstable) materials exist in the foundation of the dam based on the results of geotechnical analysis. Therefore, measures to stabilize the embankment during an earthquake event are needed to meet current safety and performance criteria.

**Storage Capacity**

The original reservoir capacity was designed using estimated annual sediment rates. In June 2006, a reservoir sediment survey was completed with the assistance of the U.S. Bureau of Reclamation (BOR) to quantify the existing sediment in the reservoir (NRCS 2006). The survey was completed through an acoustic/sonar process which resulted in a current topographic map of the bottom of the reservoir. This map was compared to the original topography of the reservoir before inundation. The capacity replaced by sediment since construction is the difference between the two topographic profiles. The annual sediment yield to the reservoir was determined to be approximately 75 acre-feet per year.

The steel 8-inch diameter Ferron City drinking water pipeline located in the principal spillway gallery has some component deterioration. This pipeline is proposed to be replaced. In addition, replacement of the existing auxiliary spillway is needed to safely pass 31,000 cubic feet per second (cfs) of storm flow.

**1.5 PROBLEMS AND OPPORTUNITIES**

**1.5.1 Problems**

During the last 40 years, the technology of dam design has improved and dam safety has become a more critical infrastructure maintenance issue. Therefore, though the dam originally met the High Hazard Class criteria 40 years ago, it does not currently meet NRCS and the State of Utah dam safety and performance criteria. The loss of reservoir storage capacity due to sedimentation is also recognized as a prime concern to the sponsors.

On June 13, 1991, the Utah Division of Water Rights (UDWRt) – Dam Safety Section, conducted a “Minimum Standards” inspection of Millsite Dam pursuant to Section 73-5a-502, Utah Code. On June 20, 1991, a letter was sent by Utah Dam Safety to the Ferron Canal and Reservoir Company addressing the inspection and deficiencies of the dam to current dam safety rules. Deficiencies were noted in the following areas:

- Geology/Seismic design
- Hydrologic/Hydraulic design
- Embankment requirements and
- Instrumentation.

In January 2006, a Phase II Dam Safety Study was completed on Millsite Dam (RB&G 2006). The investigation was conducted in accordance with a proposal submitted to the SLO and gives a detailed analysis of recommendations for meeting engineering performance and safety requirements. In addition, sediment storage has been a long standing concern of the sponsors.

The dam does not meet current earthquake loading and embankment filter criteria based on as-built construction and design records. Liquefiable soil material in the foundation of the dam has been determined through recent geotechnical drilling and sampling.

Currently, the auxiliary spillway cannot safely pass the Probable Maximum Precipitation (PMP) runoff event as required by Utah State Law. Although Millsite Dam is not in imminent danger of failure and is functioning as originally planned, there is a possibility of a storm occurring that would overtop the dam.
and cause failure. If the dam fails there are serious consequences. Resource inventories during the planning process indicate that a failure of Millsite Dam would jeopardize 95 homes/commercial buildings, 3 bridges, a critical highway and place about 200 residents at risk (NRCS 2010c).

1.5.2 Opportunities

The project opportunities are to maintain the existing use of Millsite Dam for irrigation, recreation, and municipal and industrial water supply. The project would also maintain the existing flood control, salinity, fishery and wildlife benefits.

Continuation of water supply benefits, recreation and flood prevention are desired by the sponsors and public. The following is a list of the opportunities that would be realized through the implementation of this supplemental watershed plan:

- Comply with current dam and safety performance standards
- Protect public health and safety
- Protect water supplies for the City of Ferron, irrigators, power, and recreation
- Protect water supplies to maintain a fishery in Millsite Reservoir
- Protect water supplies for use on the adjacent 18-hole Millsite Golf Course
- Protect water supplies for use in the Millsite State Park campground
- Minimize potential flood damage
- Future potential: hydroelectric power generation

Hydroelectric opportunity

Retrofitting the dam for future power generation is technically and economically viable at Millsite Dam (Symbiotics LLC 2008). However, hydroelectric power generation currently is not an eligible purpose available for cost-share under the Public Law-566 authority. Any costs associated with retrofitting the dam for hydroelectric generation would be assumed by the SLO. Given national and state incentives for the development of renewable energy, there are potential sources of funding that could help with this undertaking.
CHAPTER 2 - SCOPE OF ENVIRONMENTAL ASSESSMENT

2.1 SCOPING

A scoping process was used to identify issues of economic, environmental, cultural and social concern in the watershed. Watershed concerns of sponsors, local citizens and other groups were expressed at planning and public meetings. Factors that would affect soil, water, air, plants, animals and human resources were identified by an interdisciplinary team that included the following specialists: engineers, geologists, hydrologists, biologists, economists, resource conservationists and others. This chapter identifies the concerns relevant in defining the problems and formulating alternative solutions.

Scoping was carried out to determine the objectives and primary concerns of the SLO and to determine other relevant issues and environmental concerns associated with this project. A scoping letter was sent on November 4, 2006 to agencies that might have an interest in the project (Appendix A - Comments & Responses). In addition, an agency scoping meeting was held December 14, 2006.

A public scoping meeting was also held on February 21, 2007 at the Ferron City Hall chambers. The public was informed of the meeting through a press release in the Emery County Progress, a notice to the State Resource Development Coordinating Committee (RDCC) and email correspondence.

Additional meetings were held with the SLO and stakeholders to update the status of the project. These meetings were attended by Ferron area residents and agency personnel.

A summary of resource concerns and their relevancy is provided in Table 1 below. Resource items determined to not be relevant have been eliminated from detailed study, and those items determined to be relevant have been carried forward for analysis.

Table 1. Summary of Scoping

<table>
<thead>
<tr>
<th>Resource Concerns of SLO, Public, and Agencies</th>
<th>Relevant to the Proposed Action?</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic and Social</td>
<td>X</td>
<td>The Project will maintain the economic and social resources that the dam brings to the area (e.g. agriculture, recreation, industrial, drinking water supply).</td>
</tr>
<tr>
<td>Flood Control</td>
<td>X</td>
<td>While the primary purpose of the structure is for water storage, flood control storage of 500 acre-feet is provided.</td>
</tr>
<tr>
<td>Millsite Dam Safety</td>
<td>X</td>
<td>Even though the structure was designed to High Hazard Class criteria, the presence of unstable materials in the foundation of the embankment, seismic stability, a deficient auxiliary spillway capacity, and seepage filter conditions within the dam make this concern relevant.</td>
</tr>
<tr>
<td>Human Health and Safety</td>
<td>X</td>
<td>Under current conditions, a catastrophic event may create a breach with the potential for loss of life.</td>
</tr>
<tr>
<td>Land Use</td>
<td>X</td>
<td>The Project will affect golf course design and operations at the existing auxiliary spillway and at the downstream toe area of the dam.</td>
</tr>
<tr>
<td>Recreation</td>
<td>X</td>
<td>The structure provides water storage for boating,</td>
</tr>
</tbody>
</table>
swimming, a fishery, an 18-hole golf course and water for the adjacent Millsite State Park facilities.

| Sediment Management | X | Raising the auxiliary spillway crest and the top of the dam by 4 ft will add 62 years of sediment storage capacity to the reservoir and will facilitate continued operation for water supply to irrigators, Ferron City, Millsite Golf Course and the Hunter Power Plant. |
| Transportation | X | A breach of the existing structure and catastrophic flood damage could have short-term effects on local transportation corridors (city streets, State Hwy 10 & USFS recreation access) and interrupt coal hauling operations on State Hwy 10. |

<table>
<thead>
<tr>
<th>NRCS Planning Requirements</th>
<th>Relevant to the Proposed Action?</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Air Quality</td>
<td>X</td>
<td>Fugitive dust produced during the proposed rehabilitation construction activities. Dust control will be a part of the construction plans &amp; specifications.</td>
</tr>
<tr>
<td>Cultural Resources</td>
<td>X</td>
<td>The Utah State Historic Preservation Office (SHPO) has been contacted. The area of potential affect has been identified for each alternative and reviewed by the NRCS State Archaeologist, who will coordinate with the State Historic Preservation Officer as needed if there are changes to the area of potential affect.</td>
</tr>
<tr>
<td>Ecologically Critical Areas</td>
<td>X</td>
<td>Project area located at watershed outlet zone for high mountain, forested area. Adjacent upland soils contain important, sensitive vegetation species. Critical areas are considered under the T&amp;E concern.</td>
</tr>
<tr>
<td>Environmental Justice</td>
<td>X</td>
<td>To comply with the regulations of Title VI of the Civil Rights Act of 1964 (42 United States Code [USC] 2000d, et seq.) and Executive Order 12898, Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations (59 FR 7629), the potential environmental impacts of the alternatives were studied with respect to the demographic and socioeconomic composition of the project area. No minority or low income populations would be affected by implementation of any of the alternatives.</td>
</tr>
<tr>
<td>Essential Fish Habitat</td>
<td>X</td>
<td>No designated areas in the area of the project.</td>
</tr>
<tr>
<td>Fish and Wildlife</td>
<td>X</td>
<td>Section 12 of PL 83-566 requires the USFWS to be consulted on all Plans. Fish &amp; Wildlife will be temporarily impacted during the proposed construction process.</td>
</tr>
<tr>
<td>Floodplain Management</td>
<td>X</td>
<td>Mapping of the 100-year floodplain is not a part of this project. It is not likely that any of the alternatives would result in an adverse effect or incompatible development within the floodplain of Ferron Creek.</td>
</tr>
<tr>
<td>Forest Resources</td>
<td>X</td>
<td>The watershed for the dam is located predominantly on USFS-managed land. The area is considered for</td>
</tr>
<tr>
<td>Category</td>
<td>Action</td>
<td></td>
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<tr>
<td>----------------------------------------------</td>
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<td></td>
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<tr>
<td>Invasive Species</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Determining sediment yield into the Millsite Dam reservoir.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Migratory Birds</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Migratory birds may use the areas surrounding the existing project for nesting.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural Areas</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>None are in the project area. Nearby access road is used to access USFS and BLM lands mostly upstream of the structure.</td>
<td></td>
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</tr>
<tr>
<td>Prime and Unique Farm Lands</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>No Prime or Unique Farmlands in the project area. Reservoir water is used to irrigate important farmlands.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional Water Resource Plans</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Colorado River Salinity Control Project. The reservoir provides pressurized irrigation water for agricultural land downstream which prevents approximately 48,000 tons of salt from reaching the Colorado River.</td>
<td></td>
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</tr>
<tr>
<td>Riparian Areas</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Small riparian areas exist within the project area.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scenic Beauty</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Millsite Dam has a visual element not only with the maximum of 458 acres of open water in a mountainous setting but also has a waterfall element at the exit of the auxiliary spillway during the snowmelt runoff period.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scientific Resources</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Purpose of the proposed action is to upgrade the dam to meet current engineering and performance guidelines for dam safety. A variety of investigation and analysis resources will be produced with this Plan/EA.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sole Source Aquifers</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>A sole source aquifer has not been identified in the project area.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threatened and Endangered Species (TES)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>San Rafael cacti (Pediocactus despainii) are known to occur within the project area and would be adversely affected.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Quality</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Millsite reservoir and streams in the project area are not listed as “impaired.”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Resources</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>The project will provide continued water supply for agriculture, Ferron City, recreation and power plant operations.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wetlands-NRCS policy</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Wetlands are associated with the reservoir.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wetlands-Other Clean Water Act etc.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Wetlands and other waters of the U.S., such as stream channels, are present.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wild and Scenic Rivers</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>None are present in the project area.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>National Economic Development (NED)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>This is required by the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&amp;G). An assessment to determine the feasibility of retrofitting the dam for hydroelectric power generation was completed in order to maximize the potential net benefits that could accrue in the planning area. Retrofitting the dam for hydroelectric power generation is not economically feasible.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: Based on NRCS-CPA-52, “Environmental Evaluation for Conservation Planning” Section J, Special Environmental Concerns*
CHAPTER 3 - AFFECTED ENVIRONMENT

3.1 PROJECT SETTING

3.1.1 Original Project

The Ferron Watershed Plan (NRCS 1965) was prepared under the Authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83rd Congress, 68 Stat. 666). Figure 2 below identifies the watershed area and landownership associated with Millsite Reservoir.

The need to regulate the irrigation water supply through storage and reduce sediment and flood damages from Ferron Creek is the principal basis for Millsite Reservoir. Millsite Dam provides 10,200 acre-feet for water supply and 5,800 acre-feet for sediment storage. Recreation facilities at Millsite Reservoir were added to meet anticipated needs in the immediate future. Upper watershed land treatment measures were implemented to help slow the sedimentation rate into Millsite Reservoir. These measures included 5,230 acres of contour trenching, 6,843 acres of contour furrow, 1,453 acres of pinyon-juniper control, 50 gully plugs, 1,479 acres of sagebrush spraying, 2,500 acres of aerial seeding, 436 acres of plowing and seeding, and 30,230 acres of treatment on rangeland/cropland on non-federal lands (NRCS 1965).

Figure 2. Millsite Dam Watershed Area
3.1.2 Physical Setting

Millsite Dam is situated where Ferron Canyon emerges from the Wasatch Plateau into Castle Valley. Bluffs rising 2,000 feet surround the reservoir on three sides, and the fourth side opens to the desert badlands of Castle Valley. Ferron Canyon has a large drainage area that consists of a large portion of the southeastern Wasatch Plateau. At the headwaters, small streams arise from glaciated valleys, winter snowpack typically remains late into the season. Duck Fork and Ferron Reservoirs are stabilized lakes near the headwaters of Ferron Creek. The creek cuts a deep gorge through the eastern plateau, and then emerges as the canyon walls flare outward into the edge of the plateau. Downstream from the reservoir, flat, irrigated desert extends for a few miles beyond the cliffs, then canyons and reefs delineate the western edge of the San Rafael Swell. The reservoir is located in the mouth of the canyon, where vegetation and weather is typical of an arid environment. Irrigation water from the reservoir allows the lands to east to be irrigated for crops. The watershed high point, Heliotrope Mountain, is 11,130 feet above sea level, thereby developing a complex slope of 7% to the reservoir. The average stream gradient above the reservoir is 4.7% (249 feet per mile).

The soil in the upper watershed is of limestone origin and has good permeability and moderately slow erosion and runoff compared to the lower 20% of the watershed where the soil originates from the Mancos shale and erosion and sediment yield is considered very high.

The mean monthly summer temperatures in Utah's highland regions are usually below 72°F. Average monthly rainfall at Ferron ranges between 1.08 inches in August to 0.49 inches in December, with annual rainfall reaching 8.47 inches over an average year. August and September are the wettest months, when an average of 2.03 inches falls, mostly in the form of short duration high intensity convective thunderstorms. Winter precipitation falls as snow in the mountains and as either rain or snow at lower elevations (Western Region Climate Center 2016).

3.1.3 Land Use

The watershed above the dam includes undeveloped public lands except for the area converted to Millsite State Park. Emery County has increased in population, growing from 5,546 in 1960 to 10,976 in 2010 (U.S. Census Bureau 2010), while the population for the town of Ferron has remained consistent. There is a potential for more development in the floodplain below the dam and within Ferron City limits.

At the time of original installation, the total area benefited by flood prevention and irrigation measures was 12,125 acres. Of this amount, 6,525 acres of irrigated cropland and 5,600 acres of pasture received direct protection from floods. Of the 11,200 total acres of cropland, 6,525 acres jointly benefited from flood control and irrigation measures and the balance of 4,675 irrigated acres benefited solely from irrigation measures. Irrigation improvement measures benefited 735 people while 800 individuals benefited from flood prevention measures. In addition, there were 123 farm operating units in the watershed (NRCS 1965).

A 9-hole golf course was installed adjacent to the dam following construction in 1971. In 2010, an additional 9 holes were added to the course.

Table 2 presents the current land uses within the 190,081 acre Ferron Watershed study area and in the 97,890 acre watershed for Millsite Dam. A majority of the upper watershed is federally managed by the USFS and the BLM.
Table 2. Summary of Landuse

<table>
<thead>
<tr>
<th>Landuse</th>
<th>Ferron Watershed Area (Acres)</th>
<th>Millsite Dam Watershed Area (Acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forest</td>
<td>55,684</td>
<td>51,041</td>
</tr>
<tr>
<td>Shrublands</td>
<td>95,466</td>
<td>32,690</td>
</tr>
<tr>
<td>Grassland</td>
<td>9,298</td>
<td>7,804</td>
</tr>
<tr>
<td>Rock\Barren\Dunes</td>
<td>15,995</td>
<td>5,521</td>
</tr>
<tr>
<td>Open Water</td>
<td>773</td>
<td>701</td>
</tr>
<tr>
<td>Riparian Area</td>
<td>1,061</td>
<td>103</td>
</tr>
<tr>
<td>Developed</td>
<td>1,449</td>
<td>25</td>
</tr>
<tr>
<td>Agricultural (pasture &amp; irrigation)</td>
<td>10,355</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total Watershed Area</strong></td>
<td><strong>190,081</strong></td>
<td><strong>97,890</strong></td>
</tr>
</tbody>
</table>

3.2 EXISTING CONDITIONS

Millsite Dam is a High Hazard Class earthen embankment that was designed by the Soil Conservation Service (now NRCS) and constructed in 1971. The dam was built to regulate irrigation, municipal and industrial water supply through storage, provide for recreation storage and reduce sediment and flood damages from Ferron Creek. Recreation facilities were included based on the expected demand and need to strengthen the economy of the area.

3.2.1 Human Health and Safety

Development downstream of Millsite Dam has been minimal since construction. Millsite Dam was constructed as a High Hazard Class dam and requires rehabilitation to meet the current High Hazard safety and performance criteria.

3.2.2 Geology and Soils

Physiography and Regional Geologic Setting

Millsite Dam is located along the eastern margin of the Wasatch Plateau, one of several north-trending ranges that comprise a physiographic region in central and southern Utah known as the High Plateaus (Stokes 1980). Geologically, the High Plateaus represent a transition zone at the juncture of three geomorphic provinces which include the Colorado Plateau, the Basin and Range and the Middle Rocky Mountains (see Figure 4).

The Wasatch Plateau itself forms the northeastern margin of the High Plateaus. It has been uplifted along several faults along its western margin exposing a thick section of sedimentary rocks ranging in age from late Cretaceous through late Tertiary (Witkind et. al. 1987). The Plateau is also located adjacent to a zone of increased seismic activity known as the Intermountain Seismic Belt (Arabasz et.al. 1992). In Utah, the
most notable manifestation of this zone is the Wasatch Fault located approximately 62 miles west of Millsite dam. The Joes Valley fault zone, located about 2.5 miles west of the dam, is considered a source for possible earthquakes that may affect the structural integrity of the dam. This fault is evaluated in detail as part of the Seismic Hazard Evaluation Report for Millsite Dam (UDWRe 2011). This report gives a summary of the magnitude of the earthquake and the peak ground acceleration that could affect the dam.

Within the Wasatch Plateau, glacial and interglacial events during the Middle to Late Pleistocene (approximately 780,000 to 10,000 years ago) have shaped the region (Marchetti 2007). Spieker and Billings (1940) were the first to document detailed evidence of glaciation in the Wasatch Plateau. Additional evidence supports the presence of glaciers on the Wasatch Plateau during the Last Glacial Maximum (LGM), approximately 22,000 years ago (Marchetti 2007). With the ending of the LGM, the area was subjected to relatively rapid retreat of the mountain valley glaciers coupled with large volumes of melt water runoff throughout this period. Large deposits of debris were deposited in their wake, including lateral, medial and end moraines composed of gravel, cobbles and boulders. Over thousands of years, this sediment has been re-deposited as alluvium within the stream channel of Ferron Creek.

Millsite Geology

The reservoir is situated below a series of vertical sandstone cliffs and rolling hills of gray shale. The sandstones are moderately hard and protect the underlying shale. The gray shale is very soft and appears as deeply weathered gray clay soil with abundant chips and thin flakes of the parent rock. Figure 4 shows the general geology at Millsite Dam above the reservoir basin.

![Geologic Formations at Millsite Dam](image)

Figure 4. Geologic Formations at Millsite Dam

Millsite Dam is built on a combination of shale and sandstone within the Emery Sandstone formation. The Emery Sandstone is the most visible bedrock and can be found near the auxiliary spillway and downstream of the left abutment. The sandstone is tan to light yellow brown in color, thinly-bedded and
moderately fractured. The sandstone is moderately harder than the surrounding shale, lending it a ledge-forming character (Witkind and others 1987).

Deposits of stream alluvium occupy the present drainage of Ferron Creek. As much as 100 feet of stream alluvium is found beneath and immediately downstream of the dam. A majority of this material is a mixture of sand and gravel with varying amounts of clay locally derived from the geologic formations surrounding Millsite Dam.

Material identified as artificial fill is present along the dam alignment (rock-fill embankment) and below the existing dam (building pads, golf course, road alignment and areas of disturbed land). The fill material used to construct the embankment consists of engineered material that was borrowed from the reservoir basin and adjacent sites. Fill material used to construct the building pads, golf course, and present road alignment varies in composition, thus the source of material is unknown, but was probably locally derived.

**Soils**

The soils in the watershed are alluvial and residual deposits derived mainly from sandstone, limestone, shale and siltstone. The materials occur as floodplain, fan and terrace deposits interspersed with bedrock outcrops in the form of ridges and knolls. Soil materials on the terraces are gravelly, 20 to 48 inches deep, and are underlain by sandstone and shale bedrock. Slopes of the irrigated soils downstream of the dam range from 0 to 6%. The upper valley and lower foothill soils are shallow, predominantly fine grained and underlain by Mancos shale bedrock. Slopes range from 0 to 30% (NRCS 2007a).

**Erosion and Sedimentation**

Millsite Reservoir will continue to receive sediment at the estimated present-condition rate of approximately 75 acre-feet per year based on the 2006 reservoir sediment survey conducted by NRCS in coordination with the U.S. Bureau of Reclamation. The original capacity for sediment was designed for 5,800 acre-feet spanning a 100-year period (NRCS 2006).

Upper watershed land treatments implemented in the 1970’s are expected to continue providing moderate reduction of runoff and sediment yield to the reservoir. These treatments were implemented on lands managed by the USFS and the State of Utah.

**Archaeological Resources**

Paleoindian, Archaic, Late Prehistoric and Protohistoric peoples, as well as Euroamerican settlers, have intermittently inhabited the general project area throughout the past 10,000 to 12,000 years. Although no diagnostic Paleoindian material has been recorded in or near the project area, there was a Paleoindian presence in central Utah (P-III Associates, Inc. 2006).

**3.2.3 Water Quality**

**Surface Water**

There is no water body associated with Millsite Dam that is listed on the Utah Department of Environmental Quality (UDEQ) 303(d) list or has an associated listed use class. The water quality of Millsite Reservoir is very good. It is considered to be hard with a hardness concentration value of approximately 233 mg/L (CaCO3). There are no overall water column concentrations that have exceeded State of Utah water quality standards (UDWQ 2000). Grazing is not permitted in the vicinity of the
reservoir. There are no active mines or timber sales. There are no planned developments in the watershed above Millsite Dam and there has been minimal development downstream since construction of the dam in 1971.

