

RECLAMATION

Managing Water in the West

Daniel Irrigation Canal Modification Project Final Environmental Assessment

PRO-EA-15-008

Upper Colorado Region
Provo Area Office
Provo, Utah



U.S. Department of the Interior
Bureau of Reclamation
Provo Area Office
Provo, Utah

May 2016

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Upper Colorado Region
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prepared by *Bureau of Reclamation*
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 Provo, Utah



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Chapter 1 Purpose of and Need for Proposed Action

1.1 Introduction

This Environmental Assessment (EA) was prepared to examine the potential environmental impacts of the Daniel Irrigation Canal Modification Project, proposed by the Daniel Irrigation Company (Company) in Wasatch County, Utah. If approved 1.3 miles of their Service Canal (Canal) would be modified.

The Company has requested authorization to modify the existing Canal into a pipeline (herein referred to as the Project). An overview map showing the Canal is shown in Figure 1 of Chapter 9. Since 1978, the Company started the process of upgrading from open channels to gravity pipelines. This is the last remaining part of the system to be upgraded from open canal to enclosed piping. It is believed that the canal was lined by native materials when it was constructed, but after nearly 100 years of use, the liner has eroded and is susceptible to high seepage losses.

The purpose of the Project is to minimize or eliminate loss of water to seepage and evaporation, maximizing the amount of water available for irrigation purposes in Heber Valley from Daniel Irrigation. The Company proposes converting the entire 1.3 mile length of the Canal into a pipeline. The Canal alignment is shown in Figure 1. The Canal is located within an existing easement owned by the Company and is on privately owned land (see Land Ownership Figure 2). The Canal is operated and maintained by the Company under an agreement with the Bureau of Reclamation.

Reclamation has prepared the EA to comply with procedural requirements of the National Environmental Policy Act of 1969 (NEPA), Public Law 91-90, as amended, the Council on Environmental Quality and Department of the Interior regulations implementing NEPA. This EA analyzes the potential impacts of the Proposed Action (converting the existing Canal into a pipeline) in comparison with a No Action. Under the No Action, the existing Canal would remain unchanged. As required by the NEPA implementing regulations, if significant impacts to the human environment are identified, an Environmental Impact Statement will be prepared. If no significant impacts are identified, Reclamation will issue a Finding of No Significant Impact (FONSI).

1.2 Background

Water is diverted from the Daniels Creek into the delivery system consisting of three zones: the Lower, Middle and Upper. The Lower zone supplies the southwest area of the town of Daniels and consists of approximately 6 miles of buried pipe. The Middle zone supplies the central area of the town of Daniel and consists of approximately 9 miles of buried pipe. The Upper zone supplies the southeast area of the town of Daniel and Center Creek and consists of approximately 5 miles of buried pipe. The water for the middle pond is initially diverted from the Daniels Creek via a 1.3 mile long open canal and is routed to a storage pond. This section is the last remaining part of the system to be upgraded from open canal to enclosed piping.

After nearly 100 years of use, the Canal liner has eroded and is susceptible to high seepage losses of 4.7 cubic-feet-per-second (cfs), and it raises safety concerns over slope stability along some sections of the canal. The water is distributed through a share system in which specific quantities are delivered to each shareholder that are determined and based on water available. That delivery may vary from season to season and within the season depending on water availability. The current water right is an agricultural right, and as such, the area served is limited to the area for which the right is allocated. The agricultural base would not increase; therefore, the current rights were deemed to be sufficient and the water demands of the system would not increase.

In 1949, the Company filed Diligence Claim D-4 (WR 43-1954) to divert water from Daniel's Creek and Strawberry River for the irrigation of 1,825 acres, 800 livestock, and 25 families. In 1973, the Company deeded WR 43-1954 to Reclamation. Reclamation then allocated 2,533.65 acre-feet from WR 43-1954 and gave it back to the Company as WR 55-9665 (Utah Division of Water Rights, 2013). Since 2001, the Central Utah Water Conservancy District (District) has supplemented an average of 2,400 acre-feet of water to the Company out of the Jordanelle Reservoir.

The Company was also involved in the Wasatch County Water Efficiency Project (WCWEP) program started in the early 1990s. This program was created to improve irrigation efficiencies in irrigation companies within Heber Valley, Utah, by upgrading flood irrigation to sprinkler irrigation. This conversion is obtained by converting open canals to pipelines. Part of this project was the removal of the Company's annual diversion of 2,900 acre-feet from the Strawberry River and the installation of a replacement pipeline that supplies water from the Jordanelle Reservoir instead, thereby fulfilling an environmental mitigation commitment of the Central Utah Project (Central Utah Project Completion Act Office, 2013).

1.3 Purpose of and Need for Proposed Action

The purpose of the Project is to eliminate water losses to seepage and evaporation by converting the existing Canal into an enclosed pipeline. This would help ensure the irrigation water supply in Heber Valley and relieve some of the water use out of Jordanelle Reservoir. The Project is needed to improve water quality, increase public safety, reduce Canal maintenance, and prevent trash and debris from entering the water. The Federal Action being considered is whether or not Reclamation should provide funding and authorize the Company to modify the existing Canal by enclosing it in a pipe.

Current water uses include agricultural irrigation and stock watering. According to the base permit a total of 1,825 agricultural acres are watered of which about 26 percent is alfalfa, 73 percent is pasture and 1 percent is grain (United States Department of Agriculture land uses 2012) and 800 livestock units are allotted use. The total number of water users served is approximately 327 shareholders. The water is diverted into one open canal, multiple closed conduit piped canals, laterals, and three holding ponds.