Farmers and ranchers in the Ferron area flood irrigated for nearly 100 years, which in this arid and mineral laden land has resulted in continual salt loading to Ferron Creek and salt damages to once productive agricultural soils. Currently, a pressurized irrigation system sourced from Millsite Reservoir allows water-saving sprinklers to irrigate nearly 10,000 acres of alfalfa, row crops and pastureland. The pressurized irrigation system results in approximately 48,000 tons of salinity reduction from the Colorado River (NRCS 2005a).

**Groundwater**

The underlying material of the project area consists primarily of weathered sandstone, siltstone and shale along with alluvial deposits originating from the surrounding geologic formations. No groundwater quality problems have been identified in the project area to date.

### 3.2.4 Water Features

#### Wetlands

A wetland delineation was performed on October 29-30, 2015 in coordination with the U.S. Army Corps of Engineers (USACE) using the Arid West Region, Wetland Determination Form and the USACE 1987 Wetland Delineation Manual with addendum. Approximately 21.47 acres of wetlands were found to occur above and below the ordinary high water mark that surrounds the existing reservoir (see Appendix D - Section 1). Table 3 below summarizes the type and size of wetlands delineated in the project area. Figure 5 below represents the typical wetland habitats.

**Table 3. Wetland Habitat Types**

<table>
<thead>
<tr>
<th>Wetland Habitat Type</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forested</td>
<td>11.65</td>
</tr>
<tr>
<td>Scrub-Shrub</td>
<td>9.65</td>
</tr>
<tr>
<td>Emergent</td>
<td>0.17</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>21.47</strong></td>
</tr>
</tbody>
</table>

#### Impoundments

Millsite Dam creates a total storage capacity of 18,000 acre-feet with a 458 acre normal operating pool (ordinary high water mark) that is approximately 80 feet deep near the dam. The drainage area providing runoff to the reservoir is 97,890 acres.

#### Drainages

The main hydrological feature associated with Millsite Dam is Ferron Creek and its tributaries. Millsite Dam is located on the main channel of Ferron Creek (see Appendix B). Ferron Creek, immediately downstream of the dam, operates primarily as a conveyance for irrigation. The flows released from the
54-inch outlet pipe are split into various canals at a concrete splitter approximately 300 feet downstream of the outlet.

### 3.2.5 Flood Control

Millsite Dam was designed principally to provide water supply for agricultural, municipal, industrial and recreation uses. The structure also provides flood and sedimentation control as storm flows are stored and released downstream in a controlled manner. The original capacity for sediment in the reservoir was designed to provide for 5,800 acre-feet over a 100-year period (NRCS 1965).

### 3.2.6 Recreation Resources/Millsite State Park

Millsite Dam provides numerous recreational opportunities not only for the local communities but also for the state. The community added 9-holes to the existing Millsite Golf Course in 2010 which is anticipated to draw more users from the surrounding region. This addition, coupled with campgrounds at the adjacent Millsite State Park, enhances the recreational opportunities associated with the dam.

In 2008, 2,359 off highway vehicles (OHVs) and 121 snowmobiles were registered in Emery County. Millsite State Park is a gateway to USFS lands where a variety of recreational opportunities are available to the public such as camping, hiking, hunting, fishing, bird watching and trail riding.

A legislative audit completed in 2011 revealed that Millsite State Park operated with positive revenues of $48,992 as a result of 32,556 visitors (Utah Office of the Legislative Auditor General 2011). In 2012 there were over 40,000 visitors at Millsite State Park.

### 3.2.7 Socioeconomic Resources

**Economics**

Settlement of the area began in the late 1870s, when stockmen from central and western Utah discovered that Ferron Creek was favorably situated in a natural grazing area between the 11,000-foot Wasatch Plateau to the west (locally known as Ferron Mountain) and the winter range on the San Rafael Swell to the east. Farming and cattle ranching have been mainstays of the Ferron economy throughout its history. Several families have continued into the fourth and fifth generation of grazing on the Wasatch Plateau in the summer and on the San Rafael Swell in the winter, with supplemental feed grown on irrigated farms.

The completion of Millsite Dam not only improved the water supply for agriculture and domestic purposes but also made water available for the Hunter Power Plant, several miles to the northeast. Construction of the plant, together with the development of coal mining operations to fuel its three massive steam-electric generating units, tripled Ferron's population between 1970 and 1980 to a peak of more than 2,000 people.

Emery County's economy is driven by mining, agriculture, transportation, communications, utilities and government. An emerging part of the economy is recreation and tourism. Major employers are Rocky Mountain Power, local government, mining, construction, retail trade and accommodations.

Population, demographic and economic data were collected from the 2010 Census. The population of Ferron is about 1,626 with approximately 94.6 % of the residents of White Non-Hispanic origin, 2.6 % Hispanic or Latino, 1 % American Indian or Alaska Native, 0.5 % Black or African American, 0.2 % Asian, and 1.1 % two or more races; 8.6 % of the residents in Emery County are living below the poverty line (2010), compared to 10.8 % for Utah as a whole.
Data from the 2010 Census show that the town of Ferron had an unemployment rate of 4.2% compared with the current state average of 4% and U.S. average of 9.6%. The 2010 Census lists the median family income in Ferron as $60,781. The median home value in Ferron is $114,600 compared to $105,500 for Emery County, $218,100 for Utah and $188,400 for the U.S.

Cultural Resources/Historic Properties

In May and August of 2006, a cultural resource inventory of the Area of Potential Effect (APE) was completed on behalf of the NRCS. This effort included a Class I literature and records search, and a Class III pedestrian survey. The inventory covered approximately 329 acres and included all locations where direct or indirect affects (inundation) to cultural resources could occur as a result of the construction activities associated with any of the alternatives. No cultural or historic resources were identified during the inventory (see Appendix D - Section 16).

A supplemental cultural resource inventory was completed in November 2012 as a result of the progressing design. The inventory covered approximately 38 acres within a proposed borrow area. The inventory resulted in the identification of one previously recorded site and two newly identified sites. All three sites are prehistoric lithic debris scatters that were determined not eligible for the National Register of Historic Places (NRHP) (see Appendix D - Section 16).

A second supplemental inventory was completed in November and December 2014 as a result of the progressing design. The inventory covered approximately 79.5 acres within proposed borrow areas. The inventory resulted in the identification of three previously recorded sites. The first site is a prehistoric lithic scatter determined not eligible for the NRHP. The other sites include the North Ditch Canal and South Ditch Canal both of which were determined eligible for the NRHP (see Appendix D - Section 16).

3.2.8 Threatened and Endangered Species

A Biological Assessment (BA) is being finalized for the project and has determined that there would be adverse effects on the San Rafael cactus identified along the shoreline of Millsite Reservoir as a result of raising the operating reservoir level by 4 feet.

Table 4 below identifies the federally-listed threatened and endangered species that are known to occur in Emery County and whether suitable habitat occurs in the project area.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Listing Status</th>
<th>Suitable Habitat Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barneby Reed-mustard</td>
<td>Schoenocrambe barnebyi</td>
<td>E</td>
<td>No</td>
</tr>
<tr>
<td>Bonytail</td>
<td>Gila elegans</td>
<td>E</td>
<td>No</td>
</tr>
<tr>
<td>California Condor</td>
<td>Gymnogyps californianus</td>
<td>EXP</td>
<td>No</td>
</tr>
<tr>
<td>Colorado Pikeminnow</td>
<td>Ptychocheilus lOCUS</td>
<td>E</td>
<td>No</td>
</tr>
<tr>
<td>Humpback Club</td>
<td>Gila cypha</td>
<td>E</td>
<td>No</td>
</tr>
<tr>
<td>Jones Cycladenia</td>
<td>Cycladenia humilis var. jonesii</td>
<td>T</td>
<td>No</td>
</tr>
<tr>
<td>Last Chance Townsendia</td>
<td>Townsendia aprica</td>
<td>T</td>
<td>Yes</td>
</tr>
<tr>
<td>Maguire Daisy</td>
<td>Erigeron maguirei</td>
<td>T</td>
<td>No</td>
</tr>
<tr>
<td>Mexican Spotted Owl</td>
<td>Strix occidentalis</td>
<td>T</td>
<td>No</td>
</tr>
<tr>
<td>Razorback Sucker</td>
<td>Xyrauchen texanus</td>
<td>E</td>
<td>No</td>
</tr>
<tr>
<td>San Rafael Cactus</td>
<td>Pediocactus despainii</td>
<td>E</td>
<td>Yes - known occurrences</td>
</tr>
<tr>
<td>Southwestern Willow Flycatcher</td>
<td>Empidonax traillii extimus</td>
<td>E</td>
<td>Yes - outside known range</td>
</tr>
<tr>
<td>Utah Prairie Dog</td>
<td>Cynomys parvula</td>
<td>T</td>
<td>No</td>
</tr>
<tr>
<td>Winkler Cactus</td>
<td>Pediocactus winkleri</td>
<td>T</td>
<td>No</td>
</tr>
</tbody>
</table>
Surveys surrounding Millsite Reservoir were completed by NRCS, USFWS and BLM during the planning process as design progressed. The surveys targeted San Rafael cactus (SRC), Wright fishhook cactus and last chance townsendia. Results of the surveys revealed the presence of 615 SRC individuals in the survey area.

**San Rafael Cactus:** The SRC was listed as endangered on September 16, 1987. It is endemic to Emery and Wayne counties in central Utah occurring on benches, hilltops and gentle slopes associated with salt desert scrub and pinyon-juniper communities. The SRC is found at elevations between 6,000 and 6,700 feet in limestone gravels, shales, clays, and silty substrates of the Mancos, Morrison, Moenkopi, and Carmel formations (USFWS 2013). The average annual rainfall within the range of the SRC is between 6 and 10 inches.

The SRC is a very small barrel shaped cactus that typically does not exceed 2 inches in height or 3.5 inches in width. It has spine clusters (and no central spines) with between 9 and 13 radial spines that are approximately 0.5 inches long. The flowers of the SRC are small (approximately 1 inch across) and are peach to yellow in color with a bronze tint. The SRC typically blooms in April and May.

The SRC stores water in its succulent stems (like all cacti) which allows it to survive extended time periods with little or no precipitation; additionally, the SRC has a shallow root system that enables it to effectively collect any precipitation that does fall. It has a unique habit of shrinking underground during periods of drought and cold weather in order to survive unfavorable conditions. The size and longevity of the soil seed is unknown.

A majority of known SRC individuals occur on lands managed by the BLM and additional individuals are scattered in areas administered by the State School and Institutional Trust Lands Administration (SITLA). The species range is centered on the San Rafael Swell and currently there are five known populations, including Ferron; McCay Flat; Mussentuchit; Short Canyon; and Wedge.

The most current estimate of population size is 20,000 individuals based on an analysis of documented individuals and suitable habitat availability (USFWS 2007). Monitoring efforts indicate that SRC populations are declining (i.e., decrease in the number of individuals capable of flowering and reproducing) most likely as a result of the following threats: Illegal collecting; Off-road vehicle trampling; Livestock trampling; Mineral exploration; Drought and Natural herbivory and predation.

**Critical Habitat**

The USFWS Environmental Critical Habitat Portal was accessed on January 11, 2016 to identify the location of designated critical habitat in Emery County, Utah. The search revealed that designated critical habitat is not located in or adjacent to the project area.

### 3.2.9 Fish and Wildlife Resources

Millsite Reservoir is regularly stocked by the Utah Division of Wildlife Resources (UDWR) with rainbow trout (*Oncorhynchus mykiss*), tiger trout (*Salmo trutta X Salvelinus fontinalis*) and cutthroat trout (*Oncorhynchus clarkii*) to provide a recreational fishery. It is highly unlikely that any native fish occur in Ferron Creek downstream of the dam. Ferron Creek is a tributary to the San Rafael River, which has an
irrigation diversion structure that blocks fish passage upstream. Portions of the San Rafael River are dry by July in most years, further restricting fish movement.

The project area is used by a variety of wildlife including a wide range of native and non-native migratory birds, resident birds, mammals, amphibians and reptiles. Mule deer and cottontail rabbit sign is extensive in the dam area and around the perimeter of the reservoir. Meso-predators, including coyote, foxes, and skunks are also expected to use the area. Small mammals, such as golden-mantled ground squirrels and other rodents are common throughout the project site.

Table 5 below identifies the state-listed species that are known to occur in Emery County and whether suitable habitat occurs in the project area.

**Table 5. State Listed Species - Emery County**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>State Status</th>
<th>Suitable Habitat Present</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bald Eagle</td>
<td>Haliaeetus leucocephalus</td>
<td>SPC</td>
<td>Yes</td>
</tr>
<tr>
<td>Black-footed Ferret</td>
<td>Mustela nigripes</td>
<td>S-ESA</td>
<td>No</td>
</tr>
<tr>
<td>Bluehead Sucker</td>
<td>Catostomus discobolus</td>
<td>CS</td>
<td>Yes</td>
</tr>
<tr>
<td>Bonytail</td>
<td>Gila elegans</td>
<td>S-ESA</td>
<td>No</td>
</tr>
<tr>
<td>Burrowing Owl</td>
<td>Athene cunicularia</td>
<td>SPC</td>
<td>No</td>
</tr>
<tr>
<td>Canada Lynx</td>
<td>Lynx canadensis</td>
<td>S-ESA</td>
<td>No</td>
</tr>
<tr>
<td>Colorado Pikeminnow</td>
<td>Ptychocheilus lucius</td>
<td>S-ESA</td>
<td>No</td>
</tr>
<tr>
<td>Colorado River Cutthroat Trout</td>
<td>Oncorhynchus larkii pleuriticus</td>
<td>CS</td>
<td>No</td>
</tr>
<tr>
<td>Ferruginous Hawk</td>
<td>Buteo regalis</td>
<td>SPC</td>
<td>Yes</td>
</tr>
<tr>
<td>Flannelmouth Sucker</td>
<td>Catostomus latipinnis</td>
<td>CS</td>
<td>No</td>
</tr>
<tr>
<td>Great Plains Toad</td>
<td>Bufo cognatus</td>
<td>SPC</td>
<td>Yes</td>
</tr>
<tr>
<td>Greater Sage-grouse</td>
<td>Centrocercus urophasianus</td>
<td>SPC</td>
<td>No</td>
</tr>
<tr>
<td>Humpback Chub</td>
<td>Gila cypha</td>
<td>S-ESA</td>
<td>No</td>
</tr>
<tr>
<td>Kit Fox</td>
<td>Vulpes macrotis</td>
<td>SPC</td>
<td>Yes</td>
</tr>
<tr>
<td>Northern Goshawk</td>
<td>Accipiter gentilis</td>
<td>CS</td>
<td>No</td>
</tr>
<tr>
<td>Razorback Sucker</td>
<td>Xyrauchen texanus</td>
<td>S-ESA</td>
<td>No</td>
</tr>
<tr>
<td>Roundtail Chub</td>
<td>Gila robusta</td>
<td>CS</td>
<td>No</td>
</tr>
<tr>
<td>Townsend's Big-eared Bat</td>
<td>Corynorhinus townsendii</td>
<td>SPC</td>
<td>No</td>
</tr>
<tr>
<td>Western Toad</td>
<td>Bufo boreas</td>
<td>SPC</td>
<td>Yes</td>
</tr>
<tr>
<td>White-tailed Prairie-dog</td>
<td>Cynomys leucurus</td>
<td>SPC</td>
<td>No</td>
</tr>
</tbody>
</table>

Source: UDWR 2016

S-ESA=listed or candidate species under Endangered Species Act  
SPC= wildlife species of concern  
CS = Conservation Agreement species

**Bald Eagle**

Bald eagles generally nest in tall trees and commonly near bodies of water where fish and waterfowl prey are available. Generally these birds do not breed until they are five or six years old and they may not nest every year. During winter, bald eagles are relatively social and roost communally in sheltered stands of trees. Wintering areas are commonly associated with open water, though other habitats may be used if food resources, such as rabbit or deer carrion, are readily available. No nesting or wintering bald eagles are known to occur in the project area.
Bluehead Sucker

In Utah, the bluehead sucker is known to occur in the Colorado River, Weber River and Bear River drainages. This fish species inhabits warm to cool streams with rocky substrates and does not do well in impoundments. They mature at 2 years of age and range in length between 127 and 179 mm. Larval fish inhabit near-shore, low velocity areas of the stream channel and as they age move to deeper habitats with more cover that are further away from the shore. Larval and early-juvenile bluehead suckers eat mostly invertebrates and at later life-stages are more opportunistic omnivores, consuming algae, detritus, plant debris and occasionally aquatic invertebrates (UDWR 2006). The bluehead sucker is known to occur in Ferron Creek and Millsite Reservoir.

Ferruginous Hawk

The ferruginous hawk is a large, rust colored bird of prey that inhabits grasslands, agriculture lands, sagebrush/saltbush/greasewood shrub lands and the periphery of pinyon-juniper forests. These hawks use habitat around cliffs, buttes and creek banks because of their strong preference for elevated nest sites. The species breeds in western North America, from south-central Canada to northern Utah and New Mexico, and is absent from spotty locations within the breeding range. They winter primarily in grasslands and shrub steppes in the western and central United States, as well as in Mexico. The primary food for the ferruginous hawk is lagomorphs (rabbits and hares) and pocket gophers, although in Utah they are known to eat large numbers of prairie dogs (UDWR 2016).

Great Plains Toad

No recent records are available to substantiate the continued presence of this species in Utah. A single individual was recorded in 1927 within Emery County, however, evidence indicated that this individual was introduced. Based on this information, occurrence of this species in the project area is not expected (UDWR 2003).

Kit Fox

The kit fox is a fox species known to occur primarily in the southwestern U.S. and northern Mexico. They are found in scattered localities throughout Utah but absent from higher-elevation, montane parts of the state (UDWR 2003). The species inhabits sparsely vegetated arid habitats that are dominated by greasewood, shadscale or sagebrush. The kit fox is primarily nocturnal and feeds on small mammals (primarily rabbits), small birds, invertebrates and plants.

Western Toad

The western toad is a large toad species that occurs in the montane areas of central and northern Utah. It prefers a variety of habitats associated with permanent water bodies including riparian, mountain shrub, mixed conifer and aspen-conifer assemblages. The western toad is known to breed between March and July in small pools, beaver ponds, reservoirs and backwaters/side-channels of streams (UDWR 2003). Individuals may be found in upland areas during non-breeding periods.

3.2.10 Migratory Birds

Migratory birds including waterfowl, shorebirds, raptors, passerines and upland game birds use habitats in the project area throughout the year. Neotropical migratory and resident birds are also abundant and dependent on the available riparian and adjacent upland habitats. No site specific migratory bird
information exists for the project area but numerous resident and migratory species likely either forage in or migrate through the project area.

3.2.11 Riparian Area

Riparian vegetation occurs along Ferron Creek upstream and downstream of the reservoir; furthermore, riparian habitats occur in limited areas surrounding the reservoir. The vegetation in these riparian areas generally consist of cottonwood, tamarisk and coyote willow species.

3.2.12 Prime and Other Important Farmlands

Land uses downstream of the project area include agricultural production, as well as limited residential development, and commercial development, public transportation and recreation. Upstream of the dam, lands are used almost exclusively for recreation on USFS and BLM managed areas.

Prime and other important farmland is located downstream of the dam mostly on irrigated soils adjacent to the Ferron Creek drainage. About half of the acreage is located upstream of Ferron and the other half is situated downstream of Ferron for a total of 3,645 acres (NRCS 2007a). The 2007 Agricultural Census revealed that there are 204,775 acres in farmland with an average size of 376 acres.

The project area provides many recreational opportunities for camping, golfing, off highway vehicle (OHV) use, hiking, boating and fishing. Trails in the area provide access to public lands surrounding the reservoir.

3.2.13 Transportation/Hazardous Materials

Ferron Canyon Road is a paved 2-lane roadway used to access Millsite State Park, Millsite Golf Course and public lands upstream and adjacent to the dam. Furthermore, there are several unimproved access routes in the project area. State Highway 10 runs north-south through Ferron and is approximately 3.2 miles east of the dam. An average of 4,300 vehicles per day pass through Ferron using State Highway 10 (UDOT 2010).

3.2.14 Air Quality

The Utah Division of Environmental Quality (UDEQ) is responsible for monitoring air quality. Based on the region’s remoteness and a lack of major urban communities, Emery County is designated as “attainment” or “unclassifiable” with respect to National Ambient Air Quality Standards (NAAQS) (40 Code of Federal Regulations [CFR] Part 81.345). The air quality in the project area has never been designated as “non-attainment” for any criteria pollutant (BLM 2004).

The Hunter Power Plant is located approximately 10.3 miles from the project area and is a coal-fired electrical generation plant. The plant is a Phase II acid rain source and is a major source of SO2, NOx, PM10 and CO hazardous air pollutants. The power plant is subject to 40 CFR 60 Subparts D and Y, 40 CFR 64, and 40 CFR 63 Subpart ZZZZ (UDAQ 2012).

Ambient noise in the project area is a result of vehicular traffic on Ferron Canyon Road and OHV use. In order to abate noise, Emery County only allows construction activities between 7:30 am and 8:00 pm.

3.2.15 Scenic Beauty (Visual Resources)
Visual resource management (VRM) classes define the degree of acceptable visual change within a characteristic landscape. A class is based on the physical and sociological characteristics of any given homogeneous area and serves as a management objective. The area around the dam is classified as Class III (BLM 2004).

BLM, USFS and the State of Utah manage most of the acreage surrounding the reservoir for visual resources according to their individual area resource management plans.

The VRM Class III includes areas where changes in the basic elements (form, line, color, or texture) caused by a management activity may be evident in the characteristic landscape. However, the changes should remain subordinate to the visual strength of the existing character (BLM 2004).

The project area is surrounded by salt desert shrub and pinyon-juniper habitat that is typical of foothills associated with the Wasatch Plateau. The project area is not visible until approximately 2.5 miles west of Ferron. The project area can be observed from the Millsite Golf Course and Millsite State Park. There are no private homes that have a direct view of the project area. People using the USFS lands upstream of the dam can view the upstream dam face and reservoir area.

The auxiliary spillway typically flows in the spring for approximately 4 to 6 weeks creating a waterfall that can be seen from the golf course and Ferron Canyon Road. This feature is well known in the community and provides a unique visual resource (see Figure 6).

![Figure 6. Auxiliary Spillway Outlet.](image)

### 3.2.16 Floodplain Management

A review of the Federal Emergency Management Agency (FEMA) database revealed that the project area has not been mapped for flood hazards (FEMA 2016).

The floodplain area downstream of Millsite Dam is expected to be maintained into the future as it has since the dam was built. The area is maintained through county and city zoning ordinances. Lands are used primarily for agriculture and are within the A-1 Zone (Emery County Zoning 2004) which is intended as a district in which the primary use of the land is agriculture, as defined in Article II. This zone is characterized by farms, ranches and single family dwellings.
3.2.17 Natural Areas

There are no designated natural areas in the project area. The adjacent Ferron Canyon Road is used to access mountainous BLM and USFS lands upstream of the structure. These areas will continue to be accessible for recreation, scenic and outdoor experiences.

3.3 STATUS OF OPERATION AND MAINTENANCE

The SLO’s operation and maintenance (O&M) inspection reports indicate that O&M has been kept current on Millsite Dam and has been verified through Utah Division of Water Rights-Dam Safety (UDWRt) inspections.

3.4 SEDIMENTATION

The 1965 Work Plan states that sufficient sediment storage (5,800 acres feet) was provided to allow for 100-years of accumulation in the reservoir. In 2006, a reservoir sediment survey determined about 2,610 acre-feet of sediment has been deposited in the reservoir over the 35 year period since construction for an average of about 75 acre-feet per year. At this average sedimentation rate, an additional 3,700 acre-feet of sediment will be delivered to the reservoir over the next 50 years. A previous sedimentation study for the nearby Joes Valley Reservoir showed a close correlation with that annual sediment yield.

A relative erosion ranking of each of the sub-basins above the dam was performed by the USFS in 2005. Observations and qualitative descriptions were made regarding general erosion and sediment yield, ground cover, active roads, and grazing activities. Black Dragon canyon was determined to produce the highest sediment load into Ferron Creek above Millsite Reservoir.

Millsite Dam was originally designed with a 100-year sediment storage life. Sediment investigations and analyses made to develop the original plan consisted of: a) sampling suspended load material in Ferron Creek during the 1963 water year; b) measuring pond, reservoir, and fan deposits in the Ferron Watershed; c) measuring gully voids in the upper watershed area; d) transposing sediment rates from adjacent, similar watersheds; e) studying plant cover-condition and soils inventory data; and f) mapping sediment and erosion induced damages in the lower watershed area. Sheet and gully erosion in the lower portion of the watershed produces approximately 50% of the total sediment yield. The original design sediment storage capacity for Millsite Reservoir was calculated at 5,800 acre-feet over a 100-year period.

In June 2006, a reservoir sediment survey was completed with the assistance of the BOR to map and calculate the existing sediment volume in the reservoir. The survey was completed through an acoustic/sonar process which resulted in a current topographic map of the bottom of the reservoir. This topographic map was then compared to the original topography of the reservoir before inundation. The sediment volume was approximated to be 2,610 acre-feet, or an average of 75 acre-feet per year since 1971.

3.5 EXISTING HAZARD CLASS AND BREACH ANALYSIS

3.5.1 Existing Hazard Class

As discussed in Section 1.4, Millsite Dam was built as a High Hazard Class dam and requires rehabilitation in order to meet NRCS and UDWRt safety and performance criteria.

3.5.2 Breach Analysis and Hazard Classification
A breach analysis and hazard classification was prepared for Millsite Dam and is included in Appendix D - Section 2. The analysis determined that the dam falls under Hazard Class (c) as defined by NRCS. Class (c) structures are defined as “Dams located where failure could cause loss of life, serious damage to homes, industrial and commercial buildings, important public utilities, main highways, and railroads.” (NRCS 2005b). Class (c) dams are required to pass the PMF\(^2\) through the auxiliary spillway without catastrophic failure.

A hydrologic analyses identified three freeboard hydrographs that need to be considered. The first is a 6-hour PMF based on the 6-hour local PMP event which results in the highest peak discharge at the dam and is used to evaluate the capacity of the auxiliary spillway. The second hydrograph analyzes the 24-hour PMF based on the 24-hour local PMP event which is required in order to assess the integrity of the auxiliary spillway\(^3\). The third uses the 72-hour PMP event to also evaluate the integrity of the auxiliary spillway.

Component deterioration of the dam has not been determined as a rehabilitation need based on the ongoing maintenance of the structure.

### 3.6 POTENTIAL MODES OF DAM FAILURE

#### 3.6.1 Sedimentation

Most multiple-purpose dams are designed to store sediment. Once the sediment fills to the allocated storage elevation, the storage for other purposes such as water supply and flood control begin to decline. Storage may then become deficient for the intended purposes. Since flood storage is allocated above the sediment storage, a gradual decrease in storage for flood control would occur unless additional storage for sediment is included in future designs.

Landuse in the watershed is primarily rangeland and forestland with generally poor ground cover conditions resulting in sedimentation rates that are expected to continue to be high due to the natural erosion rates. Land treatments were implemented in the upper watershed as part of the original Ferron Watershed Plan in order to reduce the sediment yield into Millsite Reservoir. However, a survey concluded that these land treatments resulted in only a moderate reduction of sediment into the reservoir (Hotchkiss 2008).

The SLO is currently proposing to use a hydrosuction sediment removal system (HSRS) to help maintain the storage capacity and life of the reservoir (Figure 7). These systems are designed to remove sediments from reservoirs using the energy difference (i.e., hydrostatic pressure) between water levels upstream and downstream of a dam (Hotchkiss & Huang 1995).

#### 3.6.2 Hydrologic Capacity

The capacity of the auxiliary spillway for Millsite Dam is deficient; therefore, failure of the dam can occur from overtopping of the embankment or breaching the crest of the auxiliary spillway during a storm event. Overtopping of the dam is the most critical situation since the stored volume would be at a maximum. A breach analysis was performed to determine the dam-break hydrograph and the resulting

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\(^2\) The probable maximum flood (PMF) hydrograph is developed from the probably maximum precipitation (PMP) for a given duration. In this study, the 6-hour PMF was developed from a 6-hour PMP with a local storm distribution and the 24-hour PMF was developed from a 24-hour PMP with a general storm distribution. The 72-hour PMF was developed from a 72-hour PMP with a general storm distribution.

\(^3\) In Utah, the NRCS uses both the 1-day (24 hour) and 10-day duration storms for evaluation and design of dams. For all storms having a recurrence interval less than 100 years, NRCS uses the 24-hour duration.
inundation through the town of Ferron. This analysis was based on a sunny day breach using NRCS methods presented in *Earth Dams and Reservoirs - Technical Release No. 60* (NRCS 2005b) and the results are included in Appendix D - Section 2.

The exact mode and timing of a dam failure are extremely difficult to predict, and as stated above, overtopping due to excessive hydrologic loading is the most probable cause of failure. If the Millsite Dam were to suddenly fail at a high reservoir stage, regardless of failure mode, the result would be a catastrophic failure that could result in the loss of life of approximately 200 people within the breach inundation area. In addition, materials from a breach would likely plug culverts and settle in low-lying residential, agricultural and commercial areas.

### 3.6.3 Seepage

Uncontrolled seepage is a geotechnical concern for all dams that could contribute to failure through the internal erosion of embankment material (i.e., piping). As the soil material is eroded, the voids created allow even more water to flow through the embankment or foundation until the dam fails due to internal erosion. Seepage connected to an increase in reservoir stage can indicate potential problems with a dam’s performance. Embankment and foundation drainage systems manage seepage by intercepting water and limiting soil material from being transported away from the dam.

Seepage at Millsite Dam has been observed for many years in bedrock that is approximately 8 feet below the auxiliary spillway outlet; however, a July 2007 investigation by NRCS indicated there is no hazard or risk with the present seepage. To monitor this seepage, vegetation was cleared by the SLO in 2008 to visually inspect the area.

An analysis of the embankment materials concluded that Millsite Dam does not meet current engineering performance criteria. Therefore, seepage is a potential risk for dam failure (RB&G 2006).

### 3.6.4 Seismic

Millsite Dam is located in seismic zone 2B of the International Conference of Building Officials (ICBO-1997 edition) which lies in the Intermountain Seismic Belt. Most of Utah’s earthquakes have occurred along the zone between the Basin and Range and the Colorado Plateau (Cook and Smith 1967). The Joes Valley fault system is located 2.5 miles west of the dam and has the potential to create a 7.0 magnitude Maximum Credible Earthquake that could produce damaging ground motions at the dam.

A stability analysis was completed by the Utah Division of Water Resources (UDWRe) in 2010 and concluded that the foundation contains material that could liquefy during a seismic event (see Appendix D - Section 10). This material loses strength during an earthquake and can cause deformation of the foundation and/or embankment, putting the structure at risk of failure.

A structural analysis report of the intake riser tower and principal spillway pipe was completed by ABS Consulting Inc. in 2010. The report recommends that the principal spillway pipe should be strapped and bolted to the concrete gallery in order to provide adequate stability during an earthquake event (see Appendix D - Section 12).

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4 The process by which sediment that is very wet starts to behave like a liquid. Liquefaction occurs because of the increased pore pressure and reduced effective stress between solid particles generated by the presence of liquid. It is often caused by severe shaking, especially that associated with earthquakes.
A seismic hazard evaluation report has been prepared to illustrate the dynamic performance of the embankment and foundation of the dam. The analysis has been used to identify potential deficiencies in the dam regarding seismic design and has led to the development of corrective measures to bring the dam into compliance with existing standards and engineering practices (UDWRe 2011).

3.6.5 Material Deterioration (Component Failure)

Materials used in the principal spillway, auxiliary spillway, drains and electrical systems are subject to weathering and chemical reaction due to natural elements within the soil, water and atmosphere. Concrete risers and conduits can deteriorate and crack. Metal components can rust and corrode, and leaks can develop. Embankment failure can occur from internal erosion caused by these leaks.

The underwater, concrete principal spillway intake/riser tower was visually inspected by a BOR dive team and determined to be satisfactory (see Appendix - D - Section 13).

The steel 54-inch diameter principal spillway pipe is visually inspected annually by walking through the concrete gallery. The SLO completed repairs in the past to address surficial pipe corrosion due to leakage from the concrete gallery joints above the pipe. The pipe and associated components are considered to be in satisfactory condition and expected to perform effectively for the design life of the structure.

3.7 CONSEQUENCES OF DAM FAILURE

The evaluation of potential failure modes indicates that overall the embankment of the dam is in good condition. The most likely sources of a potential dam failure are inadequate hydraulic capacity of the auxiliary spillway to safely pass design flows, and seismic loading. Even though the risk of dam failure from overtopping of the dam due to inadequate spillway design may be high, the exact mode and timing of a dam failure is extremely difficult to predict. Nevertheless, the consequences of dam failure, if it occurred, could be catastrophic.

A sudden failure of the dam could put about 285 people at risk and impact 95 houses and motorists traveling on Ferron Canyon road (Homeland Security 2011). Large amounts of embankment material would be released into the stream system, impairing water quality, degrading aquatic habitat, and ultimately increasing downstream flooding by reducing channel capacity. The productivity of cropland, pasture, and hay meadows would be impaired or completely destroyed because of sedimentation and loss of water supply. Water supply to Ferron City and the Power Plant would also be cut. Fences and farm equipment would be damaged or destroyed and livestock possibly killed. Reducing the risk of loss of human life and meeting the current dam safety criteria and performance standards are the underlying reasons for the rehabilitation of Millsite Dam.
CHAPTER 4 - ALTERNATIVES

4.1 FORMULATION PROCESS AND ALTERNATIVES CONSIDERED

Notwithstanding any other alternatives, the NRCS National Watershed Manual requires the following alternatives to be considered in the development of a rehabilitation plan:

- No Action/Future Without Federal Project
- Federal Decommissioning
- Rehabilitation of the Structure (Rehabilitation)
- National Economic Development (NED) alternative if not one of the other alternatives or a combination thereof

Table 5 summarizes the alternatives required by the NRCS National Watershed Manual.

Table 5. Range of Alternatives and Determination for Detailed Study

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Summary of the Alternative</th>
<th>Screening of the Alternative</th>
<th>Carried Forward for Detailed Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Action/Future Without Federal Project</td>
<td>This alternative is eventually the most likely course of action should the SLO receive a legal mandate to fix or remove the dam and should no Federal funding be available for rehabilitation. A “sponsor’s breach” would remove the concrete principal spillway riser and gallery, steel pipe principal spillway and would include the construction of a controlled breach (cut) through the embankment to allow unimpeded flow of Ferron Creek.</td>
<td>The total estimated cost for this alternative is $8,000,000. This alternative does not meet the purpose and need for the project but is required to be considered.</td>
<td>Yes. This alternative is included for detailed study.</td>
</tr>
<tr>
<td>Federal Decommissioning</td>
<td>This alternative would include: 1) Partial removal of the earthen embankment and deposited sediment, 2) Reconnection and restoration of the Ferron Creek channel and floodplain, 3) Construction of rock drop structures, drainage channel, and revegetation, 4) Development of measures to replace the existing benefits of agricultural, municipal, industrial and recreation water supply (Appendix D - Section 18).</td>
<td>The total estimated cost for this alternative is approximately $18,572,300. Alternative needs to meet the project purpose to provide economic benefit to the area through irrigation, municipal, industrial and recreation water storage. The additional cost to replace these benefits without the dam would be: $22,400,000.</td>
<td>No. This alternative does not meet the purpose and need of the project and is not reasonable to the SLO due to the exorbitant cost.</td>
</tr>
<tr>
<td>Rehabilitation</td>
<td>This alternative would rehabilitate the dam to meet the current High Hazard Class requirements and extend its life for 62 years (from completion date).</td>
<td>The total estimated installation cost for this alternative is $29,808,100. This alternative is included for detailed study.</td>
<td>Yes. This alternative is included for detailed study.</td>
</tr>
</tbody>
</table>
Proposed rehabilitation measures include: *Appendix D - Section 18*

1) **Embankment-Downstream Toe:** Loose sand and silt materials in the downstream foundation will be excavated and replaced with compacted materials to remove the top zone of potentially liquefiable materials and to help with stability concerns.

2) **Embankment-Seismic Protection:** The downstream slope will be flattened and a berm placed at the downstream dam toe to improve stability of the dam.

3) **Embankment-Zone Modification:** As part of the downstream work, the downstream slope protection rock will be removed so that a chimney drain (filter and drain zones) can be constructed on the slope and in the foundation to collect seepage through the dam. The slope protection rock will then be replaced on the new downstream slope.

4) **Embankment-Drainage:** Pipes will be installed in conjunction with the drain materials to collect and monitor seepage through the dam.

5) **Embankment-Raise:** The dam crest will be raised four feet to restore the original reservoir capacity.

6) **Principal Spillway Outlet Works:** Downstream work will necessitate the extension of the existing principal spillway outlet works.

7) **Auxiliary Spillway:** The existing concrete spillway will be removed and replaced with a new concrete labyrinth weir spillway with the capacity to pass the design flood event.

8) **Structure Monitoring:** Piezometers, seepage flow weirs, survey monuments, and other necessary instrumentation will be installed to improve long-term monitoring of the dam.

9) **Construction Restoration:** Wave action protection measures to protect campground at Millsite State Park. Millsite Golf Course operations for holes 2, 3 and 4 will be restored. Revegetation of all disturbed areas.

<table>
<thead>
<tr>
<th>National Economic Development (NED) Alternative</th>
<th>The NED Alternative is the alternative or combination of alternatives that reasonably maximizes the net economic benefits consistent with protecting the nation’s resources.</th>
<th>The NED Alternative for the project is the Rehabilitation plan to meet the current High Hazard Class requirements and extend its life for 62 years (from completion date).</th>
<th>Yes. This alternative is included for detailed study.</th>
</tr>
</thead>
</table>
4.2 ALTERNATIVES ELIMINATED FROM DETAILED STUDY

According to the National Watershed Program Manual (NWPM), an alternative can be eliminated from detailed study if the alternative does not meet the stated purpose and need for the project; the alternative meets the need for the action, but does not achieve the purpose/purposes; and/or if the alternative is reasonable, but clearly becomes unreasonable because of cost, logistics, existing technology, or environmental reasons.

A range of alternatives and options were considered for study early in the project scoping and concept design phases. The analysis of these options included various embankment upgrades, hydrologic and seismic retrofits, but were eliminated from detailed study since they were either considered technically infeasible, did not meet the purpose and need, or were deemed too costly.

Federal Decommissioning Alternative

Under the Decommissioning alternative, the SLO would receive a legal mandate to rehabilitate or decommission the dam from UDWRt Dam Safety. Decommissioning the dam would consist of removing the concrete auxiliary spillway, principal spillway pipe and outlet works, drainage system and the associated water supply lines for culinary, irrigation and power plant operations. Reconstruction of a functioning stream channel, flood plain and upland area through the existing embankment would also have to be completed.

Reason eliminated from detailed study: The construction cost estimated for the Decommissioning Alternative is approximately $18,572,730 (see Appendix D - Section 18). In addition, the municipal and industrial water supply provided by the structure is 48,500 acre feet of storage. The benefit of the stored water is the cost of finding a replacement water supply. The estimated cost to replace the water supply would require a dam downstream of the present structure. The dam would cost approximately $22.4 million and provide the water necessary for M&I needs and agricultural needs. The average annual cost of installation is $921,400 with $25,300 in operation and maintenance (see Appendix D - Section 7). Due to exorbitant cost, logistics and that this alternative does not meet the purpose and need of the project, the Federal Decommissioning Alternative was considered unreasonable and eliminated from detailed study.

Hazard Relocation Alternative

Move houses and/or people out of the breach inundation area. This alternative would require purchasing up to 95 structures at fair-market value and relocation of approximately 200 residents to nearby locations. This would cost approximately $9,500,000.

Reason eliminated from detailed study: This alternative does not meet the purpose and need for the project. Furthermore, because of strong ties between the residents and their homes in this community, this alternative was considered unacceptable.

4.2.1 Auxiliary Spillway Options Eliminated From Detailed Study

Various technical options were evaluated that could potentially meet the required additional auxiliary spillway capacity. These options were evaluated for technical feasibility, cost efficiency and relevant environmental effects. The rehabilitation options listed below do not include the other potential rehabilitation needs such as a stability berm and raising the crest of the dam.

Auxiliary Spillway Rehabilitation Option 1

- Raise the existing auxiliary spillway 1 foot with a concrete extension
- Minimal sediment storage is provided
- Construct new Roller Compacted Concrete (RCC) spillway (~685’)
- No additional permanent water storage provided
- Estimated cost only for auxiliary spillway construction: $9,324,000.

Reason eliminated from detailed study: Minimal sediment storage and the performance of the RCC structure in an earthquake event.

**Auxiliary Spillway Rehabilitation Option 2**
- Raise the auxiliary existing spillway 2.5 feet with a concrete extension
- Moderate sediment storage provided
- Construct new RCC spillway (~1320’)
- No additional permanent water storage provided
- Estimated cost only for auxiliary spillway construction: $15,802,000.

Reason eliminated from detailed study: Excessive costs associated with RCC and questionable performance of the RCC structure under potential seismic loading. Not feasible for the SLO.

**Auxiliary Spillway Rehabilitation Option 3**
- Raise the auxiliary existing spillway 2.5 feet with a concrete extension
- Raise the top of dam 2.5 feet with concrete parapet wall
- Additional sediment storage provided
- Construct new RCC spillway (~500’)
- No additional permanent water storage provided
- Estimated cost only for auxiliary spillway construction: $7,827,000.

Reason eliminated from detailed study: Inadequate sediment storage to provide for extended service life of the structure and questionable performance of the RCC structure under potential seismic loading.

**Auxiliary Spillway Rehabilitation Option 4**
- Raise the existing auxiliary spillway 7 feet with a concrete wall, possibly requiring additional reinforcement and cost
- Additional sediment storage would be provided for a 100 yr design life
- Construct new 600 feet long roller compacted concrete (RCC) spillway over the embankment
- Additional permanent water storage of ~ 2000 AC-FT
- Estimated cost only for auxiliary spillway construction: $9,945,000.

Reason eliminated from detailed study: Risk to the performance of the protective filter in the embankment with a 7 foot raise of the normal operating pool. A re-design and installation of any new filter material is not feasible due to the added costs and unrealistic construction needs in order to do this. Questionable performance of RCC structure during the design earthquake.

**Auxiliary Spillway Rehabilitation Option 5**
- Install a Fuse Plug\(^5\) auxiliary spillway in place of the existing concrete box inlet.
- Estimated cost only for auxiliary spillway construction: $847,418 (RB&G 2006)

Reason eliminated from detailed study:

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\(^5\) A form of auxiliary spillway consisting of a low embankment designed to be overtopped and washed away during an exceptionally large flood.
- This dam is operated as an irrigation storage reservoir, not a flood control reservoir. Past operation has shown that the owners desire to fill the reservoir to the point of spilling whenever possible. Judgment dictates that this structure needs to be constructed as passive as possible to eliminate human error and the desire to store additional water. A fuse plug that would have to be reloaded on a regular basis would not be feasible.

- Substantially decreasing the amount of storage is not an option. There is a very limited amount of elevation to work with without significantly raising the dam crest. In order to pass the design flow, any fuse plug (total width) would have to be roughly the same width as an RCC structure. If the fuse plugs were to be made deeper into the embankment (rather than wider) they would get wet for several months at a time on a yearly basis.

- Regardless of any proposed fuse plug alignment, the flow would have to drop nearly the entire height of the dam. If this structure was placed over the embankment, that section would have to be reinforced, negating any cost savings. If placed near the left abutment, removal of a tremendous amount of material would be needed in order to create a stable slope. Based on the site conditions, any earthen spillway would remain un-vegetated with highly erodible soils unprotected. Creating a stable slope would also be very expensive.

- There is very little elevation to pass a large amount of flow. Therefore, any new spillway would have to be fairly wide without significantly raising the dam. Because of this, there isn't a good location to put a fuse plug spillway that would have the advantage of cost efficiency and technical feasibility.

**Auxiliary Spillway Rehabilitation Option 6**
- Locate additional auxiliary spillway at the left (northern) abutment to minimize impacts on the Millsite Golf Course operations. The estimated cost only for auxiliary spillway construction is $12,000,000.

Reason eliminated from detailed study: Major excavation of rock and earth material would be required for this option and the cost does not include any other elements needed to meet the purpose and need of the Project. Threatened & Endangered plant species would be impacted. Therefore, this option was not acceptable to the SLO.

**Auxiliary Spillway Rehabilitation Option 7**
- Excavate a 600 feet wide by 700 feet long rock/earthen auxiliary spillway at the right abutment area for extra capacity. Approximately 90,000 cubic yards of mostly siltstone/sandstone rock would be blasted, ripped and hauled from the area or placed at the upstream face of the dam and used for rip rap. The estimated cost only for auxiliary spillway construction: $6,225,000.

Reason eliminated from detailed study: This option would involve significant impact of the Millsite Golf Course design and long-term operations. There would be a considerable increase in the footprint of the auxiliary spillway with this option and the resulting alignment would create short and long-term safety risks for the golf course operations.