The current minimum demand to meet the needs of the shareholders along the project canal is 14 cfs. Known shortfalls to the water supply include seepage losses (described below Table 1-1) and potential shortfalls to water supply including seasonal drought conditions which reduce supplies between 25 to 35 percent. The following table depicts flows and losses throughout the Canal.

**Table 1-1
Flows and Seepage Loss**

	High	Low
Water diverted	14 cfs	9 cfs
Losses in unlined section	-4.7 cfs	-4.7 cfs
Total	9.3 cfs	4.3 cfs

1.3.1 Prevent Evaporation and Seepage

The average loss due to seepage and evaporation in the Canal is estimated to be 33 percent during high flow and up to 50 percent during low flow. Enclosing the Canal would eliminate this loss.

1.3.2 Improve Water Quality

Development along the Canal can result in unauthorized storm water inflows and irrigation return flow, as well as the accumulation of debris and animals in the water. The enclosure of the Canal would eliminate outside contaminants from entering the water. Storm water would no longer have any means of entering the Canal thereby improving water quality.

1.3.3 Reduce Time Maintaining the Canal

The inflows from storm water discharge and irrigation return flow can result in additional sediment loads, which have to be periodically removed from the Canal. Enclosing the Canal would eliminate these inflows.

Enclosing the Canal would also greatly reduce Canal and right-of-way maintenance activities such as grading, weed control, rodent control, and leak monitoring.

1.3.4 Prevent Trash and Debris from Entering the Water

The open water Canal has the ability to collect trash and debris, which can impact the operation of the Canal.

1.4 Public Scoping and Involvement

The Proposed Action was presented to the public and cooperating agencies through mailings. Letters were sent to the property owners within the Canal right-of-way and state and Federal agencies. The letters invited the recipients to a public scoping meeting held on August 27, 2015, and included a brief description of the Project and area map.

Comments were accepted at the scoping meeting, by e-mail, facsimile, telephone, and standard mail. Using the comments from the public and other agencies, the interdisciplinary team identified and considered issues of public concern.

1.5 Permits, Licenses, and Authorizations

Implementation of the Proposed Action may require a number of authorizations or permits from state and Federal agencies. The Company would be responsible for obtaining all permits, licenses, and authorizations required for the Project. Potential authorizations or permits may include those listed in Table 1-2.

**Table 1-2
Permits and Authorizations**

Agency/Department	Purpose
Utah Division of Water Quality	Utah Pollution Discharge Elimination System (UPDES) Permit for dewatering.
Utah Division of Water Quality	Storm Water Discharge Permit under Section 402 of the Clean Water Act (CWA) if water is to be discharged as a point source into Daniel Creek or other natural streams or creeks.

Agency/Department	Purpose
State of Utah Department of Natural Resources, Division of Water Rights (DWRi)	Stream Alteration Permit under Section 404 of the CWA and Utah statutory criteria of stream alteration described in the Utah Code. This would apply for impacts to Daniel Creek or other natural streams or creeks during Project construction.
Utah State Historic Preservation Office	Consultation pursuant to Section 106 of the National Historic Preservation Act (NHPA), 16 USC 470.
United States Army Corps of Engineers (USACE)	A USACE permit in compliance with Section 404 of the CWA may be required if waters of the United States are proposed to be filled or dredged as part of the Project.

1.6 Related Projects and Documents

The purpose of this EA is to determine whether or not Reclamation should authorize, provide funding, and enter into an agreement with the Company for the enclosure of the Canal to develop a more secure and reliable irrigation water supply for Heber Valley. That determination includes consideration of whether there would be significant impacts to the human environment. In order to enclose the Canal, this EA must be completed and a FONSI issued. Analysis in the EA includes temporary impacts from construction activities and permanent impacts as a result of enclosing the Canal.

Chapter 2 Alternatives

2.1 Introduction

This chapter describes the features of the No Action and Proposed Action Alternatives, and presents a comparative analysis. It includes a description of each alternative considered. This section also presents the alternatives in comparative form, defining the differences between each alternative.

The Company has requested funding and authorization to enclose the Canal. The irrigation water within the Canal would continue to be released from existing springs. The current yearly average volume of water transported through the Canal is 2,900 acre-feet measured over the 6 growing months of the year. The water is released into the Canal in May and shut off in early to late fall of each year. The Canal is dry 6 months of the year.

2.2 No Action

Under the No Action, the Canal would not be converted to a pipeline. The Canal would continue to deliver water through an open channel. The Company maintenance and inspection activities would continue, including annual cleaning and dredging of the Canal, monitoring, and inspection. Canal operations would continue unchanged. Evaporation and seepage from the Canal would continue. New bridges and crossings of the Canal would be constructed as required by development adjacent to the Canal, increasing the opportunity for public interaction with the Canal, thus increasing the potential of risk to public safety.

2.3 Proposed Action

The Proposed Action is the preferred alternative. It consists of converting the existing Canal into a pipeline. The new pipeline would be built under the existing Canal alignment and, once complete, would be 1.3 miles long. All construction work associated with the pipeline would remain within the existing right-of-way.

The pipe would be covered with a minimum of 2.5 feet of soil. Wherever possible, the cover soil would be graded to blend smoothly into the surrounding ground surface. However, in some places the Canal banks extend higher than 3 feet above the top of the proposed pipeline. In these areas, the Canal banks would remain visible. The disturbed ground above the pipeline would be revegetated using a mix of upland plants approved by a Reclamation biologist and appropriate for the area.