### 4.3 DESCRIPTION OF ALTERNATIVE PLANS STUDIED IN DETAIL

Alternative analysis is required to determine feasible methods that can meet the purpose of providing continued benefits of the dam and to meet current NRCS and Utah Dam Safety and engineering standards. As part of the rehabilitation, the structure would be modified to include applicable modern construction techniques and technological advances that have become standard since the original construction of the dam. The No Action Alternative must also be considered. The alternatives are described below.
4.3.1 No-Action / Future Without Federal Project Alternative

No federal funds would be expended with this alternative. The No Action Alternative, also known as the future-without-project condition, projects the changes in resource concerns from the current condition to the condition that would exist in the future if none of the federally assisted action alternatives are selected. The No Action Alternative for dam rehabilitation projects typically involves the SLO electing to (1) bring the dam up to current state dam safety criteria for high hazard dams without meeting NRCS standards, which may be more stringent; (2) reconfigure the dam to a lower hazard classification and proceed to meet state dam safety criteria; or (3) reconfigure the dam so it is no longer classified as a dam (e.g., constructed breach).

The Millsite structure has a future without project or No-Action alternative that requires construction expenditures to remove all existing reservoir storage. Thus, the cost savings of not installing the No-Action alternative costs are used as a benefit of the rehabilitation alternative. The cost of the most likely alternative is $9.5 million for installation or $372,200 on an average annual basis.

The municipal and industrial water supply provided by the structure is 48,500 acre feet of storage. The benefit of this water is the cost of finding a replacement water supply. The estimated cost to replace the water would require a dam built downstream of the present structure to replace the water supply. The dam would be $22.4 million and provide the water necessary for M&I needs and agricultural needs. The average annual cost of installation is $921,400 with $25,300 in operation and maintenance (see Appendix D - Section 7).

The SLO would excavate a breach section through the embankment to eliminate the potential for a catastrophic failure. This would result in increased flood damages to 5 residences, 3 bridges, Ferron City roadways and to agricultural land. The loss of the reservoir would:

- Result in the loss of irrigation water for agricultural uses
- Require the development of an alternative municipal water source, which could increase rates for water customers
- Result in a reduction of available areas to participate in fishing and boating
- Result in the loss of irrigation water for Millsite Golf Course
- Result in the loss of 7,000 acre-feet of water piped to the Huntington Power Plant for operations.

This alternative would most likely involve the following:

1) Removal of a section of the embankment to the valley floor and stabilizing the pool sediment and side slopes of the excavated notch with rock, vegetation or other suitable means to prevent downcutting and lateral slope erosion
2) The principal spillway concrete riser inlet and the associated concrete gallery and steel conduit would be removed and disposed, or recycled appropriately
3) Restoration of riparian habitat in the normal pool area and re-vegetation of disturbed areas would be completed to prevent erosion and to mitigate for lost habitat.

Total Cost = $9,500,000.

4.3.2 Rehabilitation

This alternative involves a plan to extend the service life of Millsite Dam to 62 years (after installation) and meet applicable safety and performance standards for a high hazard dam. The proposed rehabilitation measures are depicted in Appendix B - 6 and more detailed considerations for this alternative is detailed in Appendix D - Section 18.

The following rehabilitation actions are proposed:
1) Demolish the existing concrete box inlet auxiliary spillway and replace with a concrete labyrinth weir structure with capacity to safely pass flows up to 31,000 cubic feet per second (cfs) and raise the inlet elevation by four feet.

2) Placement of an additional 4 feet of compacted earthen material to the top (crest) of the dam.

3) Install a 102 feet wide by 35 feet tall by 300 feet long stability berm at the northern downstream toe of the dam.

4) Addition of 9,000 cubic yards of rock riprap to the upstream face of the dam.

5) Install instrumentation for long-term monitoring of the Zone III embankment material phreatic water line.

6) Install an auxiliary gate control for backup of the existing gate operation.

7) Extend the steel 54-inch diameter principal spillway outlet pipe 100 feet and rebuild the associated outlet works.

8) Replace the 8-inch diameter steel water pipe in the outlet gallery. This pipe is currently used by Ferron City for drinking water.

9) Excavate and reconstruct the downstream face of the dam with earth fill and install a new toe drain.

10) Placement of small berms/riprap in Millsite State Park for protection of existing facilities.

11) Disturbed surface area restoration: The total disturbed area (including the dam embankment) would be approximately 32 acres, predominantly downstream of the dam, on the proposed borrow areas and the auxiliary spillway area.

12) Golf course restoration: Restoration of the landscape for impacts to holes 2, 3 and 4 will be completed in coordination with Millsite Golf Course representatives.

13) Reservoir drawdown process: The reservoir would need to be drawn down to a safe level to complete work on the embankment, outlet conduit and the auxiliary spillway.


The construction cost estimated for this alternative is $26,602,400 with operation and maintenance costs at approximately $30,000 annually for the 62-year life of the project.

Construction Access and Staging

Construction staging would be located on existing golf course and Ferron Canal and Reservoir Company lands downstream of the embankment. This area would be cleared of vegetation and graded where deemed appropriate. Ferron Canyon Road and golf course access trails around holes 2, 3 and 4 would be utilized for project access during construction. All temporary staging areas would be restored to preconstruction conditions after construction completion.

Avoidance and Minimization Measures

- **Erosion:** Erosion may occur on disturbed and cleared areas within the project boundary during precipitation events. Proper BMPs would be installed during and after construction to prevent and control soil erosion. Areas disturbed during construction activities would be restored, and stabilized through establishment of ground cover.

- **Surface Water Quality:** Construction activities may temporarily impact surface water quality, but project design elements, including Best Management Practices (BMPs), would be used and implemented to reduce the quantity of sediment (1) entering drainages, and (2) flowing downstream and violating any federal or state water quality rules and regulations.

- **Air Quality:** Construction activities would temporarily emit air pollutants. Fugitive dust, mobile air source toxics (MSAs), and greenhouse gas (GHG) emission increases associated with construction would be minimized by implementation of applicable BMPs.

- **Noxious Weeds and Invasive Plants:** Construction activities would put the project area at risk for future invasion of noxious weeds and invasive plant species. BMPs would be implemented during
construction to prevent the spread of noxious weeds and invasive plant species. During construction and until restoration areas are fully established, they would be maintained on a regular basis to prevent the establishment of noxious weeds and invasive plant species. Non-desirable plant species would be controlled by cleaning equipment prior to delivery to the project site, by eradicating these species before the start and during construction as discovered, and by routine monitoring after construction completion. A Post Construction Site Rehabilitation Plan (PCSRP) would be developed and would include mechanisms for addressing weed establishment and treatment. Long-term negative impacts would be managed with re-planting, and various methods of weed control.

- **Wildlife and Wildlife Habitat**: Construction activities would be limited to the smallest extent practicable within the project area. Disturbed areas would be restored to preconstruction conditions after construction completion.

- **Special Status Animal Species**: BLM/State listed species: Construction activities would be limited to the smallest extent practicable within the project area. Disturbed areas would be restored to preconstruction conditions after construction completion.

- **Migratory Birds**: Construction activities would be limited to the smallest extent practicable within the project area. Disturbed areas would be restored to preconstruction conditions after construction completion. If construction activities occurred during migratory bird breeding/nesting periods, the project area (and surrounding habitats) would be surveyed by a qualified biologist for active nests no more than 5 days prior to the commencement of work. If active nests were found during surveys, spatial buffers would be established around such in coordination with USFWS and NRCS. Construction activities within the buffer areas would be prohibited until a qualified biologist confirmed that all nests were no longer active.

- **Hazardous Materials**: There is the potential for impact to the environment from the release of a hazardous material brought on-site during construction activities. NRCS requires that contractors comply with all federal, state, and local laws and regulations pertaining to pollution and contamination of the environment to prevent pollution of surface water, groundwater, soil, and air with any hazardous materials.

- **Visual Resources**: Areas disturbed during construction activities would be restored to preconstruction conditions. This would be accomplished by grading to match natural contours and stabilizing through establishment of ground cover. These areas would be reestablished by seeding with an NRCS- and BLM-approved seed mixture (where applicable) to match the surrounding plant community. The visual management objectives and associated reclamation standards outlined in the BLM Resource Management Plan (BLM 2008) would be followed.

**Mitigation Measures**

San Rafael cactus: 48 individuals were surveyed within the project area will be adversely affected due to the proposed 4 foot raise of the normal operating pool level. Currently, consultation with the USFWS and BLM is underway to identify acceptable mitigation. Detailed mitigation measures will be finalized in the Final BA.

**Potential Schedule**

Construction would generally start after the spring runoff, followed by a timed drawdown of the reservoir to a conservation pool level. The intent of a timed drawdown is make water available to water users as long as possible into the irrigation season. After the drawdown, construction will continue until weather conditions cause a shutdown. Construction will span approximately 2 irrigation seasons with careful consideration given to maintaining all water supplies as much as practicable. Appendix D - Section 19 outlines the potential construction schedule but would be subject to change pending final design and construction contractor selection.
4.3.3 National Economic Development (NED) Alternative

The National Economic Development (NED) Alternative is the alternative or combination of alternatives that reasonably maximizes the net economic benefit of the project consistent with protecting the nation’s environment. The net economic benefit is the benefit minus the cost. For the rehabilitation program, when human life is potentially at risk, the NED alternative is defined as the federally-assisted alternative with the greatest net economic benefits. The No Action Alternative may not be identified as the NED alternative but would continue to be included to allow a valid comparison of the reasonable alternatives. In this case, the Rehabilitation Alternative described in Section 4.3.2 would best meet the NWPM definition by resulting in fewer negative net benefits.

4.4 COMPARISON OF ALTERNATIVES

Table 5 displays the relevant concerns identified in Chapter 2, Table 1, Summary of Scoping, and adds relevant economic details. These concerns are compared to each of the alternatives carried forward for detailed study. Applicable concerns are identified for a more detailed comparison in Chapter 5, Environmental Consequences.

<table>
<thead>
<tr>
<th>General Information</th>
<th>No-Action/Future Without Federal Project</th>
<th>Rehabilitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternative Description</td>
<td>Construction of a breach through the dam; stabilize slopes, stream and reservoir sediment.</td>
<td>Rehabilitate Millsite Dam to meet current engineering High Hazard Class safety &amp; performance criteria.</td>
</tr>
<tr>
<td>National Economic Development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction Cost</td>
<td>$8,000,000</td>
<td>$17,291,600</td>
</tr>
<tr>
<td>Project Environmental, Engineering, and Administrative Costs</td>
<td>$1,500,000</td>
<td>$3,205,700</td>
</tr>
<tr>
<td>Total Project Cost (Install Cost)</td>
<td>$9,500,000</td>
<td>$29,808,100</td>
</tr>
<tr>
<td>Cost Sharing (NRCS)</td>
<td>$0</td>
<td>19,375,265</td>
</tr>
<tr>
<td>Cost Sharing (Sponsor)</td>
<td>$9,500,000</td>
<td>$10,432,835</td>
</tr>
<tr>
<td>O&amp;M Cost</td>
<td>$25,300</td>
<td>$30,000</td>
</tr>
<tr>
<td>Annual Benefit</td>
<td>$0</td>
<td>$1,775,900</td>
</tr>
<tr>
<td>Annual Sum Cost</td>
<td>$33,300</td>
<td>$1,224,900</td>
</tr>
<tr>
<td>Net Economic Benefit</td>
<td>$-33,300</td>
<td>$551,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resource Concerns of SLO, Public, Agencies</th>
<th>No-Action/Future Without Federal Project</th>
<th>Rehabilitation (NED)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic &amp; Social</td>
<td>Refer to Human Health &amp; Safety and economic related sections.</td>
<td>Refer to Human Health &amp; Safety and economic related sections.</td>
</tr>
<tr>
<td>Erosion &amp; Sedimentation</td>
<td>No impoundment-allows sediment transport downstream.</td>
<td>Continue with existing erosion and sedimentation benefits.</td>
</tr>
<tr>
<td>Flood Control</td>
<td>Flood protection removed. The result is that crop damages now prevented would begin to occur on different return interval storms. The data is based on damages for</td>
<td>Upgrade of existing flood control benefits to meet current safety and performance criteria. The alternative would continue the flood protection provided by Millsite. The result is that crop damages will still occur but with lower acreages affected as compared to the without project alternative for each return</td>
</tr>
<tr>
<td>Human Health and Safety</td>
<td>Removes the threat of a breach. Loss of incidental flood control benefits; results in downstream potential for residential and roadway flooding.</td>
<td>Reduction in threat of a breach. Additional flood control benefit with increased sediment storage capacity.</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Millsite Dam Safety</td>
<td>Functions of the structure removed.</td>
<td>Addresses need to meet high hazard dam design criteria to ensure safety and performance of the dam.</td>
</tr>
<tr>
<td>Recreation</td>
<td>Loss of open water fishing &amp; boating; Assume substitute effect for recreation at alternative locations (Huntington State Park (22.5 miles), Scofield State Park (80 miles), Palisade State Park (88 miles) and Yuba State Park (101 miles). Average annual net benefit = $295,500.</td>
<td>Water storage for recreation associated with the reservoir would continue into the future. During the construction period, the reservoir would be drawn down. Fishing and limited boating for fishing would be allowed in a temporary 2,000 acre-foot conservation pool. Golf course operations would temporarily be stopped at holes 2, 3 and 4 during the construction period. Average annual net benefit = $295,600.</td>
</tr>
<tr>
<td>Transportation</td>
<td>Construction access for removal and disposal of concrete riser tower, gallery, principal &amp; auxiliary spillway.</td>
<td>Construction related activities for ingress &amp; egress to site &amp; disposal/removal of old concrete auxiliary spillway materials. Golf course access to holes during demolition and re-construction of auxiliary spillway.</td>
</tr>
<tr>
<td>Water Quality</td>
<td>Sediment loads increase downstream of the dam.</td>
<td>Maintains dam &amp; reservoir sediment retention benefits.</td>
</tr>
<tr>
<td>NRCS Planning Requirements</td>
<td><strong>No-Action/Future Without Federal Project</strong></td>
<td><strong>Rehabilitation</strong></td>
</tr>
<tr>
<td>Cultural Resources</td>
<td>No change in existing conditions.</td>
<td>Historic properties present downstream of the dam. Consultation and concurrence by SHPO and BLM documents no adverse effect on historical resources.</td>
</tr>
<tr>
<td>Threatened &amp; Endangered Species</td>
<td>Spring runoff flows in Ferron Creek would eventually be used almost completely for irrigation –</td>
<td>San Rafael cactus individuals are identified within the project area. Rehabilitation will allow for continued operation (spilling) of the auxiliary spillway.</td>
</tr>
<tr>
<td>Category</td>
<td>Description</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Fish and Wildlife Coordination Act</td>
<td>Consultation with USFWS. Loss of plant, wildlife, and aquatic habitat associated with the reservoir. Bluehead sucker (a State Sensitive Species), is known to occur in Millsite Reservoir.</td>
<td>Consultation with USFWS for the final BA is underway and will be completed for the Final Plan/EA. A 2,000 acre-foot conservation pool and connection with Ferron Creek (for any potential spawning) would be maintained during the construction period. Fish salvage activities would be carried out during the reservoir drawdown (for construction) in coordination with UDWR.</td>
</tr>
<tr>
<td>Floodplain Management</td>
<td>A floodplain permit would be necessary for any action alternative.</td>
<td>A floodplain permit would be necessary for any action alternative.</td>
</tr>
<tr>
<td>Migratory Birds</td>
<td>To avoid impacts, needed vegetation clearing would be proposed to occur before April or after August 15.</td>
<td>To avoid impacts, needed vegetation clearing would be proposed to occur before April 1 or after August 15.</td>
</tr>
<tr>
<td>Prime &amp; Unique Farmlands</td>
<td>Loss of irrigation benefits to 3,645 acres of important farmland if the reservoir is breached.</td>
<td>Sustained water availability for irrigating 3,645 acres of important farmland.</td>
</tr>
<tr>
<td>Riparian Area</td>
<td>Loss of fringe habitat around the reservoir. Re-establishment of 20 acres riparian habitat through the restored Ferron Creek corridor above the dam.</td>
<td>No net change from the existing condition with the 4 foot raise in the normal operating level of the reservoir – there would be a spatial adjustment to the higher reservoir operating level.</td>
</tr>
<tr>
<td>Wetlands-NRCS Policy</td>
<td>Loss of the reservoir shoreline fringe vegetation and wetland characteristics. Wetland delineation identifies approximately 21.47 acres of wetlands exist above and below the ordinary high water mark that surrounds the existing reservoir (see Appendix D - Section 1). Expect gain in riparian vegetation and wetland characteristics extending through a 1.7 mile long corridor of Ferron Creek from the downstream toe of the existing dam, upstream to the maximum reservoir water line.</td>
<td>Wetland characteristics would remain mostly unchanged. The auxiliary spillway elevation would increase 4 feet which would result in a 4 feet rise in the normal operating pool elevation. The 4 foot raise would initially provide for more water storage capacity but would eventually be replaced by sediment deposition in the pool. It is anticipated that over time there would be a hydrologic benefit to the existing wetland habitats along the fringe of the reservoir.</td>
</tr>
<tr>
<td>Wetlands-Other Clean Water etc.</td>
<td>21.47 acres wetlands exist above and below the OHWM.</td>
<td>Increase in deep water habitat along reservoir fringe; only spatial change in wetlands due to 4 foot raise.</td>
</tr>
</tbody>
</table>
CHAPTER 5 - ENVIRONMENTAL CONSEQUENCES

The NRCS has the responsibility under NEPA to identify and address effects on the human environment that may occur as a result of the alternative plans. These plans include the No Action and Rehabilitation alternatives. This section describes the potential effects of the alternatives within each resource category as defined in Chapter 3 - Affected Environment.

Table 6 lists the type of effects and impacts analysis used in this chapter (NRCS 2014a).

Table 6. Types of Effects and Impacts

<table>
<thead>
<tr>
<th>Direct Effect</th>
<th>Impacts caused by a proposed action and occurring at the same time and place.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indirect Effect</td>
<td>Impacts caused by an action that are later in time or farther removed in distance, but are still reasonably foreseeable.</td>
</tr>
<tr>
<td>Cumulative Effect</td>
<td>The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertaking such other action.</td>
</tr>
</tbody>
</table>

5.1 EFFECTS OF ALTERNATIVE PLANS

5.1.1 Human Health and Safety / Public Health and Safety

No Action/Future Without Federal Project

Human health and safety would be improved by eliminating the threat of the dam breaching. A total of 95 buildings would be inundated with a breach of the dam. However, removing the impoundment would create a flood risk for 5 homes, numerous roads and 3 bridges within the 100 year floodplain.

Rehabilitation

The risk of a dam breach affecting existing and future downstream property would be reduced. This alternative would maintain the existing flood control and water supply benefits of the structure.

5.1.2 Geology and Soils

No Action/Future Without Federal Project

The water and sediment storage capacity for which the structure was originally built would be eliminated, so erosion and sediment transport through the Ferron Creek corridor would be expected to resume after breaching the dam. The stream corridor downstream of the structure would likely receive sediment volumes that would be stored on point bars and transported further downstream during higher flows or flood events.
Rehabilitation

Sediment storage capacity would be increased by raising the auxiliary spillway crest by 4 feet. This raise accommodates an additional 1,835 acre-feet of sediment in the reservoir. This value, when added to existing water storage capacity totals to 18,016 acre-feet (at the new auxiliary spillway crest).

5.1.3 Water Quality

Surface Water

No-Action / Future Without Federal Project

The loss of the reservoir eliminates the settling of sediment loads and other debris from Ferron Creek storm water runoff. Materials stored in the reservoir would continue to be delivered downstream through the Ferron Creek corridor. Because of the difference in elevation upstream of the structure to downstream of the structure, sediments stored in the reservoir would continue to be eroded and transported downstream. The breach slopes and the channel upstream and downstream of the breach would be stabilized for proper geomorphic connection and function.

Project design elements, including best management practices (BMPs), would be implemented to reduce the quantity of sediment entering drainages and flowing downstream and violating any federal or state water quality rules and regulations. This alternative would also meet Clean Water Act (CWA) and Utah Water Quality Act antidegradation policy requirements (Utah DEQ 2012). Construction BMPs would include, but are not limited to, the following:

- A Storm Water Pollution Prevention Plan that contains erosion and sediment control and pollution prevention BMPs, such as, but not limited to, silt fences, fiber wattles, and/or earthen berms, would be required and implemented.

- Straw bales, silt fences, and other appropriate sediment control BMPs would be implemented to prevent the entry of sediment and other contaminants into Ferron Creek.

- To ensure that accidental spills would not enter Ferron Creek, the storage of petroleum-based fuels and the refueling of construction machinery would not occur outside of approved designated staging/batch plant areas. Furthermore, the project would comply with state and federal water quality standards and toxic effluent standards to minimize any potential adverse impacts from discharges to waters of the U.S.

- No construction materials would be stockpiled or deposited in or near Ferron Creek or Millsite Reservoir.

With the implementation of the BMPs listed above, there would only be temporary impacts on water quality. Impacts would include an increase in sediment load in surface water from the sediment stored in the reservoir.

Rehabilitation

Construction activities would result in a temporary increase in turbidity downstream of the embankment and auxiliary spillway locations. This alternative would utilize the same BMPs as the No-Action alternative for minimizing potential construction impacts (i.e., sediment load, contaminants) to water quality.
Activities associated with this alternative would have no long-term effect on water quality downstream of the project area or within the reservoir. There would be approximately a 1,835 acre-foot increase in sediment storage capacity with the proposed 4 foot raise of the auxiliary spillway crest elevation.

**Groundwater**

**No-Action / Future Without Federal Project**

Groundwater associated with Millsite Reservoir would be reduced to a riparian area along a newly restored Ferron Creek corridor.

**Rehabilitation**

There will be a short-term disruption of groundwater flow and levels during the reservoir drawdown and the dewatering activities proposed at the toe of the dam. Dewatering at the downstream toe of the dam is intended to keep water levels at a safe level during construction activities.

### 5.1.4 Water Features

**No-Action / Future Without Federal Project - Wetlands**

There would be a loss of the reservoir shoreline fringe vegetation and wetland characteristics as a result of removing the impoundment. As documented in the wetland delineation, approximately 21.47 acres of wetlands exist above and below the ordinary high water mark that surrounds the existing reservoir (see Appendix D - Section 1).

It is anticipated that there would be an overall gain in riparian vegetation and wetland characteristics extending through a restored 1.7 mile long corridor of Ferron Creek from the downstream toe of the existing dam, upstream to the maximum reservoir water line.

**Rehabilitation - Wetlands**

Wetland characteristics would remain mostly unchanged. The auxiliary spillway elevation would increase 4 feet which would result in a 4 feet rise in the normal operating pool elevation. The 4 foot raise would initially provide for more water storage capacity but would eventually be replaced by sediment deposition in the pool. It is anticipated that over time there would be a hydrologic benefit to the existing wetland habitats along the fringe of the reservoir.