The pipe would be 30 inches in diameter and constructed from corrugated pipe (M294). The size and materials of the pipeline would be carefully selected to ensure that the pipeline capacity would equal the capacity of the existing Canal. There would be no new water right diversions and water operations would remain the same (pictures of the existing condition are in Appendix B).

2.3.1 Canal Enclosure

The Canal currently operates as an open Canal. The Company desires to enclose the Canal as funding becomes available. During planning of the Project, the Canal would continue to be operated as an open Canal not piped and would have limited pressure until the entire Project is completed. At that time, the Canal would become fully enclosed. The canal would be revegetated after construction.

2.3.2 Turnouts

The Canal has no turnouts on the proposed improvement section.

2.3.3 Road Crossings

Vehicular access over the Canal is provided by two major road crossings. Major road crossings occur where highways and surface streets cross the Canal and consist of box culverts (see Table 2-1).

All major road crossings would remain following construction of the pipeline. Where possible, the pipeline would be installed without disturbing the overlying road (Highway 40). In the other locations, the road crossing may be shutdown temporarily so that the road can be cut and the pipeline installed (Cove Lane). Detours would be provided while the road crossing is out of service and the road would be repaired following pipeline construction.

Driveway crossings provide access over the Canal for individual land owners and consist of existing culverts. Most driveway crossings would remain intact throughout construction of the pipeline.

**Table 2-1
Road Crossings**

Name	Station	Type of Structure
Highway 40	45+00	Box Culvert
Cove Lane	38+50	Box Culvert

2.3.4 Stream Crossings/Siphon

The Canal does not cross any active stream.

2.3.5 Other Crossings

Each crossing would remain open following pipeline construction. Service of these crossings may be temporarily disrupted during construction and some of the crossings may need to be modified, but they would all remain operable following

construction. Drainage inlets would be routed over the pipeline and would discharge on the downstream side of the pipeline.

2.3.6 Saved Water

The water saved due to the elimination of seepage and evaporation losses does not constitute a new source of water previously unavailable to the users of the Canal. The saved water would help firm up the existing water supply, ensuring that users can receive their full allotment.

2.3.7 Construction Schedule and Canal Operation during Construction

Construction of the project consists of the entire 1.3 miles of pipeline. Pipeline construction would begin at the downstream end of the Canal and progress upstream. The first construction season is scheduled to begin in the spring 2016. In order to continue delivering water between construction seasons, a temporary intake structure would be built at the upstream end of the pipeline. The temporary structure would be moved upstream as pipeline construction progresses. While the pipeline is under construction, the pipeline would operate under gravity flow conditions.

2.3.8 Pipeline Construction Procedures

2.3.8.1 Construction Sequence

Construction would likely occur in the following sequence:

- Clear and grade Canal bottom
- Install pipeline bedding materials
- Haul pipeline to construction sites
- Place pipeline in Canal and connect
- Backfill around pipeline and grade surface
- Cleanup and restore areas disturbed by construction
- Plant right-of-way and disturbed areas to provide revegetation

2.3.8.2 Clear and Grade Canal Bottom

The existing Canal bottom would be excavated and graded to provide a base for installation of the pipeline. All excess material would be disposed within the Canal right-of-way. Much of the excavated material could be used for backfill and would be disposed along the enclosure in ways that blend with adjacent terrain. Base material for bedding the enclosure would be hauled to the site and placed in the Canal bottom once graded.

2.3.8.3 Pipeline Installation

The pipe would be transported from the manufacturer to the work site by flatbed truck and/or specially outfitted loaders. Needed bedding and backfill material would be imported from available commercial sources. Each pipeline section would be placed in the prepared Canal by the necessary construction equipment and connected to the previously laid section by field welding depending on the

pipeline type. After the sections are connected, backfill would be carefully placed around the pipeline in lifts either from material available along the Canal or imported from local offsite commercial gravel pits. Typically, backfill would be mechanically compacted with a compactor.

Following construction, the contractor would remove all debris. Spoils in work areas would be spread evenly to blend with contours and maintain local drainage patterns.

2.3.8.4 Road Crossings

Where possible, road crossings would be completed through minimal disturbance to existing structures to allow installation of the pipeline. Controlled low strength material would be used as backfill to the bottom of the structure to provide adequate strength below the structure. Where this option is not possible, the road crossings would be excavated and asphalt and concrete material would be removed offsite to an approved disposal site. Backfill would be compacted all the way to the ground surface at road crossings to prevent the road surface from subsiding under repeated traffic loads during and after construction. Temporary gravel surfaces at the road crossings would be installed and the final asphalt and curb and gutter restoration completed before spring. Road crossings would be restored to a condition better than or equal to existing conditions.

2.3.8.5 Drainage Crossing

There would be no impacts to existing drainage crossings. Any canal drainage structure would be maintained or improved during construction.

2.3.8.6 Quality Control Procedures

After backfilling and all construction work are completed; the contractor would ensure quality control of construction through visual inspection and required testing to ensure that the system operates to design specifications.

2.3.8.7 Construction Staging Areas

The project construction area would be a strip approximately 60-feet-wide by 1.3-miles long. The crews involved, invert preparation, enclosure laying, and finish grading and restoration, would all move along the Canal from day-to-day. Each crew's equipment would move along the Canal with them.

Some of the pipe would be stockpiled at approved staging areas. However, much of the pipe would be delivered as it is needed along the Canal right-of-way. As such, the Canal right-of-way would be a continuous staging area for the crews as they move up and down the Canal. Three separate staging areas (totaling 4 acres) along the Canal corridor were evaluated as part of the environmental process (Figure 1). These staging areas would be used for equipment staging, construction personnel vehicular parking, and occasional materials stockpiling.

2.3.8.8 Operation and Maintenance

Operation of the Canal after enclosure would remain essentially unchanged, and maintenance would be reduced significantly as a result of the enclosure. Operation would occur primarily from April 15 to October 15. Emergency situations or when other conveyance systems are out of service may require the enclosed Canal to be operated at other times.

2.3.8.9 Land Disturbance

The Canal right-of-way is approximately 6,500 feet in length and approximately 60 feet in width. The construction activity would be confined to the existing right-of-way and staging areas.

2.3.8.10 Construction Materials Requirements

Table 2-2 lists major construction material requirements for the Proposed Action. All materials would be delivered from local suppliers.

**Table 2-2
Estimated Major Construction Material Requirements
For the Proposed Action**

Type of Material	Use of Material	Quantity
Bedding	Bed pipe	3,328 cubic yards
Pipe	Convey Water	6,500 feet

2.3.8.11 Transportation Requirements

Construction transportation routes for the project include the existing access road along the Canal and the cross streets shown on Figure 1. Transportation to the Project would be dispersed from each construction crew along the Canal and from day-to-day as the Project proceeds along the Canal alignment.

2.3.8.12 Standard Operating Procedures

Standard Operating Procedures (SOPs) would be followed (except for unforeseen conditions that would require modifications) during construction and Operation and Maintenance (O&M) of the Project to avoid or minimize adverse impacts on people and natural resources. The SOPs and features of the Proposed Action have been formulated to avoid or minimize adverse impacts. Chapter 3 presents the impact analysis for resources after SOPs have been successfully implemented.

2.4 Alternatives Considered and Eliminated from Further Study

The following alternatives were evaluated but eliminated because they did not meet the purpose or need for the Project.

2.4.1 Membrane Lining

This alternative consists of lining the existing Canal with an impermeable membrane, such as an ethylene propylene diene monomer or polyvinyl chloride. This liner would be installed on top of a 6-inch-thick layer of clean backfill material and covered with several inches of the same backfill material.

This alternative was rejected because of susceptibility to puncturing and the need to repair punctures on a regular basis. Punctures can occur when equipment or large animals such as livestock, enter the Canal. It would also still allow debris to enter the Canal, it would not shorten the time to make flow changes, and most of the other aspects of an open Canal would remain the same. Public safety and evaporation loss would not be addressed with this alternative.

This alternative does not meet the purpose and need of the Project because it would keep the water in an open environment; thus allowing evaporation and contamination from equipment and livestock.

2.4.2 Pressurized Pipeline

In pressurized pipeline alternative, a buried pipeline would operate under pressurized flow conditions. The pipeline would be constructed of steel pipe with diameters of 30 inches or smaller. Smaller diameter sections would be constructed of High Density Polyethylene pipe.

This alternative was rejected because the increased costs of associated with pumping the water. This alternative does not meet the purpose and need of the Project because it would not reduce Canal maintenance.

2.5 Minimization Measures Incorporated into the Proposed Action

The minimization measures, along with other measures listed under each resource in Chapter 3 and Chapter 4 have been incorporated into the Proposed Action to lessen the potential adverse effects.

- The proposed project construction area would be located in previously disturbed sites and would have as small a footprint as possible.
- Staging areas would be located where they would minimize new disturbance of area soils and vegetation.
- Ground disturbance would be minimized to the extent possible.
- Only certified weed-free hay, straw or mulch if needed, would be used to minimize the potential spread of nonnative invasive plants.
- Construction vehicles and equipment would be inspected and cleaned prior to entry into the project area to ensure that they are free of weed seed.

- Newly disturbed sites would be monitored for impacts to native vegetation.
- Stockpiling of materials would be limited to those areas approved and cleared in advance.

Chapter 3 Affected Environment and Environmental Consequences

3.1 Introduction

This chapter describes the environment that could be affected by the Proposed Action. These impacts are discussed under the following resource issues: geology and soils resources; visual resources; cultural resources; paleontological resources; wilderness and wild and scenic rivers; hydrology and water quality; groundwater resources; health, safety, air quality, and noise; prime and unique farmlands; wetlands and riparian resources; wildlife resources; threatened, endangered, and sensitive species; recreation; socioeconomics; public safety, access, and transportation; water rights; Indian Trust Assets (ITAs); environmental justice, and cumulative effects. The present condition or characteristics of each resource are discussed first, followed by a discussion of the predicted impacts caused by the Proposed Action. The environmental effects are summarized in Section 3-7.

3.2 Resources Considered and Eliminated from Further Analysis

The following resources were considered but eliminated from further analysis because they did not occur in the Project area or because their effect is so minor (negligible) that it was discounted.

**Table 3-1
Resources Eliminated From Analysis**

Resource	Rationale for Elimination from Further Analysis
Wilderness and Wild and Scenic Rivers	There are no designated wilderness areas or Wild and Scenic Rivers within the Project area; therefore, there would be no impact to these resources from the Proposed Action.
Prime and Unique Farmlands	There is Prime and Unique Farmland within the Project area; however, there would be no impacts to this resource from the Proposed Action.