**Impoundments - No-Action / Future Without Federal Project**

Approximately 450 acres of the existing open water in Millsite Reservoir would be lost.
Impoundments - Rehabilitation

Millsite Dam would create a total storage capacity at the auxiliary spillway elevation of 18,016 acre-feet with a 458 acre normal operating pool (ordinary high water mark) that is approximately 80 feet deep near the dam. The drainage area providing runoff to the reservoir is 97,890 acres.

Drainages - No-Action / Future Without Federal Project

Ferron Creek would be restored to its historic alignment. It is anticipated that there would be an overall gain in riparian vegetation and wetland characteristics extending through a restored 1.7 mile long corridor of Ferron Creek from the downstream toe of the existing dam, upstream to the maximum reservoir water line. Drainages leading to Ferron Creek would be reconnected.

Drainages - Rehabilitation

There will be no change to the 97,890 acre drainage area providing runoff to the reservoir. The main hydrological feature associated with Millsite Dam is Ferron Creek and its tributaries. Ferron Creek, immediately downstream of the dam, operates primarily as a conveyance for irrigation. The flows released from the principal spillway outlet pipe would continue to be split into the North Ditch and South Ditch canals at the splitter approximately 200 feet downstream of the proposed extended outlet. The extension of the outlet results in the filling of a 100 feet long by 30 feet wide section of Ferron Creek.

5.1.5 Flood Control

No-Action / Future Without Federal Project

Flood control benefits would be eliminated since the impoundment and reservoir would be removed.

Rehabilitation

Flood protection benefits would be extended for at least another 62 years. A concrete labyrinth auxiliary spillway would be installed with the inlet crest raised 4 feet and the floor of the structure lowered by 10 feet in order to pass the PMP event. An additional 4 feet of earth fill would be added to the crest of the dam to account for the raise of auxiliary spillway elevation.

5.1.6 Recreation Resources/Millsite State Park

No-Action / Future Without Federal Project

Recreation opportunities such as boating, swimming and quiet enjoyment of the open water would be eliminated along with the associated fishery and visual aesthetics. Water supplies for continued golf course operation would have to be provided through the construction of a new diversion on Ferron Creek. The average annual visitor value associated with Millsite State Park would decrease to $295,500 compared to the future with project (rehabilitation) value of $295,600. Recreation opportunities lost would likely be substituted with other reservoir locations within driving distance (Huntington State Park (22.5 miles), Scofield State Park (80 miles), Palisade State Park (88 miles) and Yuba State Park (101 miles).
Rehabilitation

Long-term recreation opportunities associated with the existing reservoir would be maintained with an average annual user value of $295,600. The user days projected at the end of the project life of 2077 would be approximately 101,500 per year.

Construction activities would temporarily affect and disrupt Millsite Golf Course operations on holes 2, 3 and 4. Impacts to the golf course would be restored in coordination with golf course representatives. Access to the golf course maintenance building at the downstream toe of the embankment would be maintained.

The new normal operating pool level and associated wave action would affect approximately 5 campsites and other low-lying areas in Millsite State Park. Protection measures (i.e., berm, riprap) would be added to protect park facilities.

The reservoir would be drawn down to a safe level during construction. Therefore, recreational opportunities such as boating and fishing would be temporarily disrupted until State Dam Safety approves filling of the reservoir.

5.1.7 Socioeconomic Resources

No-Action / Future Without Federal Project

Cultural Resources

It is anticipated that no resources would be affected that are eligible for the NRHP. Activity would be limited to the embankment, auxiliary spillway footprint and deposited sediment materials upstream of the embankment.

Rehabilitation

Cultural Resources

In May and August of 2006, a cultural resource inventory of the APE was completed on behalf of the NRCS. No cultural or historic resources were identified during the inventory; accordingly, it was determined by NRCS that the undertaking would not affect historic properties. SHPO concurred with this determination on February 6, 2007 (see Appendix A).

A supplemental cultural resource inventory was completed in November 2012. The inventory resulted in the identification of one previously recorded site and two newly identified sites. All three sites were found not eligible for the NRHP, therefore NRCS determined that the revised undertaking would not affect historic properties. SHPO concurred with this determination on March 25, 2013 (see Appendix A).

A second supplemental inventory was completed in November and December 2014 as a result of the progressing design. The inventory resulted in the identification of three previously recorded sites. The first site is a prehistoric lithic scatter determined not eligible for the NRHP. The other sites include the North Ditch Canal and South Ditch Canal both of which were determined eligible for the NRHP. Based on this information and consideration of the project scope, NRCS determined that the revised undertaking would not adversely affect historic properties. SHPO concurred with this determination on, March 10, 2015 (see Appendix A).
**No-Action / Future Without Federal Project**

**Benefits**

No economic benefits of the No-Action/Future Without Alternative have been identified.

**Costs**

If the federal project is not completed, the dam would be breached and stabilized. This would return the watershed to a state of periodic flooding in which damages to real properties as well as damages to agricultural crops would occur on a regular, repeating basis. The estimated present value of flood damage losses is $1,696,000.

It is assumed that a new diversion would be constructed to divert water into the existing canal and pipeline system, enabling local producers to continue agricultural operations using the water available in Ferron Creek. The potential cost of this diversion is not known and is not included in this analysis. The level of agricultural production would be lower than in comparison with the dam in place and would be derived from the annual snowpack, rainfall—which determines the annual Net Irrigation Requirement (NIR) and related flows in Ferron Creek. In order to operate existing sprinkler irrigation systems, producers would have to operate pumps to pressurize their sprinkler systems. This added cost would be considered as another loss. The estimated present value to agriculture of losing irrigation water storage in Millsite Reservoir is estimated at $13,548,000. This figure includes net losses in net agricultural revenue and increased pumping expenses.

The loss of water-related recreation visits to Millsite Reservoir would result in a corresponding loss to the local economy in recreation spending. With an annual value of $153,000, these losses have a present value of $3,489,000 over the 62 year life of the proposed project.

The sum of the present values of the losses outlined above is $18,886,000. These losses would also be associated with further multiplier effects in the form of reduced spending and employment in the community as agricultural producers’ spending and recreational expenditures would fall.

An additional loss associated with breaching the dam would be its impact on power production. PacifiCorp holds the right to water in Millsite Reservoir, which contributes to power generation at its at the nearby Hunter power plant. Because the multiple water rights held by PacifiCorp cover various reservoirs and streams and because the utility can often replace water lost from one source with water from another, it is not possible to attribute specific power generation to specific water bodies. The value of the water right held by PacifiCorp in Millsite Reservoir, therefore, is not included in this analysis.

**Rehabilitation**

**Benefits**

The benefits associated with the Rehabilitation Alternative are equal to avoidance of the losses associated with dam decommissioning. The present value of these benefits is $18,886,000. Additional benefits would result from the spending and employment multiplier effects related to agricultural income and recreational spending in the project area (see Appendix D - Section 7).
Costs

The average annual cost of this alternative is $1,254,900 with $1,224,900 for installation cost and $30,000 for annual operation and maintenance cost. The $26,602,400 installation cost will be split 65% federal ($17,291,600) and 35% non-federal ($9,310,800). The remaining design and project administrative cost of $2,671,400 and $534,000 respectively will be federal only costs as they are not cost-share eligible items under the rehabilitation program (see Appendix D - Section 7).

5.1.8 Threatened and Endangered Species

Table 6 identifies the federally-listed species known to occur in Emery County and effect determinations as a result of the proposed project. Designated critical habitat does not occur in or near the project area, therefore NRCS determined that the project would have no effect on critical habitat for federally-listed species.

Table 6. Threatened & Endangered Species List - Emery County

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Listing Status</th>
<th>Effect Determination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barneby Reed-mustard</td>
<td>Schoenocrambe barnebyi</td>
<td>E</td>
<td>No Effect</td>
</tr>
<tr>
<td>Bonytail</td>
<td>Gila elegans</td>
<td>E</td>
<td>No Effect</td>
</tr>
<tr>
<td>California Condor</td>
<td>Gymnogyps californianus</td>
<td>EXP</td>
<td>No Effect</td>
</tr>
<tr>
<td>Colorado Pikeminnow</td>
<td>Ptychocheilus lucius</td>
<td>E</td>
<td>No Effect</td>
</tr>
<tr>
<td>Humpback Chub</td>
<td>Gila cypha</td>
<td>E</td>
<td>No Effect</td>
</tr>
<tr>
<td>Jones Cycladenia</td>
<td>Cycladenia humilis var. jonesii</td>
<td>T</td>
<td>No Effect</td>
</tr>
<tr>
<td>Last Chance Townsendia</td>
<td>Townsendia aprica</td>
<td>T</td>
<td>No Effect</td>
</tr>
<tr>
<td>Maguire Daisy</td>
<td>Erigeron maguirei</td>
<td>T</td>
<td>No Effect</td>
</tr>
<tr>
<td>Mexican Spotted Owl</td>
<td>Strix occidentalis</td>
<td>T</td>
<td>No Effect</td>
</tr>
<tr>
<td>Razorback Sucker</td>
<td>Xyrauchen texanus</td>
<td>E</td>
<td>No Effect</td>
</tr>
<tr>
<td>San Rafael Cactus</td>
<td>Pediocactus despainii</td>
<td>E</td>
<td>Adverse Effect</td>
</tr>
<tr>
<td>Southwestern Willow Flycatcher</td>
<td>Empidonax traillii extimus</td>
<td>E</td>
<td>No Effect</td>
</tr>
<tr>
<td>Utah Prairie Dog</td>
<td>Cynomys parvidens</td>
<td>T</td>
<td>No Effect</td>
</tr>
<tr>
<td>Winkler Cactus</td>
<td>Pediocactus winkleri</td>
<td>T</td>
<td>No Effect</td>
</tr>
<tr>
<td>Wright Fishhook Cactus</td>
<td>Sclerocactus wrightiae</td>
<td>T</td>
<td>No Effect</td>
</tr>
<tr>
<td>Yellow-billed Cuckoo</td>
<td>Coccyzus americanus</td>
<td>T</td>
<td>No Effect</td>
</tr>
</tbody>
</table>

Source: USFWS 2016

No-Action / Future Without Federal Project

SRCs may be directly affected (i.e., crushed, excavated) by construction equipment during the restoration of Ferron Creek; however, access and staging areas could be located outside occupied habitat and SRCs would not likely occur in a proposed alignment for the restored stream. No indirect impacts to SRCs are anticipated as result of this alternative.

Rehabilitation

SRCs may be directly affected by construction equipment and translocation efforts. Excavation in borrow areas may result in SRC individuals being crushed by equipment or collected in conjunction with borrow material. This impact will be minimized by avoiding occupied habitat although there is the potential loss of undiscovered individuals. A pre-construction survey (during the flowering period) will be completed in Borrow Area 3 (Appendix B - 13) based on the presence of occupied habitat. This survey and results
from previous surveys will be used, in coordination with USFWS and BLM, to identify areas that will be avoided during construction.

SRCs that occur in the area affected by the 4 foot raise of the reservoir (see indirect discussion below) are expected to die if not translocated. However, moving these SRCs as part of mitigation could also result in death or stress to individuals. Protocols established by USFWS will be used to minimize impacts during translocation, however it is unlikely that all individuals will survive and reproduce.

A new ordinary high water mark would be established during periods of high water as a result of raising the elevation of the proposed auxiliary spillway by 4 feet. This new inundation would indirectly affect SRCs that occur near the existing ordinary high water mark surrounding the reservoir. It is expected that individuals in the new area of inundation would die based on habitat requirements of the SRC. Furthermore, SRCs directly adjacent to the new area of inundation would likely be killed or stressed by potential wave-action during high wind events or additional soil moisture. Recreation activities may also indirectly affect SRCs (i.e., crushing, trampling) based on relocating campsites or trails to areas near the new ordinary high water mark.

Approximately 48 SRC individuals occur in areas that would be inundated by the 4 foot raise of the reservoir. This raise would indirectly impact approximately 29 acres of potential SRC habitat. To minimize impacts to these individuals, NRCS proposes to translocate them prior to inundation in coordination with USFWS and BLM.

A BA is being finalized to document impacts to the SRC, conservation measures and mitigation commitments. Once the BA is final, USFWS will prepare a Biological Opinion (BO) in order to determine whether the proposed project would jeopardize the continued existence of the SRC. The final BA and BO will be included in the Final Plan/EA.

### 5.1.9 Fish and Wildlife Resources

#### No-Action / Future Without Federal Project

**Plant and Wildlife Habitat**

Implementation of this alternative would negatively affect the existing habitat surrounding the reservoir as a result of losing water storage. A new riparian area would likely develop adjacent to the re-established Ferron Creek. The downstream corridor would be negatively affected by eroding reservoir sediment in the short-term.

State sensitive wildlife species that could potentially occur in the project area (bald eagle, ferruginous hawk, kit fox) may be temporarily disturbed and displaced to adjacent habitats. Once construction is completed, they could return to the area. Impacts are expected to be insignificant based on the project location/scope, duration of construction and availability of similar habitat surrounding the project area. Furthermore, disturbed areas would be restored upon completion of construction.

**Aquatic Habitat**

Millsite Reservoir is stocked by UDWR to provide a recreational fishery. The reservoir provides the only fishery below 7,500 feet (mean sea level) in this part of Utah and currently is open for use much earlier and later in the season than other reservoirs. This fishery would be lost with this alternative except for the approximately 1.7 miles of Ferron Creek corridor from the reservoir high water elevation downstream to the breached section of the dam.
Bluehead Sucker: Restoring 1.7 miles of Ferron Creek may benefit this species as a result of providing more favorable habitat in a natural stream corridor. However, it is anticipated that bluehead suckers would be killed, injured or disturbed during the restoration of Ferron Creek.

Western Toad: The change in hydrologic conditions would permanently destroy suitable habitat for the western toad around the reservoir. It is anticipated that individuals in the construction area would be killed, injured or disturbed during the restoration of Ferron Creek. The restored creek corridor would provide suitable habitat for breeding, foraging and sheltering.

Rehabilitation

Plant and Wildlife Habitat

Raising the auxiliary spillway by 4 feet would maintain or improve hydrologic conditions in habitats surrounding the reservoir. There is suitable habitat available in the surrounding terrain for wildlife to migrate to during and after construction.

State sensitive wildlife species that could potentially occur in the project area (bald eagle, ferruginous hawk, kit fox), may be temporarily disturbed and displaced to adjacent habitats. There would be no direct impacts to breeding or nesting habitat for the bald eagle or ferruginous hawk; however, available prey for these species could be negatively affected by construction activities (i.e., noise, vibration, excavation) albeit temporary. No indirect impacts to the bald eagle or ferruginous hawk are anticipated.

The kit fox, if present in the project area, is expected to avoid areas where construction activities would occur. These activities may result in the destruction of kit fox dens and could result in death or disturbance to available prey. Avoidance (and potential abandonment) of suitable habitat may impact successful breeding, foraging and sheltering behaviors. No indirect impacts to the kit fox are expected.

Once construction is completed, state sensitive wildlife species could return to the area. Impacts are expected to be insignificant based on the project scope, duration of construction and availability of similar habitat surrounding the project area. Furthermore, disturbed areas would be restored upon completion of construction.

Aquatic Habitat

A small conservation pool would be established in coordination with UDWR for fish and aquatic habitat until the Utah State Dam Safety office approves filling of the reservoir. Connection of the conservation pool and Ferron Creek flows will be maintained for potential spawning activity. Access for fishing in the temporary conservation pool would be allowed. The drawdown is proposed to start after the spring runoff period.

Bluehead Sucker: Drawdown of the reservoir during construction may result in bluehead suckers being killed, injured or disturbed until the conservation pool is established. These impacts would be minimized through fish salvage activities completed in coordination with UDWR. Potential elevated turbidity in Ferron Creek during and immediately following construction may temporarily disturb individuals. BMPs are expected to minimize turbidity and protect in-stream habitat for the bluehead sucker.

Western Toad: Drawdown of the reservoir during construction may result in western toads being killed, injured or disturbed until the conservation pool is established. The change in hydrologic conditions would benefit western toads by creating additional suitable habitat for breeding, foraging and sheltering.
5.1.10 Migratory Birds

No-Action / Future Without Federal Project

Construction activities would likely disturb migratory birds and may result in avoidance or abandonment of habitats in the project area. Avoidance or abandonment of suitable habitat may negatively affect breeding, foraging or sheltering. Implementation of this alternative would indirectly impact the existing habitat for migratory birds as a result of losing the water storage; however, a new riparian area would likely develop adjacent to the re-established Ferron Creek.

It is anticipated that migratory birds would return to the project area once construction is complete. Impacts to migratory birds are expected to be insignificant based on the scope of project, duration of construction and availability of similar habitat surrounding the project area. Furthermore, disturbed areas would be restored upon completion of construction.

In order to minimize impacts to migratory birds, vegetation will be cleared and grubbed when feasible outside of the primary nesting period of April 1 to August 15. If the clearing of vegetation is required during the nesting period, the project area will be surveyed by a qualified biologist for active nests no more than 2 weeks prior to the commencement of work. If active nests are found during surveys, spatial buffers will be established in coordination with USFWS. Construction activities within the buffer areas will be prohibited until a qualified biologist confirms that all nests are no longer active.

Rehabilitation

Construction activities would likely disturb migratory birds and may result in avoidance or abandonment of habitats in the project area. Avoidance or abandonment of suitable habitat may negatively affect breeding, foraging or sheltering. Implementation of this alternative is expected to benefit the existing habitat for migratory birds as a result of the 4 foot raise in the reservoir.

It is anticipated that migratory birds would return to the area once construction is complete. Impacts to migratory birds are expected to be insignificant based on the scope of project, duration of construction and availability of similar habitat surrounding the project area. Furthermore, disturbed areas would be restored upon completion of construction.

In order to minimize impacts to migratory birds, vegetation will be cleared and grubbed when feasible outside of the primary nesting period of April 1 to August 15. If the clearing of vegetation is required during the nesting period, the project area will be surveyed by a qualified biologist for active nests no more than 2 weeks prior to the commencement of work. If active nests are found during surveys, spatial buffers will be established in coordination with USFWS and NRCS. Construction activities within the buffer areas will be prohibited until a qualified biologist confirms that all nests are no longer active.

5.1.11 Riparian Area

No-Action / Future Without Federal Project

Breaching of the dam would reconnect the riparian corridor upstream of the high water (normal pool) elevation of the reservoir with the corridor downstream of the dam. Sediment material would have to be stabilized with drop structures, vegetation and riprap to help control excessive erosion of the reservoir sediment. Approximately 1.7 linear miles of the historic Ferron Creek stream channel would be restored.
Rehabilitation

The crest of the auxiliary spillway would be raised 4 feet causing the normal pool elevation to rise by 4 feet. Since the reservoir would continue to be operated the same as it currently is, there would be no net change to the riparian vegetation.

5.1.12 Prime and Other Important Farmlands

No-Action / Future Without Federal Project

Assuming the dam would eventually have to be breached, irrigation water would no longer be delivered for 3,645 acres of Prime and Unique Farmlands downstream of Ferron Reservoir (NRCS 2007).

Rehabilitation

No change from the existing conditions.

5.1.13 Transportation/Hazardous Materials

No-Action / Future Without Federal Project

Effects on transportation relating to this alternative are generally linked to the proposed construction activities. Heavy trucks and other earth-moving equipment would use Ferron Canyon Road (100 South in Ferron City) and Mill Road closer to the structure for ingress and egress to the embankment. Material removed from the embankment would be stockpiled on site and used in construction of this alternative or placed on-site in a suitable location. A construction permit would include measures that outline hazardous material (e.g., fuel, chemical, etc.) controls during the construction period.

Rehabilitation

Activities associated with the proposed construction would affect transportation on Ferron Canyon Road, Mill Road and access to the golf course parking lot area. Waste or demolished materials associated with the existing auxiliary spillway would be hauled away for disposal. A construction permit would include measures that outline hazardous material (fuel, chemical, etc.) controls during the construction period.

5.1.14 Air Quality

No-Action / Future Without Federal Project

The SLO would eventually be required through State Dam Safety regulations to either breach the dam or upgrade the dam to meet current engineering and safety performance criteria. Any work would have to stay in compliance with visibility limits set in UAC R307-205 (UDAQ 2012).

Rehabilitation

The impacts under this alternative are similar to the Federal Decommissioning alternative except that the excavation and moving of soil materials shall be scheduled to minimize the size of areas disturbed and unprotected from erosion for the shortest reasonable time.

The project would have to stay in compliance with visibility limits set in UAC R307-205 (UDAQ 2012).
5.1.15 Scenic Beauty (Visual Resources)

No-Action / Future Without Federal Project

The embankment would eventually be breached and the principal spillway conduit, concrete gallery and outlet works connections would be removed and recycled or appropriately disposed. Loss of open water aesthetics would be replaced with restoration of the 1.7 mile historic Ferron Creek riparian zone upstream of the dam. Rock riprap used to stabilize the engineered dam breach area, would likely be visible from Ferron Canyon Road until vegetation is reestablished.

Rehabilitation

All of the proposed construction activities would temporarily diminish the scenic beauty of the project area. The proposed replacement of the auxiliary spillway would decrease the elevation of the spillway waterfall by 10 feet and replace the existing box inlet configuration with a labyrinth weir configuration. The golf cart bridge over the auxiliary spillway would be replaced with a modern and improved bridge. Materials used for earthen stability berm and for the downstream face of the dam would match the existing native rock as much as practicable therefore minimizing long-term visual impacts when compared to the No-Action FWOP alternative.

5.1.16 Floodplain Management

No-Action / Future Without Federal Project

The floodplain area downstream of Millsite Dam is expected to be maintained into as it has since the dam was built. The area is maintained through County and City zoning ordinances. The floodplain area is used primarily for agriculture and is mostly within the A-1 Zone (Emery County Zoning 2004) which is intended as a district in which the primary use of the land is agriculture, as defined in Article II. This zone is characterized by farms, ranches, family dwellings and is managed to allow, as conditional uses, certain non-agricultural structures and/or activities.

Rehabilitation

An area of spoiled borrow material immediately downstream of the dam which was placed there during the original construction of the dam is proposed to be used for embankment stabilization upgrades. This area, although within the original floodplain of Ferron Creek is not considered part of a floodplain.

5.1.17 Natural Areas

No-Action / Future Without Federal Project

There are no designated natural areas in the project area. The adjacent Ferron Canyon road is used to access mountainous USFS and BLM lands mostly upstream of the structure. Those areas will continue to be accessible for recreation and scenic, outdoor experiences.

Rehabilitation

There are no designated natural areas in the project area. The adjacent Ferron Canyon road is used to access mountainous USFS and BLM lands mostly upstream of the structure. Those areas will continue to be accessible for recreation and scenic, outdoor experiences.
5.2 CUMULATIVE EFFECTS OF ALTERNATIVES

Cumulative impacts include the direct and indirect effects of a project together with effects from reasonably foreseeable future actions of others. Reasonably foreseeable future actions are not speculative, are likely to occur based on reliable sources, and are typically characterized in planning documents.