3.3 Affected Environment and Environmental Consequences

This chapter describes the affected environment (baseline conditions) and environmental consequences (impacts as a result of the Proposed Action) on the quality of the human environment that could be impacted by construction and operation of the Proposed Action, as described in Chapter 2. The human environment is defined in this study as all of the environmental resources, including social and economic conditions occurring in the impact area of influence.

3.3.1 Geology and Soils Resources

The Project is located in the Center Creek quadrangle which lies astride a structural and topographic saddle between the Wasatch Range and Uinta Mountains as shown in Figure 3. Geologically, the majority of the area consists of alluvial fan deposits (alluvial plain) with sedimentary rocks surfacing (Biek, 2003). The sedimentary rock formations to the north and east of alignment have been involved in numerous folding actions (anticlines and synclines) with minor faulting located on the western boundary of the valley. According to the U.S. Geological Service, the faults and folds do not appear to be in an active state. The Project area is in northeastern Utah with elevation ranging from 6,040 feet to 6,000 feet above mean sea level (msl).

In August 2014, a geotechnical soils analysis was performed by Natural Resources Conservation Service (NRCS) within the reach of the Canal. The investigation consisted of a review of the surface, as well as subsurface conditions encountered in the test trenches dug between a depth of 4 and 8 feet. The soils along the alignment consist of loams, and gravelly loam as shown in Figure 6. A description of the soils by the NRCS of this area can be found in Appendix A.

3.3.1.1 No Action

Under the No Action, the Project would not be built. This would have no effect on geology and soils.

3.3.1.2 Proposed Action

Temporary surface soil impacts during construction are anticipated. Construction erosion and sediment controls would serve to minimize these impacts.

Construction of the pipe would include corrugated pipe to minimize impacts due to operating pressures and the potential for possible seismic activity. Construction documents would address any additional appropriate pipe construction methods or materials.

3.3.2 Visual Resources

The visual resource of the area would be of a rural and urban setting with irrigated crops, residential development, commercial development, institution

development, fences, dirt access roads for farm equipment and major access roads for thoroughfare.

While the Canal corridor is relatively clear of larger vegetation and understory, it is surrounded by larger vegetation (see vegetation Figure 5). The impact area of influence for visual resources is the area adjacent to the alignment of the Proposed Action. The Canal presents an introduction of line and color into the landscape through the lined vegetation outside of the Canal corridor and the open water during the irrigation season. Right-of-way maintenance of the Canal is visible where vegetation is cleared, burned, or chemically treated to minimize impacts to the water flow and continue to provide maintenance access.

3.3.2.1 No Action

The No Action would have no effect on visual resources.

3.3.2.2 Proposed Action

The Canal corridor is an open area cleared of most vegetation. The understory consists of grasses and weeds. The impacts to the visual environment from the Proposed Action would be noticeable by the adjacent landowners. The Proposed Action would contour and seed the corridor to help mitigate the action once construction is complete.

3.3.3 Cultural Resources

Cultural resources are defined as physical or other expressions of human activity or occupation. Such resources include culturally significant landscapes, prehistoric and historic archaeological sites, as well as isolated artifacts or features, traditional cultural properties, Native American and other sacred places, and artifacts and documents of cultural and historic significance.

Section 106 of the NHPA of 1966 mandates that Reclamation take into account the potential effects of a proposed undertaking on historic properties. Historic properties are defined as any prehistoric or historic district, site, building, structure, or object included in, or eligible for, inclusion in the National Register of Historic Places (NRHP). Potential effects of the described alternatives on historic properties are the primary focus of this analysis.

The affected environment for cultural resources is identified as the APE (area of potential effects), in compliance with the regulations to Section 106 of the NHPA (36 CFR 800.16). The APE is defined as the geographic area within which Federal actions may directly or indirectly cause alterations in the character or use of historic properties. The APE for this Proposed Action consists of a 60 foot-wide linear corridor, approximately 1.3 miles in length, as well as the three staging areas. The APE encompasses the areas of potential ground disturbance associated with the proposed pipeline and staging areas.

A Class I record search and a Class III cultural resource inventory of the APE were completed by Bighorn Archaeological Consultants, L.L.C. (Bighorn), in

October 2015. A total of 15.4 acres were inventoried during the Class III cultural resource inventory to determine if the Proposed Action would have any effect on cultural resources. A previously recorded cultural resource site (42WA293) was identified during the inventory (Baxter 2015).

In accordance with 36 CFR 800.4, the site was evaluated for significance in terms of NRHP eligibility. The significance criteria applied to evaluate cultural resources are defined in 36 CFR 60.4 as follows: The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, association and

- That are associated with events that have made a significant contribution to the broad patterns of our history; or
- That are associated with the lives of persons significant in our past; or
- That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- That has yielded, or may be likely to yield, information important in prehistory or history.

Site 42WA293, or the Old Extension Canal, was previously recommended eligible for the NRHP in 2002 due to the role it played in regional history and the development of irrigation law in the State of Utah. The proposed Project would pipe the canal, thereby altering or removing its original construction methods. This is an adverse effect to potential historic resources and requires mitigation efforts.

In compliance with 36 CFR 800.4(d) (2) and 36 CFR 800.11(e), a copy of the Class III cultural resource inventory report and a determination of adverse effect to historic properties were submitted to the Utah State Historic Preservation Office (SHPO), the Advisory Council on Historic Preservation (ACHP), and tribes which may attach religious or cultural significance to historic properties possibly affected by the Proposed Action for consultation. Pursuant to 36 CFR 800.6(c), a Memorandum of Agreement (MOA) was developed to resolve any adverse effects to site 42WA293. Signatories to the MOA included all parties that assume a responsibility under the agreement, including, Reclamation, SHPO, and the District.

3.3.3.1 No Action

Under the No Action, there would be no foreseeable impacts to cultural resources. There would be no need for ground disturbance associated with pipeline installation or staging. The existing conditions would remain intact and would not be affected.

3.3.3.2 Proposed Action

Under the Proposed Action, there would be potential to adversely affect site 42WA293. The site was recommended eligible because of the role it played in regional history and the development of irrigation law in the State of Utah. Pursuant to 36 CFR 800.5, the criteria of adverse effect were applied to site 42WA293. An adverse effect is defined as an effect that could diminish the integrity of a historic property's location, design, setting, materials, workmanship, feeling, or association. The proposed action would have an adverse effect to the historic property.

Pursuant to 36 CFR 800.6(c), a Memorandum of Agreement (MOA) was developed to resolve any adverse effects to site 42WA293. Signatories to the MOA included all parties that assume a responsibility under the agreement, including, Reclamation, SHPO, and the District.

3.3.4 Paleontological Resources

A paleontological file search for the APE was conducted by Martha Hayden, Paleontological Assistant for the Utah Geological Survey (UGS). In a letter dated January 29, 2016, the UGS stated that no significant paleontological localities recorded in the UGS files are located in the APE. Further, Quaternary and recent alluvial deposits that are exposed throughout much of the APE have a low potential for yielding significant fossil localities. Otherwise, unless fossils are discovered as a result of construction activities, the UGS concluded that the Proposed Action should have no impact on paleontological resources.

3.3.4.1 No Action

Under the No Action, there would be no foreseeable impacts to paleontological resources. There would be no need for ground disturbance associated with pipeline installation or staging. The existing conditions would remain intact and would not be affected.

3.3.4.2 Proposed Action

Under the Proposed Action, there would be ground disturbing activities which have the potential to impact subsurface fossil material. However, there are no paleontological localities within the APE that are recorded in the UGS files. Therefore, the Proposed Action is not anticipated to have an impact on paleontological resources.

3.3.5 Hydrology and Water Quality

The analysis of surface hydrology resources cover surface water features in the Canal from existing springs to the Canal outlet, as well as lands located immediately adjacent to those features. The affected environment is defined by the baseline conditions for the hydrologic features within the impact area of influence. Currently the Canal receives unauthorized inflows from storm water and irrigation return flow from lands adjacent to the Canal. There is no water quality data available on the Canal. Impacts on water quality caused by the No Action and Proposed Action are not able to be examined.

Development along the Canal has resulted in impacts to water quality because of unauthorized storm water inflow, unauthorized discharges, irrigation return flow and the presence of animals within upstream basins draining to the Canal. Piping the Canal would eliminate these water quality impacts. Under the Proposed Action, the capacity to meet the demands of water shareholders would not be affected.

There would be no significant impacts to water quality from this Project due to the proposed guidelines for construction outlined in Chapter 2. In addition, since construction of the Canal would occur in the winter months, no deliveries would be taking place from the Canal during construction and the end users of water from the Canal would not be affected.

Under the Proposed Action, storm water would no longer have any means of entering the Canal. Reclamation and the Company are not responsible for unauthorized discharges and have never authorized any discharges into the Canal.

3.3.5.1 No Action

The No Action would have no effect on hydrology and water quality.

3.3.5.2 Proposed Action

The construction impacts of this Project would not adversely impact water resources and water quality. The amount of water to be delivered through the Proposed Action would remain the same. In addition, water quality would not be influenced since water delivery only occurs between April and October and construction activities would be performed between October and April.

3.3.6 Ground Resources

The analysis for ground water resources covers water wells and springs near and along the Canal alignment from existing springs to the Canal outlet.

Aquifers underlying the Canal are predominately recharged by surface water from canals and seepage from irrigated fields along with recharge from precipitation and subsurface inflow. Groundwater flow is generally to the north east towards Heber Valley. Ground water is approximately 80-feet-deep based on well completion reports submitted to the State of Utah DWR.

3.3.6.1 No Action

Under the No Action the Project would not be built. This would have no effect on groundwater resources.

3.3.6.2 Proposed Action

The Proposed Action would require construction activities to take place between October and April. Following the enclosure of the Canal, groundwater recharge directly from Canal seepage would essentially be eliminated. The impact to

groundwater supplies, as a result of virtual elimination of this seepage, is unknown. Rather than water recharging directly by seepage under the Canal, infiltration by irrigation and losses after each turnout off the enclosed Canal would continue to feed the underlying aquifer. It is likely that existing seepage penetrated no further than the shallow groundwater table. However, the extent of the shallow groundwater usage is predominately for domestic purposes with well depths approximately 80-feet-below ground surface (all within alluvial fill material). The extent of effects on the wells is unknown at this time.

3.3.7 Health, Safety, Air Quality, and Noise

This section identifies potential public safety hazards and health risks from the construction and operation of the Proposed Action and No Action. The areas that receive the most noise within the impact area of influence lie adjacent to U.S. Highway 40. Although traffic noise may be heard throughout most of the urbanized areas of impact, most is associated with small volumes of residential traffic. Therefore, they are not considered to be a public safety issue. Since portions of the Canal right-of-way are currently vegetated, local residents experience minimal air quality impacts associated with dust and it is not considered to be a health issue.

3.3.7.1 No Action

Under the No Action there would be no adverse effects to health, safety, air quality, and noise.