This review of the cumulative effects for Federal, State, and private actions is required by the Council on Environmental Quality (CEQ) regulations developed from the National Environmental Policy Act of 1969 (NEPA).

Cumulative impact issues associated with this Project would be effects on health and human safety, water quality, flood control, loss of recreation opportunities associated with the No-Action/Future Without Federal Project and Decommissioning Alternatives, and loss of plant and wildlife habitat associated with the No-Action/Future Without Federal Project and Decommissioning Alternatives.

Potential growth and development west of Ferron, Utah may have cumulative effects under any of the alternatives by increasing the flood hazard in the potential breach inundation zone.

Table 7 summarizes the Project Cumulative Effects for each alternative based on the potential resource effect or concern. Two or more effects on a single resource indicate a potential cumulative effect for that particular resource issue.

Table 7. Summary of Potential Cumulative Effects

<table>
<thead>
<tr>
<th>No Action/Future Without Federal Project Alternative – Cumulative Effects Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Health and Human Safety and Flood Control</strong></td>
</tr>
<tr>
<td>The structure currently provides flood control benefits to downstream areas. These benefits would be eliminated by breaching the dam. Future projects would have to be considered relative to future potential flood hazards. Growth downstream of the existing structure is expected to be limited, but could change depending on future employment and other economic opportunities in the area (e.g. mining, power plants, etc.). Removing the flood control benefits through this alternative would increase the flood-related threat to residences, roads and cropland downstream.</td>
</tr>
<tr>
<td><strong>Water Quality</strong></td>
</tr>
<tr>
<td>The existing structure provides downstream water quality benefits with sediment deposition in the reservoir normal pool. This alternative would remove the sediment deposition benefit and increase the sediment loading downstream, especially during storm runoff events. However, buffering provided by channel bank riparian/wetland vegetation would eventually provide some overall sediment retention benefits when the Ferron Creek channel is restored to pre-dam conditions. It is assumed that golf course operations would continue after the reservoir is taken out as long as water would be supplied through a new point of diversion on Ferron Creek. Long-term cumulative effects on water quality associated with this alternative and other identified projects would return to the pre-dam condition of Ferron Creek.</td>
</tr>
<tr>
<td><strong>Recreation</strong></td>
</tr>
<tr>
<td>The reservoir provides numerous recreation opportunities for the community and surrounding areas. Removal of the reservoir would likely cause more recreational pressure on the surrounding public lands and eliminate the boating, open water fishing, quiet enjoyment and scenic beauty elements of open water in a mountainous setting. However, the restoration of the stream corridor through the normal pool would provide different types of recreation and scenery in the long-term. Water for Millsite Golf Course operations would likely divert water from Ferron Creek, so it’s anticipated those operations would continue contingent on permitting for a change in the point of diversion and any other regulatory requirements.</td>
</tr>
<tr>
<td><strong>Fish &amp; Wildlife Habitat</strong></td>
</tr>
<tr>
<td>The reservoir’s normal pool and hydrology changes would affect the wetland characteristics associated with the vegetation along the pool edge. There is approximately 21.47 acres of wetlands along the reservoir fringe. However, the historic 1.7 mile Ferron Creek channel would be restored and the associated riparian vegetation</td>
</tr>
</tbody>
</table>

Draft Plan / EA - Millsite Dam Rehabilitation, Emery County, Utah January 2016
would re-establish on approximately 20 acres along the restored channel.

**Scenic Beauty**

The reservoir provides stunning scenery set within a mountainous background. Regular spring time auxiliary spillway flows provide another scenic backdrop of a waterfall set within the Millsite Golf Course terrain. This scenery has been a local attraction since the dam was built. Implementation of this alternative would eliminate that scenery.

<table>
<thead>
<tr>
<th>Rehabilitation Alternative Cumulative Effects Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Health and Human Safety and Flood Control</strong></td>
</tr>
<tr>
<td>The structure currently provides flood control benefits to downstream areas. These benefits would continue with a widened auxiliary spillway that would safely pass 31,000 cubic feet per second. Growth downstream of the existing structure is expected to be limited, but could change depending on future employment and other economic opportunities in the area (e.g. mining, power plants, etc.).</td>
</tr>
<tr>
<td><strong>Water Quality</strong></td>
</tr>
<tr>
<td>Rehabilitation of the structure would maintain the current water quality benefits in the reservoir normal pool. Future development downstream may produce short-term potential for decreases in water quality due to storm water runoff. The 30,000 ton reduction of salt into the Colorado River would continue with this alternative by providing pressurized Millsite reservoir water for 9,000 acres of farmland downstream of the dam. Note: A future O&amp;M action by the SLO may include the sluicing of reservoir sediment through a hydro-suction process that would incorporate reservoir sediment with springtime auxiliary spillway flows to extend the longevity of the reservoir and affect the stream dynamics and water quality in Ferron Creek. A separate EA is in progress to evaluate the hydro-suction proposal.</td>
</tr>
<tr>
<td><strong>Recreation</strong></td>
</tr>
<tr>
<td>The reservoir provides numerous recreational opportunities for the community and surrounding areas that include boating, swimming, fishing, camping, and quiet enjoyment of an open water setting. Maintenance of the reservoir would continue to offer the numerous recreational opportunities mentioned above. There would be a short-term disruption of Golf Course play during construction and temporary measures would have to be planned for continued play and safety around heavy equipment. The largest impact likely would be around the holes at the existing auxiliary spillway area and around the downstream toe of the dam.</td>
</tr>
<tr>
<td><strong>Fish &amp; Wildlife Habitat</strong></td>
</tr>
<tr>
<td>The proposed 4 foot increase in elevation of the reservoir’s normal pool elevation would affect the wetland characteristics associated with the vegetation along the normal pool edge. Given the operation of the pool for irrigation and other water supplies, the elevation fluctuates dramatically throughout the summer with the lowest pool level usually in September. Approximately 37 acres of artificial reservoir fringe wetland could be affected, but a net loss or gain is not anticipated. There would be short-term disturbance to habitats during construction around the auxiliary spillway and at the downstream toe area of the dam, mostly attributed to heavy equipment causing vibration, noise, and dust. Most of the land use downstream of the dam is agricultural which does provide some wildlife habitat along field boundaries and fence rows. The riparian corridor is anticipated to be maintained even if there is moderate road and urban growth downstream of the dam.</td>
</tr>
<tr>
<td><strong>Scenic Beauty</strong></td>
</tr>
</tbody>
</table>
| The reservoir provides stunning scenery set within a mountainous background and is an important aspect for tourism and recreation in the immediate area and Utah in general. Regular springtime auxiliary spillway flows also have provided another scenic backdrop of a waterfall set within the Millsite Golf Course terrain. This scenic quality has been a local attraction since the dam was built. Implementation of this alternative would maintain the scenic qualities and also maintain the existing Millsite Golf Course characteristics. A 10 foot reduction in the drop of the waterfall is proposed with this alternative, but the overall aesthetics of a waterfall would remain.  

The potential for growth and residential development downstream of Millsite Dam is moderate and would minimally detract from the overall scenic and open space qualities of the area. Public lands surround the dam and comprise most of the upper watershed acreage (Emery County is 92% public lands). Public land management agencies address potential impacts to visual resources (i.e. Scenic Beauty) in their land use management plans. For these reasons, the cumulative impacts on scenic beauty would have no effect other than during the short-term construction activities. |
5.3 INDIRECT EFFECTS

Indirect effects are caused by the action and occur later in time or are farther removed in distance from the project, but are still considered reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR 1508.7).

A potential indirect effect with the Rehabilitation alternative would be the positive overall effects upon real estate values below the dam. Property values downstream of the dam would likely be reinforced with the increased long-term safety and performance of the dam.

Rehabilitation of the dam to meet current safety and performance criteria may enhance the possibility of retrofitting the dam for hydroelectric power generation at some time in the future.

5.4 RISK AND UNCERTAINTY

5.4.1 Engineering

All cost and structural data are based on about an additional 62 years of life. A variety of factors contribute to the potential for structure failure, including the intensity of a storm event, construction materials and techniques, and operation and maintenance activities. Millsite Dam has operated since 1971 with few problems and the SLO has an excellent record in performing maintenance as needed and operating the structure. Inspection of the principal spillway intake tower and the auxiliary spillway revealed no structural problems. An evaluation of the steel outlet conduit through the dam revealed that placement of strapping bolted into the concrete base would be needed for adequate stability during a seismic event.

The Rehabilitation Alternative would raise the existing crest of the auxiliary spillway 4 feet. Flows from the PMP event, if that was to ever occur, would cause significant damage downstream of the auxiliary spillway outlet and Millsite Golf Course.

There is no unusual risk or uncertainty if the Millsite Dam would not continue to operate as intended. Dams are inherently hazardous structures, but with continued maintenance, it should continue to provide flood protection and water storage through the original design life and with rehabilitation it should operate safely for the next 62 years.

5.4.2 Natural Resources

Natural resources risk and uncertainties associated with the project may include the following:

- **Plants:** Due to construction disturbance in the project area, there is an increased risk that noxious weeds and invasive species would become established. Successful mitigation for the San Rafael cacti plants adversely affected by the reservoir level increase may be problematic due to the sensitive nature of the species.
- **Animals:** General wildlife habitat would be temporarily disturbed. Alteration of habitat has the potential to deter known species from returning or attract nuisance species to the area.
- **Upland Erosion and Sedimentation:** The sedimentation rate calculated for the reservoir was based on interpretation of an electronic bathymetric survey through deep water. This survey can be confirmed during the drawdown of the reservoir with direct topographic survey methods. The watershed sedimentation rate could vary based conditions in the drainage area, including construction activity, wildfires, storm events, and OHV use.
5.4.2 Economics

Risk and uncertainty is inherent in any watershed analysis. P&G describes risk as a potential outcome that can be described in a reasonably well known probability distribution. Uncertainty is potential outcomes that cannot be described in objectively known probability distributions. Both of these exist in the Plan/EA for the rehabilitation of Millsite Dam.

The risk of damage levels relative to specified flood events were estimated and transferred without data less than first entry points into structures. A linear interpolation method is utilized to capture damages occurring before the first entry point into affected structures. Uncertainty is associated with the changes in land use and price levels relative to the original discount rate. The future demographics and price level changes over the sixty-two year evaluation period add more uncertainty to economic effects of this project. Also, the long-term changes in land use due population demand for housing and landuse change, relative to the cropping patterns, create an uncertainty in the values evaluated in these analyses. However, the reason for the implementation study was for reducing the structure safety and protection of downstream residents while continuing the present purposes of the stored water (see Appendix D - Section 7).

5.5 Irreversible and Irretrievable Resource Commitments

NEPA requires that environmental analysis include identification of "… any irreversible and irretrievable commitments of resource which would be involved in the Proposed Action should it be implemented." Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects this use could have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action (e.g., extinction of a threatened or endangered species or the disturbance of a cultural resource).

5.5.1 No Action/Future Without Federal Project

Implementing this alternative would involve a commitment of a range of natural, physical, human and fiscal resources. Over time, these resources could resemble the commitments for the Rehabilitation Alternative because some of the infrastructure would eventually need to be completely replaced.

5.5.2 Rehabilitation Alternative

Implementing the Rehabilitation Alternative would involve a commitment of a range of natural, physical, human and fiscal resources. Moderate amounts of fossil fuels, labor and construction materials (such as cement, aggregate, and bituminous material) would be expended. Additionally, considerable amounts of labor and natural resources would be used in the fabrication and preparation of construction materials. These materials are generally not retrievable. They are not, however, in short supply and their use would not have an adverse effect upon continued availability of these resources. Any construction would also require a one-time expenditure of federal, state and local cost-share funds that would not be retrievable.

The commitment of these resources would be based on the premise that residents in the immediate area, the state, and the region would benefit by the improved quality/safety of the dam and its appurtenances. These benefits are expected to outweigh the permanent commitment of resources.
5.6 CONCERNS IDENTIFIED DURING SCOPING

The SLO is concerned about impacts on agricultural water users during construction activities for the Rehabilitation Alternative. Water supply for agricultural uses will be maintained as much as practicable during construction. The SLO, NRCS and UDWRRe will coordinate with State Dam Safety to determine the timing of filling the reservoir.

Concerns for operations on Millsite Golf Course during and after construction will be considered for the final design of the rehabilitation. Construction plans would be coordinated with the Millsite Golf Course staff to ensure safe ingress and egress to the work areas and to minimize impacts on the golf course design and operation.

The feasibility to retrofit the structure for hydroelectric power generation was assessed based on the need to evaluate alternatives to reasonably maximize the net economic benefits consistent with protecting the nation’s environment (NRCS 2014, 501.12). This assessment was not identified during the original scoping process but was added at the request of the SLO.

5.7 COMPLIANCE WITH FEDERAL, STATE AND LOCAL LAWS

| Federal |
|------------------|--------------------------|
| USACE (Corps)    | The Ferron Canal and Reservoir Company (FCRC) submitted a Joint Stream Alteration Permit Application Form and the Millsite Wetland/Waters of the U.S. delineation report (Appendix D) to the State Engineer’s Office on December 16, 2016 (No. 15-93-03SA). A hard copy of the permit form in addition to Form ENG 4345 was delivered to Corps Offices on December 17, 2016. The Stream Alteration permit was approved pending resolution of the comments listed in the UDWRt section below. |
| BLM (and conformance to BLM Land Use Plans) | The Ferron Canal and Reservoir Company would submit the application to amend its right-of-way (ROW) grant to make repairs at the auxiliary spillway area. The need for the BLM action is established by BLM statutory and regulatory responsibilities regarding ROWs under the Federal Land Policy and Management Act of 1976 (43 CFR 2800). The project would occur on public lands administered by the BLM’s Price Field Office. Land use decisions for the project area are contained in the Price Field Office Resource Management Plan (RMP) BLM 2007). It has been determined that the project would not conflict with any objectives or decisions in the RMP. Applicable objectives and decisions include the following: “LD-12 - Applications for new rights-of-way on public lands will be considered and analyzed on a case-by-case basis. Proposals will be reviewed for consistency with planning decisions and evaluated under requirements of the NEPA and other applicable laws for resource protection. Mitigation needed to avoid adverse impacts will be integrated into project proposals and, where appropriate, alternatives identified to further reduce environmental impacts to lands, resources, or adjacent land uses.” |
| USFWS            | An effects determination has been completed for the project and concluded that there would be Adverse Effects on 48 San Rafael cactus individuals with the proposed Rehabilitation Alternative. Section 7 consultation is underway and a Biological Assessment will be completed for the Final Plan/EA. |

| State |
|------------------|--------------------------|
| STATE PARKS      | A State of Utah right-of-way application would be submitted and a permit obtained for work on state lands. |
| UDWRRe           | Utah Division of Water Resources is preparing the Design/Plans/Specifications for the Rehabilitation Alternative in coordination with NRCS and Dam Safety to ensure all current engineering design criteria is met. |
| UDWRt            | Stream Alteration: A Joint Permit Application Form for USACOE – Sections 404 and 10 |
| (Stream Alt and Dam Safety) | *Utah State Engineer’s Office – For Natural Stream Channels* was submitted to UDWRt on December 16, 2016 (No. 15-93-03SA) for stream channel work that will affect Ferron Creek/Waters of the U.S. downstream of the embankment. The permit was approved on Jan 5, 2016 under three conditions/comments received; 1) The USFWS indicated they anticipate finishing Section 7 formal consultation with NRCS due primarily to adverse impacts to San Rafael cactus; 2) The USACE indicated that separate Corps permitting will be required due to Endangered Species Act (ESA) and potential indirect wetland impacts; 3) A floodplain permit from the local Floodplain Administrator (FPA) needs to be acquired and that the project is in compliance with the National Flood Insurance Program.  
Dam Safety Office: Approval would be required for the final design report, construction drawings, and specifications through the Assistant State Engineer (Dam Safety). |
<table>
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<tr>
<td>UDWQ</td>
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</table>
| SHPO | In May and August of 2006, a cultural resource inventory of the APE was completed on behalf of the NRCS. No cultural or historic resources were identified during the inventory; accordingly, it was determined by NRCS that the undertaking would not affect historic properties. SHPO concurred with this determination on February 6, 2007 (see Appendix A).  
A supplemental cultural resource inventory was completed in November 2012. The inventory resulted in the identification of one previously recorded site and two newly identified sites. All three sites were found not eligible for the NRHP, therefore NRCS determined that the revised undertaking would not affect historic properties. SHPO concurred with this determination on March 25, 2013 (see Appendix A).  
A second supplemental inventory was completed in November and December 2014 as a result of the progressing design. The inventory resulted in the identification of three previously recorded sites. The first site is a prehistoric lithic scatter determined not eligible for the NRHP. The other sites include the North Ditch Canal and South Ditch Canal both of which were determined eligible for the NRHP. Based on this information and consideration of the project scope, NRCS determined that the revised undertaking would not adversely affect historic properties. SHPO concurred with this determination on, March 10, 2015 (see Appendix A). |
| UDOGM | If riprap is obtained from a source that does not have an existing mining permit, a mining operations permit would be required in order to mine the riprap (Utah Division of Oil, Gas and Mining [UDOGM]). |
| Local |
| County and Town | Any additional County and Town permits such as a floodplain development permit would be required prior to construction. A floodplain permit from the local Floodplain Administrator (FPA) needs to be acquired. The project is in compliance with the NFIP. |
CHAPTER 6 - CONSULTATION, COORDINATION AND PUBLIC PARTICIPATION

Refer to Chapter 3, Table 1 – Summary of Scoping for a list of primary scoping concerns identified by the SLO, public, and agencies.

6.1 PUBLIC PARTICIPATION

A Rehabilitation Assessment Report for Millsite Dam was completed by NRCS in September 2004 which provided the SLO with information relating to the overall condition of the dam and whether or not it would be eligible for rehabilitation. The result was the SLO’s desire to meet the current Engineering Design criteria and to ensure the long-term safety and performance of the dam.

The SLO and NRCS held multiple public meetings to receive input, discuss project alternatives, and to provide an update on progress. The meetings held and summary comments received are listed in sequence from early discussions to the recent efforts.

- **September 5, 2003** – SLO meeting at Ferron City Hall, Ferron, Utah. Rehabilitation Program on the Board’s agenda. Discussed sedimentation in Millsite Dam reservoir. Discussed progress of the rehabilitation assessment report. Discussed evaluation of the upper watershed on USFS lands.

- **January 11, 2006** – Joint public and SLO meeting, Ferron City Hall, Ferron, Utah. The objective was for NRCS State Office to explain the rehabilitation program to the SLO and other attendees and cover the process required to develop a Rehabilitation Plan/EA. There were 22 attendees including representatives from the BOR, State Division of Wildlife Habitat, Utah State Parks, UDWR, UDWQ, Emery County, USFS, and Emery County Public Lands. The agenda covered in this meeting included:
  - Next Steps: Agency meetings to get input/comments on rehab – concerns, impacts etc.; initiate Reservoir Sediment Survey; set time for public participation (open house) to get input, comments, concerns, resource needs from the public, identify alternatives for Rehab (4 alternatives are mandated for the EA); and start to assemble parts/sections of a Draft EA document where possible.

- **September 15, 2006** – Regular meeting of the Utah State Water Resources Board. Presentation about the NRCS Rehabilitation Program and Millsite Dam rehabilitation planning progress to the Board and gather any comments or concerns from the Board. The board is responsible for promoting the orderly and timely planning, conservation, development, utilization, and protection of Utah’s water resources and to enhance the quality of life for the citizens of the state. The Board supported the efforts to rehabilitate Millsite Dam to meet current Engineering Design criteria.

- **December 14, 2006** – Agency Scoping meeting held at Murray NRCS office in the Salt Lake Valley. A PowerPoint presentation was given to explain the Rehabilitation Program, existing conditions at the dam, and preliminary alternatives to rehab the dam to meet the current engineering
design criteria. Nineteen people were in attendance including 4 from NRCS, four from PacifiCorp, UDWQ, USFWS, BLM, San Rafael Soil Conservation District, BYU, UDWRt and UDWRe.

Questions revolved around potential alternatives for the auxiliary spillway and what dimensions were needed to pass the PMP event. Discussed Roller Compacted Concrete (RCC) spillway alternative that would be positioned over the right side of the embankment (looking downstream). Questions about estimated cost for rehabilitation.

- **February 21, 2007** – Public Scoping open house meeting at Ferron City Hall, Ferron, Utah. Hosted by the SLO. Forty-three people attended the meeting including six from NRCS. The meeting format included an initial open house to give attendees a chance to view displays and other information about the Project. A formal presentation was given by the SLO and NRCS later to explain existing conditions, investigation results to date, and summarize the alternatives considered. A tri-fold brochure summarizing the Project was distributed at the meeting. A comment space was available on the tri-fold if an attendee wanted to comment later and send it to the SLO or NRCS. Comment forms were also made available at the meeting.

Questions were asked concerning availability of funding for the project and the timeline format. Some residents and the City were concerned about Golf Course operations and the upcoming additional 9 holes that were in the design phase. Questions about the earthquake hazard to the dam were raised and what steps would be made to investigate that further and possible fixes. There was concern expressed about sediment in the dam and losing water storage capacity. A question about auxiliary spillway flows during snowmelt runoff and whether or not that would continue was also raised.

- **November 10, 2011** – Public open house at Ferron City Hall, Ferron, Utah. Hosted by the SLO. The format included a background and update presentation by NRCS and the UDWRe to summarize the extensive investigation work completed since the last public meeting which has facilitated the development of the rehabilitation design and a preferred alternative that would meet the purpose and need for the project. The overall projected costs (and cost-share) for the proposed rehab alternative to meet dam safety and performance criteria were presented. Time was afforded for questions from the attendees. There were questions referring to the sponsors 35% cost-share in relation to what the State of Utah may be able to contribute toward the sponsors’ share of the project. Other comments related to evaluating the use of the sediment in the reservoir for appropriate use in the rehabilitation (potential to be reviewed during the remaining design process). Thirty-nine participants were in attendance at this meeting.

Progressive Planning Updates: From 2011 to the present, planning and design progress updates were held with the SLO and stakeholders. Three separate press releases were sent to local papers in Emery County to announce scoping meetings and to update the public about the rehabilitation planning and investigation process.

Monthly meetings have been held with UDWRe and the State Dam Safety Office for coordination of planning, investigations, design and overall communication.

An electronic copy of this Draft Watershed Plan Supplement and EA was made available to agencies, stakeholders and interested parties on January 20, 2016. A 30-day comment period was provided that ended February 22, 2016. Responses received (TBD).
6.2 AGENCY CONSULTATION

Various federal, state and local agencies as well as other organizations and public citizens were consulted for the project. A list of these groups is provided in Appendix D: Investigation and Analysis Report, Agency Coordination.

December 14, 2006: Agency scoping meeting was held at the Murray NRCS office in Salt Lake County. The meeting was advertised through email and a Notice to the Utah State Resource Development Coordinating Committee (RDCC). A PowerPoint presentation was given to explain the Rehabilitation Program, existing conditions and preliminary alternatives to rehabilitate Millsite Dam to meet the current Engineering Design criteria. Nineteen people were in attendance including 4 from NRCS, 4 from PacifiCorp and representatives from the UDWQ, USFWS, BLM, San Rafael Soil Conservation District, Brigham Young University, UDWRt and UDWRe.

The agencies had the opportunity to comment on the proposed project and potential effects on resources.

January 11, 2006: A meeting conducted by the sponsor was held at the Ferron City Hall, Ferron, Utah. The sponsor and NRCS representatives presented information about the Rehabilitation Program and the requirements involved with producing a Rehabilitation Plan/EA. Attendees, which included numerous agency representatives, had the opportunity to comment on the Project and the effects on their respective resources. There were twenty-two attendees including representatives from the U.S. Bureau of Reclamation, State Division of Wildlife Habitat, Utah State Parks, Utah Division of Water Rights, Utah Division of Water Quality, Emery County, USFS and Emery County Public Lands.

The information covered in this meeting included:

SHPO /Tribal Consultation-2007: Based on a Class I records search and the Class III pedestrian survey (Report # U-06-PD-0688b,p,s, Report #U-06-PD-1131b,p,s), the NRCS has determined that the proposed work associated with the area of potential effect, would not directly or indirectly affect cultural resources. The Utah State Historic Preservation Officer (SHPO) concurred with this determination on February 6, 2007.

The NRCS provided notification and documentation of the determination to the SHPO, the BLM, the State of Utah School and Institutional Trust Lands Administration, and the Ute Indian Tribe of the Uintah & Ouray Reservation. To date, no comments or objections to the determination have been received.

SHPO /Tribal Supplemental Consultation- March 2013: A supplemental cultural resource inventory was completed in November 2012 for a proposed borrow material area located adjacent to Millsite Dam. The NRCS recommended that development of the proposed borrow area proceed as planned with a determination of no historic properties affected. Consultation letters were sent to Tribal leaders and the Utah SHPO informing of a completed Supplemental Cultural Resource Inventory for the Millsite Dam Rehabilitation Project, (Report No. U-12-SH-1067p). The report is included in Appendix D, excluding any sensitive information. Individual consultation letters were sent to the following:
• Ms. Irene Cuch, Chairwoman, Ute Indian Tribe of the Uintah and Ouray Reservation, Ft. Duchesne, Utah
• Ms. Jeanine Borchardt, Chairperson, Paiute Indian Tribe of Utah, Cedar City, Utah.
• Ms. Lori Hunsaker, Deputy State Historic Preservation Officer, Salt Lake City, Utah

SHPO/Tribal Supplemental Consultation - March 2015: An additional cultural resource inventory was carried out in November 2014 for additional proposed borrow areas surrounding Millsite Dam. The area identified included 69 acres on private land and 10.5 acres on BLM lands (Report No. U-14-SH-1260bp). The report is included in Appendix D, excluding any sensitive information. Individual consultation letters were sent to the following:
• Ms. Betsy Chapoose, Director, Ute Indian Tribe of the Uintah & Ouray Reservation, Utah
• Mr. Gordon Howell, Ute Indian Tribe of the Uintah & Ouray Reservation, Utah
• Ms. Lori Hunsaker, Deputy State Historic Preservation Officer, Salt Lake City, Utah
• Ms. Gari Laferty, Paiute Indian Tribe, Cedar City, Utah
• Mr. Ahmed Mohsen, BLM Field Office, Price, Utah

USACE Consultation: Letter sent March 22, 2013 to the Utah USACE Regulatory Office requesting the Corps to be a cooperating agency. A copy of a preliminary wetland determination with supporting documentation, a copy of the Plan/EA were enclosed with the letter.

In a letter dated October 2, 2015 the USACE designated NRCS as the lead federal agency to act on USACE behalf for purposes of compliance with Section 7 of the ESA and Section 106 of the NHPA.

State Stream Alteration / Wetland / Waters of the U.S. Permit: On December 16, 2016, the Ferron Canal and Reservoir Company submitted a Joint Stream Alteration Permit Application Form and the Millsite Wetland/Waters of the U.S. delineation report (Appendix D) to the Utah State Engineer’s Office (No. 15-93-03SA). On December 17, 2016, a hard copy of the permit form, Wetland Delineation and Form ENG 4345 was delivered to Corps Offices in Bountiful, Utah. The State Stream Alteration permit was approved January 5, 2016 pending resolution of three comments: 1) The USFWS indicated they anticipate finishing Section 7 formal consultation with NRCS due primarily to adverse impacts to San Rafael cactus; 2) The USACOE indicated that separate Corps permitting will be required due to Endangered Species Act (ESA) and potential indirect wetland impacts; 3) A floodplain permit from the local Floodplain Administrator (FPA) needs to be acquired and that the project is in compliance with the National Flood Insurance Program.
CHAPTER 7 - THE PREFERRED ALTERNATIVE

7.1 SELECTION OF THE PREFERRED ALTERNATIVE

The Preferred Alternative for the project is the Rehabilitation Alternative. This is based on the ability to meet the purpose and need for the project, least impacts to environmental and social resources, and the greatest net economic benefits out of all the alternatives. Several items need to be addressed in order for Millsite Dam to meet current NRCS and Utah Dam Safety regulations and engineering standards associated with a high hazard class dam, and to ensure the useful life of the structure for an additional 62 years. Appendix - B contains project maps that depict the overall location and rehabilitation measures proposed.

7.2 RATIONALE FOR THE PREFERRED ALTERNATIVE

The purpose of the project is to provide continued agricultural, municipal, industrial and recreational water supply in addition to flood protection downstream of the Millsite Dam.

Alternative plans were formulated in consideration of the purposes of the project and concerns expressed during the public scoping process. Formulation of the alternative plans gave consideration to four criteria: completeness, effectiveness, efficiency and acceptability. The No Action, Decommissioning and Rehabilitation Alternatives all meet the criteria for completeness. The Decommissioning Alternative removes the safety hazard of dam failure, but where it must address the primary problem of assuring that downstream flood protection would continue to be provided, it loses efficiency and acceptability due to costs; however, the Rehabilitation Alternative effectively reduces the risk of dam failure by overtopping and maintains the current level of flood protection downstream.

The federally funded alternatives considered for detailed study in this Plan-EA include the No Action Alternative and Rehabilitation Alternative (see Section 3.0). According to Section 502.2.1 of the NWPM:

To avoid seeking individual exceptions in such cases, the NED plan is defined as the federally assisted alternative with the greatest net economic benefits. Thus, for rehabilitation projects, the no-action alternative may not be identified as the NED alternative, but will continue to be included to allow a valid comparison of the reasonable alternatives.

The NED alternative for this project is the federally assisted Rehabilitation Alternative, as human life would be at risk in the event of a catastrophic failure of the existing dam structure, and the existing structure does not meet current safety regulations and engineering standards. The Preferred Alternative is designed to meet these regulations and standards, and provides the greatest net benefit of the federally assisted alternatives. See the Investigation and Analysis Report in Appendix D - Section 7 for benefit comparisons between the alternatives considered for detailed study.

7.2.1 Measures to be Installed

The following list includes the proposed design features that will address the current deficiencies of the dam and reservoir. These items will bring the dam and reservoir into compliance with current dam safety standards.

1) Embankment-Downstream Toe: Loose sand and silt materials in the downstream foundation will be excavated and replaced with compacted materials to remove the top zone of potentially liquefiable materials and to help with stability concerns.
2) Embankment-Seismic Protection: The downstream slope will be flattened and a berm placed at the downstream dam toe to improve stability of the dam.
3) Embankment-Zone Modification: As part of the downstream work, the downstream slope protection rock will be removed so that a chimney drain (filter and drain zones) can be constructed on the slope and in the foundation to collect seepage through the dam. The slope protection rock will then be replaced on the new downstream slope.
4) Embankment-Drainage: Pipes will be installed in conjunction with the drain materials to collect and monitor seepage through the dam.
5) Embankment-Raise: The dam crest will be raised four feet to restore the original reservoir capacity.
6) Principal Spillway Outlet Works: Downstream work will necessitate the extension of the existing principal spillway outlet works.
7) Auxiliary Spillway: The existing concrete spillway will be removed and replaced with a new concrete labyrinth weir spillway with the capacity to pass the design flood event.
8) Structure Monitoring: Piezometers, seepage flow weirs, survey monuments, and other necessary instrumentation will be installed to improve long-term monitoring of the dam.
9) Construction Restoration: Repairs will be made to Millsite State Park located near the reservoir, and Millsite Golf Course located downstream of the dam, to restore displaced features resulting from the construction impacts on holes 2, 3 and 4.

7.2.2 Construction Access and Staging

Construction access and staging would be located mostly downstream of the embankment, around the auxiliary spillway area and in the proposed borrow areas. These areas would be cleared of vegetation and graded where deemed appropriate. The existing roads (Ferron Canyon Road and unimproved roads) would be utilized for project access during construction. All temporary staging areas would be restored to pre-construction conditions.

7.2.3 Schedule

*Subject to Change pending Final Design and approval of the construction contractor.*

<p>| | | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1</td>
<td>Spring 2016</td>
<td>Ensure notification of the planned construction start (public notification &amp; signage).</td>
</tr>
<tr>
<td>2</td>
<td>Spring 2016</td>
<td>Ensure safety measures – traffic control, etc.</td>
</tr>
<tr>
<td>3</td>
<td>Summer 2016</td>
<td>After snowmelt runoff – begin drawdown of the reservoir to a safe level.</td>
</tr>
<tr>
<td>3</td>
<td>Summer 2016</td>
<td>Begin downstream slope excavation</td>
</tr>
<tr>
<td>4</td>
<td>Fall 2016</td>
<td>Begin foundation excavation and backfill.</td>
</tr>
<tr>
<td>5</td>
<td>Fall 2016</td>
<td>Begin auxiliary spillway removal &amp; construction of concrete labyrinth weir.</td>
</tr>
<tr>
<td>6</td>
<td>Winter 2016/ Spring 2017</td>
<td>Begin outlet works/ 54” diameter pipe extension.</td>
</tr>
<tr>
<td>7</td>
<td>Spring-Summer 2017</td>
<td>Begin installation of stability berm on the downstream face of the dam (north end). Use materials from borrow areas immediately downstream of dam.</td>
</tr>
<tr>
<td>8</td>
<td>Summer-Fall 2017</td>
<td>Begin reconstruction of downstream face of the dam. Use borrow materials immediately downstream of the dam as appropriate.</td>
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</table>

To begin construction, the water level in Millsite Reservoir will be drawn down at a quicker rate than normal in the summer of 2016 to facilitate work at the downstream toe. Dewatering measures will be needed in order to complete the foundation excavation and backfill before freezing conditions arrive in late 2016. Concrete work on the outlet works and spillway would then take place during the winter. The reservoir will be filled to a pre-determined conservation pool and eventually filled during the spring of 2017 pending approval of State Dam Safety. The downstream berm and backfill would then occur during
the spring through end of 2017. A detailed potential schedule can be found in Appendix D - Section 19.

Table 8 compares the existing dam features with the Preferred Alternative features.

<table>
<thead>
<tr>
<th>Description</th>
<th>Existing Conditions</th>
<th>Preferred Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevation Auxiliary Spillway Crest (ft)</td>
<td>6215</td>
<td>6219</td>
</tr>
<tr>
<td>Auxiliary Spillway Dimensions (ft)</td>
<td>60’ wide</td>
<td>120’ wide x 320’ long-narrowing to 70’</td>
</tr>
<tr>
<td>Elevation Top of Dam (ft)</td>
<td>6222.5</td>
<td>6226.5</td>
</tr>
<tr>
<td>Top Width of Dam Embankment (ft)</td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td>Downstream Embankment Slope</td>
<td>1.75: 1</td>
<td>2:1</td>
</tr>
<tr>
<td>Principal Spillway Pipe (outlet)</td>
<td>54” steel</td>
<td>54” steel</td>
</tr>
<tr>
<td>Municipal Water Pipeline</td>
<td>8” steel</td>
<td>12” steel</td>
</tr>
<tr>
<td>Storage Capacity at Auxiliary Spillway Crest (ac-ft)</td>
<td>16,230</td>
<td>18,016</td>
</tr>
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</table>

7.3 AVOIDANCE, MINIMIZATION AND MITIGATION

7.3.1 Avoidance and Minimization

Erosion

Erosion may occur on disturbed and cleared areas within the project boundary during precipitation events. Proper BMPs would be installed during and after construction to prevent and control soil erosion. Areas disturbed during construction activities would be restored, and stabilized through establishment of ground cover.

Surface Water Quality

Construction activities may temporarily impact surface water quality but, project design elements, including BMPs, would be used and would be implemented to reduce the quantity of sediment (1) entering drainages, and (2) flowing downstream and violating any federal or state water quality rules and regulations. Construction BMPs would include, but are not limited to, the following:

- A Storm Water Pollution Prevention Plan (SWPPP) that contains erosion and sediment control and pollution prevention measures, such as, but not limited to, silt fences, fiber wattles, and/or earth berms, would be required and implemented.
- Construction and staging areas would be assessed for the feasibility of such measures as straw bales, silt fences, and other appropriate sediment control measures, which would be implemented to prevent the entry of sediment and other contaminants into downstream drainages.
- To ensure that accidental spills would not enter waters, the storage of petroleum-based fuels and other hazardous materials and the refueling of construction machinery would not occur outside of approved designated staging/batch plant areas. Furthermore, the project would comply with federal and state water quality standards and toxic effluent standards to minimize any potential adverse impacts from discharges to waters of the U.S.
Air Quality

Construction activities would temporarily emit air pollutants. Fugitive dust, MSAT, and GHG emission increases associated with construction would be minimized by implementation of the following applicable BMPs:

- Spraying the soil on-site with water, or other similar approved dust suppressant/soil binder.
- Wetting materials hauled in trucks, providing adequate freeboard (space from the top of the material to the top of the truck), or covering loads to reduce emissions during material transportation/handling.
- Providing a stabilized construction entrance (track-out pad), wheel washers, and/or other similar BMPs at construction site accesses to reduce track-out of site materials onto the adjacent roadway network.
- Removing tracked-out materials deposited onto adjacent roadways.
- Wetting material stockpiles to prevent wind-blown emissions.
- Establishing vegetative cover on bare ground as soon as possible after grading to reduce wind-blown dust.
- Requiring appropriate emission-control devices on all construction equipment.
- Requiring the use of cleaner burning fuels.
- Using only properly operating, well-maintained construction equipment.

Noxious Weeds and Invasive Plants

Construction activities would put the project area at risk for future invasion of noxious weeds and invasive plant species. BMPs would be implemented during construction to prevent the spread of noxious weeds and invasive plant species. During construction and until restoration areas were fully established, BMPs would be maintained on a regular basis to prevent the establishment of noxious weeds and invasive plant species. Non-desirable plant species would be controlled by cleaning equipment prior to delivery to the project site, eradicating these plants before the start and during construction as discovered, and routine monitoring after construction completion. A PCSRP would be developed and would include mechanisms for addressing weed establishment and treatment. Long-term negative impacts would be managed with re-planting, and various methods of weed control.

Wildlife and Wildlife Habitat

Construction activities would be limited to the smallest extent practicable within the project area. Disturbed areas would be restored to preconstruction conditions after construction completion.

Migratory Birds

In order to minimize impacts to migratory birds, vegetation will cleared and grubbed when feasible outside of the primary nesting period of April 1 to August 15. If the clearing of vegetation is required during the nesting period, the project area will be surveyed by a qualified biologist for active nests no more than 2 weeks prior to the commencement of work. If active nests are found during surveys, spatial buffers will be established in coordination with USFWS and NRCS. Construction activities within the buffer areas will be prohibited until a qualified biologist confirms that all nests are no longer active.

Hazardous Materials

NRCS requires that contractors comply with all federal, state, and local laws and regulations pertaining to pollution and contamination of the environment to prevent pollution of surface water, groundwater, soil,
and air with any hazardous materials.

**Visual Resources**

Areas disturbed during construction activities would be restored to preconstruction conditions. This would be accomplished by grading to match natural contours where appropriate and stabilizing with ground cover. These areas would be reestablished by seeding with an herbaceous plant seed mixture and revegetation with NRCS- and BLM-approved plant species to match the surrounding plant community. The visual management objectives and associated reclamation standards outlined in the Price Resource Management Plan (BLM 2008) would be adhered to.

**7.3.1 Mitigation**

Mitigation is anticipated for adverse effects to approximately 48 San Rafael cactus plants. Consultation with USFWS is underway and will be finalized for the Final Plan/EA.

**7.3 PERMITS AND COMPLIANCE**

The following permits and compliance actions would be required for construction of the Project:

- If during construction, previously unevaluated cultural resources are discovered, then the area of discovery would be avoided, the discovery given adequate protection, and NRCS and SHPO would be notified. Procedures for discoveries outlined in the cultural resources NRCS State Level Agreement will be followed.

- The appropriate Section 404 permit would be obtained from the USACE by the SLO before construction.

- A State Stream Alteration Permit was granted by UDWRt on January 5, 2016 contingent on Section 7, Section 106 and local floodplain manager coordination.

- A storm water NPDES permit for construction activity would be required from the Utah Department of Environmental Quality (UDEQ), because the disturbed areas would be greater than 1 acre.

- Part of the auxiliary spillway area is situated within BLM lands where the BLM granted a right-of-way for the operation of “Millsite Reservoir” on October 6, 1966. Coordination with the BLM would be required to outline any proposed work in this area and the rights-of-way U-54668 and U-432 would have to be updated.

- A Supplemental Project Agreement and Operation and Maintenance Agreement between NRCS and the SLO would be required.

**7.4 COSTS AND COST SHARING**

The following sections describe the major components of installation costs and specific costs for each alternative, the percentage of cost share of each component, and components of the NED costs. The Ferron Watershed Supplemental Agreement No. 3 between the SLO and NRCS also details these costs and cost-sharing between the SLO and NRCS. NRCS would pay up to 65% of the eligible project costs but not to exceed 100% of the total construction cost. The cost share rate for the rehabilitation of Millsite
Dam is 65% NRCS PL 83-566 funds and 35% SLO funds. The amortized installation costs were determined by amortizing the project cost over a period of 62 years at a discount rate of 3.75 percent.

7.4.1 Installation

Major components of construction costs consist of mobilization; earthwork; removal of the existing concrete structural auxiliary spillway components and reconstruction; extension of the steel principal spillway pipe and tunnel; addition of embankment filter and drain components; clearing and grubbing; instrumentation and re-establishment of any disturbed area vegetation.

Responsibilities

The original Watershed Work Plan (SCS 1965) set forth the responsibilities of the NRCS (formerly Soil Conservation Service [SCS]) and the sponsors of the watershed plan. The roles and responsibilities for the NRCS and FCRC would continue in accordance with this Plan-EA, the Watershed Agreement and the Memorandum of Understanding. A summary of other responsibilities related to this project include:

- SLO entered an agreement with the Emery County Commission to act as the fiscal agent for managing the implementation of the proposed rehabilitation measures.
- NRCS is responsible for leading the planning efforts and providing engineering support.
- NRCS entered into a Cooperative Agreement with the UDWRe to finalize the design, drawings, specifications and operation and maintenance details for rehabilitation.
- SLO is responsible for environmental permits and construction implementation.
- NRCS would assist SLO and UDWRe during construction by providing oversight and certifying completion of the project.

Contracting

Rehabilitation improvements installed from NRCS funding mechanisms would be procured using contracting methodology awarded through the Emery County Commission. UDWRe and SLO would oversee and administer construction of the project in coordination with the NRCS.

Real Property Acquisition and Easements

It is not anticipated that additional acquisition and easements would be required, only adjustments to the existing boundary lines of operation for the auxiliary spillway and the change in the embankment footprint for work at the downstream toe of the dam. The SLO would be required to provide 100% of funding for the land rights acquisition and easement costs if any arise.

Millsite Golf Course operations would need to be altered around the existing auxiliary spillway (Figure 12). A longer bridge span to cross the planned auxiliary spillway would be needed for golfers to access the holes downstream of the dam.

The project lands in the vicinity of the dam are in private ownership surrounded by public lands. The SLO holds easements that are combined to surround the dam itself and the auxiliary spillway. The Millsite Golf course is situated immediately downstream and adjacent to the dam and auxiliary spillway. The easements are summarized below and are included in Appendix E, Other Supporting Information.

1) **U-54668 – 1986**: Recreation or Public Purposes Lease - Ferron City – Golf Course **Grantor: US Dept. of Interior – BLM; For:** Construction, operation, and maintenance of a Golf Course.
Location: Salt Lake Meridian, Utah; T.20S, R.63E, Section 12, Lots 3 & 4; T.20S, R.7E, Section 7, Lots 3 & 4, W1/2 W1/2, NE1/4 SW1/4, NW NW1/4NW1/4 SE1/4SW1/4.

2) U-432 – 1971: Millsite Dam & Reservoir - Utah Division of Water Resources (operated by Ferron Canal & Reservoir Co.). **Grantor:** US Dept. of Interior – BLM; **For:** Construction, installation, operation, maintenance, and inspection of watershed protection works and measures, including earth fill dam and reservoir pool above the dam. **Location:** Reservoir area, right abutment south to access road to center portion of Section 7, T.20S, R.7E.

3) U-54674: Recreation or Public Purposes Lease – Emery County Road **Grantor:** US Dept. of Interior – BLM; **For:** Construction, operation, maintenance of a County Road. **Location:** Aligned along the south side Millsite Reservoir.

4) U-54669: Recreation or Public Purposes Lease – Ferron City Water Tank & Pipeline **Grantor:** US Dept. of Interior – BLM; **For:** Construction, operation, maintenance of a city water supply tank and pipeline. **Location:** Aligned along the County Road right-of-way.

Emergency Action Plan (EAP)

The existing EAP for Millsite Dam was prepared in accordance with the following:

- 210-NRCS National Engineering Manual, Part 520, Subpart B, Section 520.27
- 180-NRCS National Operations and Maintenance Manual, Part 500, Subpart F, Section 500.52
- Utah Dam Safety Requirements

A new EAP must be completed by FCRC to address the rehabilitation changes to the dam and must be prepared as a standalone document. The NRCS would determine that an EAP is prepared prior to the execution of fund obligating documents for construction of the dam. EAPs shall be reviewed and updated by FCRC annually for consistency with the project and to include all local points of contact necessary for an emergency response. The EAP should include a notification flowchart; determination of responsibility for EAP-related tasks; emergency identification, evaluation and classification; notification procedures; preventative action; inundation map; and appendices, as outlined in the Utah Dam Safety Guide to Emergency Action Plans Development and Implementation (UDWRt).