3.3.7.2 Proposed Action

The Proposed Action would have minor short-term effects during construction, but there would be no long-term effects on health, safety, air quality, and noise.

3.3.8 Wetlands and Riparian Resources

The Canal corridor does not pass through riparian areas created by Canal seepage, as shown in Figure 4. There is a riparian wetland noted at the pound outlet that should not be disturbed due to the proposed activities.

Wetlands

A preliminary wetland delineation study was completed along the Project area and no wetlands were located. Wetlands may be jurisdictional in nature, or regulated by the USACE under Section 404 of the CWA. According to the USACE Sacramento Regulatory Branch, the Proposed Action may be exempted (if deemed jurisdictional) under the Irrigation Ditch Construction or Maintenance exemptions under Section 404 of the CWA.

The wetland assessment performed herein, is in accordance with the 1987 USACE Wetland Delineation Manual. Wetlands must exhibit three parameters to meet the USACE definition of a wetland: hydrophytic vegetation, hydric soils, and hydrology. Test holes were excavated to determine the soil conditions and vegetation was identified. The U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) maps for the area were also used as a screening tool to

identify potential wetlands on the property; however, the closest NWI wetland is north of the Project site.

Riparian

Riparian areas are typically dominated by wetland-type vegetation and may include horsetail (*Equisetum arvense*), scouringrush (*Equisetum hyemale*), reed canary grass (*Phalaris arundinacea*), showy milkweed (*Asclepias speciosa*), Ute ladies'-tresses (*Spiranthes diluvialis*), foxtail barley (*Hordeum jubatum*), common cattail (*Typha latifolia*), torrey's rush (*Juncus torreyi*), coyote willow (*Salix exigua*), cottonwood (*Populus sp.*), elm (*Ulmus pumila*), and Russian olives (*Elaeagnus angustifolia*). Riparian vegetation exists along the banks of the Canal and is primarily contained within a 20-foot-wide strip. A riparian wetland area, located at the pond outlet, is not anticipated to be disturbed due to the proposed activities.

Several riparian corridors exist within the Project area are sustained by natural drainages and seepage from other canals. The natural drainages that sustain later riparian areas along Daniel Creek would continue to flow through culverts and pipes where the canal bisects the existing riparian corridor.

3.3.8.1 No Action

The No Action would have no negative effect on wetlands and riparian vegetation.

3.3.8.2 Proposed Action

The Proposed Action would not impact any wetland. The USACE has determined that canals are not navigable waters and therefore, are exempt from regulation under Section 404 of the CWA, according to the irrigation construction and maintenance exemption. Therefore, a USACE Permit is not required for completion of this Project.

3.3.9 Wildlife Resources

Wildlife resources within the general area of the Project include fish, birds, reptiles and amphibians, and big game.

Fish

In general no fish exist in the Canal. On rare occasions, fish travel the length of the canal and end up in the stilling basin (pond to the north).

Birds

The most common birds are migratory songbirds, but there are also upland gamebirds, raptors, and owls in the project area. They are generally found nesting and feeding in the tree, shrub, and grassland habitats surrounding the project area. The only species of concern that is a bird that could be present in the project area is the short-eared owl (*Asio flammeus*). Also found in the area are California quail (*Callipepla californica*), dusky grouse (*Dendragapus obscurus*), and ruffed grouse (*Bonasa umbellus*).

Reptiles and Amphibians

A number of reptiles and amphibians occur in the general area including the common garter snake (*Thamnophis sirtalis*), western rattlesnake (*Crotalus viridis*), western chorus frog (*Pseudacris triseriata*), and tiger salamander (*Ambystoma tigrinum*).

Big Game

The Canal corridor is at the bottom of the mouth of the canyon. Mule deer (*Odocoileus hemionus*), and their habitat are found throughout the project area (Figure 7). In addition, there is limited habitat for Rocky mountain elk (*Cervus elaphus nelsoni*), black bear (*Ursus americanus*), cougar (*Puma concolor*), and moose (*Alces alces*).

3.3.9.1 No Action

The No Action would have no negative effects on wildlife. Free water and habitat conditions would remain the same.

3.3.9.2 Proposed Action

Under the Proposed Action there would be no major long-term detrimental effects to wildlife. However, in the short term, especially during and immediately after construction, animals would have to find unfamiliar habitat wherein, they are more susceptible to exposure to the elements and predation. Construction activity would cause stress to some wildlife species from noise, dust, displacement, and temporary loss of habitat. In addition, trees and shrubs that used to be occupied by birds and other wildlife may not be able to obtain the same amounts of water and either struggle to survive or die. This may affect nesting habitat, and thermal cover for a variety of species. Free water would be a little less available to wildlife as a result of implementing the proposed action.

3.3.10 Threatened, Endangered, and Sensitive Species

During the environmental review process for the Project area, several sources were reviewed to determine the proposed projects impact on the Threatened, Endangered, and Sensitive Species. By reviewing Utah's AGRC Environmental Consulting Team resources for the Center Creek Quadrangle it was determined that there was only potential for five listed species in the project area: Bonneville Cutthroat Trout (*Oncorhynchus clarkii utah*), Columbia Spotted Frog (*Rana luteiventris*), Short-eared Owl (*Asio flammeus*), Yellow-billed Cuckoo (*Coccyzus americanus*) and Ute ladies'-tresses (*Spiranthes diluvialis*). On July 27, 2015, Reclamation biologists surveyed the project area for potential impacts to listed species.