Operation and Maintenance

Operation of the dam includes the administration, management, and performance of non-maintenance actions needed to keep the dam structure safe and functioning as designed. Maintenance includes performing work, measuring the recording instrumentation data, preventing deterioration of structures, and repairing damage or replacing the structure as needed to prevent failure. Damages to completed structures caused by normal deterioration, droughts, flooding, or vandalism are considered maintenance. Maintenance comprise both routine and as-needed measures, which include the following:

- Annual control of woody species on or near the dam and spillways. Chemical control would only be used after determining there would be no ill-effect on human, fish, or wildlife health.
- Other specific items that would be identified during design.

Inspection of the dam is necessary to verify that the structures are safe and functioning properly. The SLO and UDWRt Dam Safety are responsible for inspecting the dam on an annual basis as well as after major events such as floods and earthquakes. Inspection reports would be supplied to the NRCS following each inspection. Inspections and the associated reports would assess the following items:
• Identify the adequacy of O&M activities
• Identify needed O&M work
• Identify unsafe conditions, including changes in the use of the floodplain below the dam
• Specify ways of relieving unsafe work or performing other needed work
• Set action dates for performing corrective actions

SLO would continue to be responsible for the operation, maintenance, rehabilitation and future modifications to the dam. The estimated annual O&M cost is $30,000 for which a specific O&M Plan would be prepared by the NRCS and SLO in accordance with the NRCS National Operation and Maintenance Manual (NRCS 2003). This plan and agreement would be entered into prior to the start of construction activities and would be in place for the extended life of the project. The agreement would provide for inspections, reports, and procedures for performing the maintenance items. The agreement would include specific provisions for retention, use, and property improved with PL 83-566, as amended by PL 106-472, assistance.

Operation, maintenance, and replacement costs were based on the total cost of construction. See Appendix D, Economic Evaluation for the annual average operation, maintenance, and repair costs. This cost is estimated to be approximately $30,000 annually. This is contingent upon whether or not hydro-suction of the reservoir sediment is feasible as an on-going operation and maintenance activity. A separate EA commissioned by the SLO is underway to evaluate that activity and how that can increase the design life of the total reservoir storage capacity.

7.4.2 General Sequence of Construction

Structural measures would be installed during year one of the evaluation period. The general sequence of construction for the preferred alternative will involve considerable coordination with the Millsite golf course and Millsite State Park operations. The general sequence for installation of the proposed rehabilitation measures are as follows:

<table>
<thead>
<tr>
<th></th>
<th>Subject to change pending Final Design and approval of the construction contractor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Spring 2016 Ensure notification of the planned construction start (public notification &amp; signage).</td>
</tr>
<tr>
<td>2</td>
<td>Spring 2016 Ensure safety measures – traffic control, etc.</td>
</tr>
<tr>
<td>3</td>
<td>Summer 2016 After snowmelt runoff – begin drawdown of the reservoir to a safe level.</td>
</tr>
<tr>
<td>4</td>
<td>Summer 2016 Begin downstream slope excavation</td>
</tr>
<tr>
<td>5</td>
<td>Fall 2016 Begin foundation excavation and backfill.</td>
</tr>
<tr>
<td>6</td>
<td>Fall 2016 Begin auxiliary spillway removal &amp; construction of concrete labyrinth weir.</td>
</tr>
<tr>
<td>7</td>
<td>Winter 2016 /Spring 2017 Begin outlet works/54” diameter pipe extension.</td>
</tr>
<tr>
<td>8</td>
<td>Spring-Summer 2017 Begin installation of stability berm on the downstream face of the dam (north end). Use materials from borrow areas immediately downstream of dam.</td>
</tr>
<tr>
<td>9</td>
<td>Summer-Fall 2017 Begin reconstruction of downstream face of the dam. Use borrow materials immediately downstream of the dam as appropriate.</td>
</tr>
</tbody>
</table>

7.5.3 Financing

The NRCS would provide 65% of the total construction rehabilitation cost for the Preferred Alternative with funding from the Watershed Rehabilitation Program. The sponsor is responsible for providing the remaining non-federally funded 35% of the rehabilitation cost of the project. NRCS would provide 100% of design engineering, and both NRCS and Glenwood Town would bear project administration costs that each incurs for the project.
Funding for O&M of the dam after construction would be derived from normal revenues of SLO. This O&M cost would be budgeted annually so that the dam is kept in good condition and meeting current NRCS and Utah Dam Safety regulations. The SLO has secured financial assistance through the UDWRt to help with their 35% cost share of the project.

This project would be classified as a maintenance activity by the SLO. All maintenance activities are funded by general funds derived from shares within the Ferron Canal and Reservoir Company. The project, once approved by the SLO's Board of Director's, would be placed on the fiscal budget for implementation. Costs for permits and licenses are not eligible for PL 83-566 funds. The financing for these would be provided by the SLO through their maintenance activities fund. The SLO has agreed to enter into an agreement with the Emery County Commission to administer the contracting function for installation of the project.

7.5.5 Costs

The installation cost estimate for the Rehabilitation Alternative (Preferred and NED Alternative) is $1,226,900 as identified in Table 15. Economic tables have been included to present information relevant to the costs and benefits of the Preferred Alternative and NED Alternative. Structural tables have been included to present the relevant structural information pertinent to the design of the Preferred Alternative. The costs for the Preferred Alternative are conceptual level cost estimates only with an estimated range of accuracy at ±30%, and are intended to reflect the maximum level of cost that could be associated with the rehabilitation. Detailed structural designs and construction cost estimates would be prepared for the project during the final design phase and prior to the start of the competitive bidding process. The final cost of the project would be the price received from the winning construction bid plus or minus the amount of contract modifications. Assessments, considerations, and calculations are based on a 100-year evaluation period and a discount rate of 3.375%.

The Estimated Installation Cost table (Table 9) documents land status upon which the project structures reside, as well as federal and non-federal funding sources, respectively.

Table 9. Estimated Installation Cost - Millsite Dam (dollars)

<table>
<thead>
<tr>
<th>Works of Improvement</th>
<th>PL83-566 Funds</th>
<th>Other Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Federal Land</td>
<td>Non-Federal Land</td>
</tr>
<tr>
<td>Millsite Dam Structures (Rehabilitation)</td>
<td>$19,375,265</td>
<td>$19,375,265</td>
</tr>
</tbody>
</table>

1Price base: 2014 May-2014
The Estimated Cost Distribution table (Table 10) shows the estimated costs to be charged to the PL 83-566, as amended by PL 106-472, funds and the costs borne by the SLO.

Table 10. Estimated Cost Distribution - Water Resource Project Measures - Millsite Dam

<table>
<thead>
<tr>
<th>Works of Improvement</th>
<th>Installation Cost - Public Law 83-566(^2)</th>
<th>Installation Cost - Other Funds(^2)</th>
<th>Total</th>
</tr>
</thead>
</table>

\(^1\) Price base: 2014

The Structural Data table (Table 11) shows important physical characteristics for Millsite Dam after the Preferred Alternative has been constructed.

Table 11. Structural Data - Dam with Planned Storage Capacity - Millsite Dam

<table>
<thead>
<tr>
<th>Structure Element</th>
<th>Millsite Dam Preferred Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard Class of Structure</td>
<td>Class C - High</td>
</tr>
<tr>
<td>Embankment</td>
<td>Zoned earth w/stability berm and filter upgrade &amp; riprap upstream face</td>
</tr>
<tr>
<td>Seismic Zone Hazard</td>
<td>2b</td>
</tr>
<tr>
<td>Controlled Drainage Area (square miles)</td>
<td>153</td>
</tr>
<tr>
<td>Elevation -Top of Dam – (MSL)</td>
<td>6226.6</td>
</tr>
<tr>
<td>Elevation –Crest Auxiliary Spillway (MSL)</td>
<td>6219</td>
</tr>
<tr>
<td>Elevation –Crest Principal Spillway (MSL)</td>
<td>6143</td>
</tr>
<tr>
<td>Elevation –Sediment Pool (MSL)</td>
<td>6219</td>
</tr>
<tr>
<td>Reservoir Storage @ Top Dam Crest (acre-feet)</td>
<td>23,736</td>
</tr>
<tr>
<td>Reservoir Storage @ Auxiliary Spillway Crest (acre-feet)</td>
<td>18,016</td>
</tr>
<tr>
<td>Dam Crest Width (feet)</td>
<td>26</td>
</tr>
<tr>
<td>Auxiliary Spillway Type</td>
<td>Concrete Labyrinth Weir</td>
</tr>
<tr>
<td>Auxiliary Spillway Bottom Width (feet)</td>
<td>120 narrowing to 70 at discharge point</td>
</tr>
<tr>
<td>Auxiliary Spillway Exit Slope (%)</td>
<td>9</td>
</tr>
<tr>
<td>Maximum Height of Dam (feet)</td>
<td>119</td>
</tr>
<tr>
<td>Volume of Fill (cubic yards)</td>
<td>2,999,000 (berm,4’ raise, riprap)</td>
</tr>
<tr>
<td><strong>Total Storage Capacity-Aux Spillway Crest (ac-ft)</strong></td>
<td></td>
</tr>
<tr>
<td>Sediment (acre-feet)</td>
<td>(4 ft raise for ~1,838 ac-ft sediment)</td>
</tr>
<tr>
<td>Irrigation (acre-feet)</td>
<td>7,638(^1)</td>
</tr>
<tr>
<td>Floodwater (acre-feet)</td>
<td>10,200(^1)</td>
</tr>
<tr>
<td>Fishery (acre-feet)</td>
<td>500</td>
</tr>
<tr>
<td>Top of Dam-Crest (acre-feet)</td>
<td>2,000</td>
</tr>
<tr>
<td></td>
<td>21,814</td>
</tr>
</tbody>
</table>
The Average Annual Cost table (Table 12) shows the anticipated installation costs of the Preferred Alternative. It also summarizes the total annual cost based on the annualized cost of installation, amortized over 100 years, and the average annual cost for operations and maintenance.

**Table 12. Estimated Average Annual NED Costs - Millsite Dam** (dollars)

<table>
<thead>
<tr>
<th>Improvements</th>
<th>Project Outlays</th>
<th></th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Amortization of Installation Cost (^1)</td>
<td>Operation,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maintenance</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>and Replacement Cost</td>
<td></td>
</tr>
<tr>
<td>Millsite Dam Rehabilitation</td>
<td>$1,224,900</td>
<td>$30,000</td>
<td>$1,254,900</td>
</tr>
</tbody>
</table>

\(^1\) Price base: 2014, amortized over 62 years at a discount rate of 3.5%
The Estimated Average Flood Damage Reduction Benefits table (Table 13) summarizes the results of the flood damage reduction analysis conducted for this project.

**Table 13. Estimated Average Annual Damage Reduction Benefits - Millsite Dam** (dollars)

<table>
<thead>
<tr>
<th>Item</th>
<th>Estimated Average Annual Damage Reduction Benefit</th>
<th>Damage Reduction Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Without Project</td>
<td>With Project</td>
</tr>
<tr>
<td></td>
<td>Agricultural Related 3/ Nonagricultural Related</td>
<td>Agricultural Related 3/ Nonagricultural Related</td>
</tr>
<tr>
<td>Floodwater</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crop and Pasture</td>
<td>$63,700</td>
<td>$6,300</td>
</tr>
<tr>
<td>Urban</td>
<td>$83,900</td>
<td>$5,300</td>
</tr>
<tr>
<td>Grand Total</td>
<td>$63,700</td>
<td>$83,900</td>
</tr>
</tbody>
</table>

1 Price base: 2014, amortized over 62 years at a discount rate of 3.5 percent. May-2014

2 Damages and benefits will accrue from floods of greater magnitude than 1% frequency event, but these were not evaluated.

3 Agriculture-related damage includes damages occurring in rural communities with a population of less than 50,000.

The Comparison of NED Benefits and Costs table (Table 14) summarizes the benefits and costs of each analysis unit within the project and documents the overall benefit to cost ratio of the proposed rehabilitation improvements.

**Table 14. Comparison of Annual NED Benefits and Costs - Millsite Dam** (dollars)

<table>
<thead>
<tr>
<th>Evaluation Unit</th>
<th>Average Annual Benefits</th>
<th>Average Annual Costs</th>
<th>Benefit Cost Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Agricultural</td>
<td>Nonagricultural</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>Damage Reduction</td>
<td>Avoidance of Cost of No Action to Sponsor</td>
<td>$1,673,700</td>
</tr>
<tr>
<td>Millsite Dam Rehabilitation</td>
<td>$136,000</td>
<td>$1,537,700</td>
<td>$1,673,700</td>
</tr>
</tbody>
</table>

1 Price base: 2014 May-2014

2 Used the Future Without Project cost as a savings to society (Cost of th Most Likely Alternative) as per P&G 1.7.2(b)(3).
7.6 OPERATION, MAINTENANCE AND REPLACEMENT

Operation includes the administration, management and performance of non-maintenance actions needed to keep the structure safe and functioning as planned. Maintenance includes performance of work, preventing deterioration of practices, and repairing damage or replacement of the structure if one or more of its components fail. Damages to a completed structure caused by normal deterioration, droughts, flooding caused by rainfall in excess of design rainfall, or vandalism are considered maintenance.

Measures in this plan would be operated and maintained by the SLO with the technical assistance from Federal, State, and local agencies in accordance with their delegated authority. A specific O&M plan will be prepared using the NRCS National Operation and Maintenance Manual. The SLO's liability for O&M extends throughout the actual life of the structure.

A separate O&M Agreement would be developed before construction. The agreement will provide for inspections, reports, and procedures for performing the maintenance items. The agreement will include specific provisions for retention, use, and disposal of property acquired or improved with PL 83-566 assistance. The term of this new O&M Agreement will be for a period of 62 years, which is the life expectancy of the project. The overall average O&M costs after rehabilitation is approximately $30,000 annually.

The structure is to be inspected annually by the SLO on a regularly scheduled basis and during or immediately following major storms, earthquakes, or other occurrences that may adversely affect the structure and appurtenant works.
CHAPTER 8 - REFERENCES


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### CHAPTER 9 - LIST OF PREPARERS

<table>
<thead>
<tr>
<th>Name</th>
<th>Title (Experience-Years)</th>
<th>Education</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NRCS – Utah</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norm Evenstad</td>
<td>Water Resources Coordinator (25)</td>
<td>B.S. Geology</td>
<td>Utah PG</td>
</tr>
<tr>
<td>Nathaniel Todea</td>
<td>Hydraulic Engineer (15)</td>
<td>M.S. Civil Engineering</td>
<td></td>
</tr>
<tr>
<td>Bronson Smart</td>
<td>State Conservation Engineer (15)</td>
<td>M.S. Irrigation Engineering</td>
<td>Utah PE</td>
</tr>
<tr>
<td>Ana Vargo</td>
<td>Geologist (22)</td>
<td>M.S. Geology</td>
<td></td>
</tr>
<tr>
<td>Julie Suhr Pierce</td>
<td>State Economist (22)</td>
<td>Ph.D. - Economics</td>
<td></td>
</tr>
<tr>
<td>George Townsend</td>
<td>National Water Management Center -</td>
<td>M.S. Economics</td>
<td></td>
</tr>
<tr>
<td>Karen Fullen</td>
<td>State Biologist (20)</td>
<td>B.S. Wildlife Biology</td>
<td></td>
</tr>
<tr>
<td>Derek Hamilton</td>
<td>Biologist (20)</td>
<td>M.S. Environmental Science</td>
<td></td>
</tr>
<tr>
<td>Andrew Williamson</td>
<td>Archaeologist, Cultural Resources</td>
<td>M.S. Anthropology and Archaeology</td>
<td>RPA, PLPCO Principal Investigator</td>
</tr>
<tr>
<td>Ryan Pierce</td>
<td>State GIS Specialist (10)</td>
<td>B.S. Geography</td>
<td></td>
</tr>
<tr>
<td><strong>Utah Division of Water Resources (UDWRe)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bill Leeflang</td>
<td>Chief Engineer (35)</td>
<td>M.S. Geological Engineering</td>
<td>Utah PE, PG</td>
</tr>
<tr>
<td>Eric Dixon</td>
<td>Civil Engineer</td>
<td>B.S. Civil Engineering</td>
<td>Utah PE</td>
</tr>
<tr>
<td>Matt Call</td>
<td>Geotechnical Engineer (15)</td>
<td>B.S. Civil Engineering</td>
<td>Utah PE</td>
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<tr>
<td>Carl Ege</td>
<td>Geologist</td>
<td>B.S. Geology</td>
<td>Utah PG</td>
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<tr>
<td>Aaron Spencer</td>
<td>Civil Engineer (10)</td>
<td>B.S. Civil Engineering</td>
<td>Utah PE</td>
</tr>
<tr>
<td>Lee Sporleder</td>
<td>Civil Engineer (Ret)</td>
<td>B.S. Civil Engineering</td>
<td>Utah PE</td>
</tr>
<tr>
<td><strong>Technical Consultant Teams</strong></td>
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<td></td>
<td></td>
</tr>
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CHAPTER 10 - DISTRIBUTION LIST

A notice of availability for the Draft Plan-EA will be distributed to the following government agencies/staff and organizations.

**Federal Government**
- Bureau of Land Management
- Army Corps of Engineers
- Forest Service
- Fish and Wildlife Service
- Bureau of Reclamation
- Environmental Protection Agency

**State Government**
- School and Institutional Trust Lands Admin
- Utah Department of Agriculture
- Utah Natural Heritage Program
- Utah Public Land & Policy Coordination Office
- Utah Reclamation Mitigation & Conservation Commission
- Utah Department of Natural Resources
- Utah Division of Water Rights
- Utah Department of Public Safety
- Utah Environmental Congress
- Utah National Parks Council
- Utah Division of Forestry, Fire & State Lands
- Utah Wildlife Federation
- Utah Department of Environmental Quality
- Utah Department of Heritage and Arts

**Local Government**
- Ferron City
- Emery County Commissioners
- Emery County Water Conservancy District
- Emery County Planning and Zoning
- San Rafael Soil Conservation District

**Businesses and Organizations**
- Ferron Canal and Reservoir Company
- Millsite Golf Course
- PacifiCorp

**Private Parties**
The names and addresses of private parties who will receive notice of the Draft Plan-EA are not listed in this section for privacy.
CHAPTER 11 - ACRONYMS, ABBREVIATIONS and SHORT FORMS

Ac-Ft  Acre-Feet
AADT  Annual Average Daily Traffic
ACHP  Advisory Council on Historic Preservation
AGRC  Automated Geographic Reference Center
BLM  Bureau of Land Management, U.S.
BOR  Bureau of Reclamation, U.S.
CE  Categorical exclusion
CEQ  Council on Environmental Quality
CFR  Code of Federal Regulations
CFS  Cubic Feet Per Second
CO  Carbon monoxide
COE  Corps of Engineers
CPPE  Conservation Practice Physical Effects
CPT  AD-Conservation and Planning Technical Assistance Division
CTA  Conservation and Technical Assistance
Draft Plan EA  Draft Supplemental Watershed Plan and Environmental Assessment
EA  Environmental Assessment
EAP  Emergency Action Plan
BE  Environmental Evaluation
EIS  Environmental Impact Statement
EPA  Environmental Protection Agency
EQ  Environmental quality
ESA  Endangered Species Act
FA  Financial assistance
FCRC  Ferron Canal and Reservoir Company
FE  Federal Endangered
FT  Federal Threatened
FONSI  Finding of No Significant Impact
FR  Federal Register
FS  Forest Service
FSA  Farm Services Agency
FSEIS  Final Supplemental Environmental Impact Statement
FWOP  Future Without Project
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<tr>
<td>GAP</td>
<td>Gap Analysis Program</td>
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<td>GM</td>
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<td>HAP</td>
<td>Hazardous Air Pollution</td>
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<td>HCl</td>
<td>Hydrogen Chloride</td>
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<td>HSRS</td>
<td>Hydrosuction sediment-removal systems</td>
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<td>ICBQ</td>
<td>International Conference of Building Officials</td>
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<td>LGM</td>
<td>Last Glacial Maximum</td>
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<td>LTC</td>
<td>Long Term Contract</td>
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<td>M&amp;I</td>
<td>Municipal and Industrial Water Supply</td>
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<td>MOU</td>
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<td>NEM</td>
<td>National Engineering Manual</td>
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<td>NEPA</td>
<td>National Environmental Policy Act</td>
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<tr>
<td>NHCP</td>
<td>National Handbook of Conservation Practices</td>
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<td>NHPA</td>
<td>National Historic Preservation Act</td>
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<tr>
<td>NHQ</td>
<td>National Headquarters (NRCS)</td>
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<td>NIR</td>
<td>Net Irrigation Requirement</td>
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<td>NOAA</td>
<td>National Oceanic and Atmospheric Administration</td>
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<td>NO\textsubscript{x}</td>
<td>A genetic term for Nitrogen oxides produced during combustion and includes Nitric Oxide (NO) or Nitrogen Dioxide (NO\textsubscript{2})</td>
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<td>NPPH</td>
<td>National Planning Procedures Handbook</td>
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<td>NWPH</td>
<td>National Watershed Program Handbook</td>
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<td>NWPM</td>
<td>National Watershed Program Manual</td>
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<tr>
<td>O&amp;M</td>
<td>Operation and Maintenance</td>
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<td>OMB</td>
<td>Office of Management and Budget</td>
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<td>OM&amp;R</td>
<td>Operation, maintenance and replacement</td>
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<td>OSE</td>
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OHV  Off-highway vehicles
P&G  Economic and Environmental Principals and Guidelines for Water and Related Land Resources Implementation Studies
PFEIS  Preliminary Final Environmental Impact Statement
PM$_{10}$  Particulate Matter with a diameter of 10 micrometers or less
PMF  Probable Maximum Flood
PMP  Probable Maximum Precipitation
Q  Discharge
RCC  Roller Compacted Concrete
RDCC  Resource Development Coordinating Committee, State of Utah
RED  Regional Economic Development
RFO  Responsible Federal Official
ROD  Record of Decision
SHPO  State Historic Preservation Officer
SLO  Sponsoring Local Organizations
SO$_2$  Sulfur dioxide
STC  State Conservationist
SWCD  Soil and Water Conservation District
SWPPP  Storm Water Pollution Prevention Plan
TA  Technical assistance
T&E  Threatened and Endangered
TES  Threatened, Endangered and Sensitive
THPO  Tribal Historic Preservation Officer
UACD  Utah Association of Conservation Districts
UDEQ  Utah Department of Environmental Quality
UDOT  Utah Department of Transportation
UDAQ  Utah Division of Air Quality
UDWQ  Utah Division of Water Quality
UDWRe  Utah Division of Water Resources
UDWRt  Utah Division of Water Rights
UDWR  Utah Division of Wildlife Resources
USACE  U.S. Army Corps of Engineers
USC  U.S. Code
USDA  U.S. Department of Agriculture
USDA-RD  U.S. Department of Agriculture, Rural Development
USFS   U.S. Forest Service
USFWS  U.S. Fish and Wildlife Service
VRM    Visual resource management
WRC    Water Resources Council, U.S.
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