3.3.10.1 No Action

The No Action would have no effect on Threatened, Endangered, and Sensitive Species.

3.3.10.2 Proposed Action

The proposed project would have no effect on Threatened, Endangered, and Sensitive Species. The entire project area has already been developed/disturbed leading to minimal impact to already impacted species. Full impact summary by species can be viewed in Table 3-2 below.

**Table 3-2
Full Impact Summary of Species**

Group	Name	Potential	Determination of Effects
Fish	Bonneville Cutthroat Trout (<i>Oncorhynchus clarkii utah</i>),	Not suitable habitat. Unlikely to occur in the Project area due to lack of riparian vegetation and lack of perennial streams.	No Effect
Amphibians	Columbia Spotted Frog (<i>Rana luteiventris</i>)	Not suitable habitat. Unlikely to occur in the Project area due to lack of riparian vegetation and lack of perennial streams.	No Effect
Birds	Short-eared Owl (<i>Asio flammeus</i>)	Not suitable habitat. Unlikely to be effected by project due to lack of dense woody vegetation.	No Effect
	Yellow-billed Cuckoo (<i>Coccyzus americanus</i>)	Some suitable habitat exists. Unlikely to be effected due to the narrowness of riparian habitat. Riparian habitat surrounding the canal is long enough to meet the minimum area	No Effect
Plants	Ute ladies'-tresses (<i>Spiranthes diluvialis</i>)	Not suitable habitat. Unlikely to occur in the Project area due to cobbly nature of the site.	No Effect

3.3.11 Recreation

The closest recreation area to the Canal is Deer Creek Reservoir, west of the Canal alignment. The Canal corridor is on private land and is not used as a recreational area for walking, jogging, and bicycling.

3.3.11.1 No Action

The No Action would have no effect on recreation.

3.3.11.2 Proposed Action

The Proposed Action would not adversely impact recreation. The enclosure of the open Canal would remain at the same surface elevation once the Canal is enclosed.

3.3.12 Socioeconomics

The proposed Canal enclosure would continue to provide a needed water supply to customers. Up to 2,900 acre-feet of water, would be secured for the existing water rights and irrigation use. This water would continue to be used for supplemental irrigation of pasture grasses, alfalfa, and grains.

3.3.12.1 No Action

Under the No Action there would be no adverse effects to socioeconomics.

3.3.12.2 Proposed Action

Under the Proposed Action, the water supply to the intended irrigation shareholders would be secured to help ensure a constant and regular source of water for irrigation. Construction would occur during the non-irrigated season; therefore, no significant effect is anticipated during construction.

3.3.13 Public Safety, Access, and Transportation

The Project is located within Wasatch County and can be accessed from several cross streets and major roadways within the county. The impact area of influence for transportation includes roads that would be used during construction, operation and maintenance of the Proposed and the No Action. The impact area of influence for utilities includes any utilities that would be moved, replaced or experience service interruptions under the Proposed Action or No Action Alternative.

During construction, it is estimated that up to about five construction vehicles per day would travel to the site. The majority of the vehicle trips would be for transporting construction materials including concrete, excavation and backfill materials. The contractor would be transporting heavy construction equipment at the beginning and end of the Project. Upon completion of construction, vehicle trips are expected to be reduced to no more than three per day for O&M purposes during irrigation season.

3.3.13.1 No Action

The No Action would have no impact on public safety, access, and transportation.

3.3.13.2 Proposed Action

The Proposed Action would have minor short-term effects during construction but no long-term effects on public safety, access, and transportation.

3.3.14 Water Rights

In 1949, the Company filed Diligence Claim D-4 (WR 43-1954) to divert water from Daniel's Creek and Strawberry River for the irrigation of 1,825 acres, 800 livestock, and 25 families. In 1973, the Company deeded WR 43-1954 to Reclamation. Reclamation then allocated 2,533.65 acre-feet from WR 43-1954 and gave it back to the Company as WR 55-9665 (Utah Division of Water Rights, 2013). Since 2001, the District has supplemented an average of 2,400 acre-feet of water to the Company out of the Jordanelle Reservoir. It is believed that the canal was lined by native materials when it was constructed but after nearly 100 years of use the liner has eroded and is susceptible to high seepage losses and raises safety concerns over slope stability along some sections of the canal. Water losses along the canal are calculated to be 4.7 cfs. The rest of the Company's system was upgraded from open canals to buried, pressurized pipes starting in 1978. This section is the last remaining part of the system to be upgraded from open canal to enclosed piping.

The Company was also involved in the Wasatch County Water Efficiency Project (WCWEP) program started in the early 1990's. This program was created to improve irrigation efficiencies in irrigation companies within Heber Valley, Utah, by upgrading flood irrigation to sprinkler irrigation. This conversion is obtained by converting open canals to pressurized pipelines. Part of this project was the removal of the Company's annual diversion of 2,900 acre-feet from the Strawberry River and the installation of a replacement pipeline that supplies water from the Jordanelle Reservoir instead, thereby fulfilling an environmental mitigation commitment of the Central Utah Project.

3.3.14.1 No Action

Under the No Action, the Project would not be built. This would have no effect on water rights.

3.3.14.2 Proposed Action

Under the Proposed Action, there would be no changes to the beneficial use of existing water rights. However, as stated in Section 2, within the new piped system, "saved water" would allow irrigation companies to fully utilize their water rights due to elimination of water losses associated with seepage and evapotranspiration.

3.4 Indian Trust Assets

Indian Trust Assets (ITAs) are legal interests in property held in trust by the United States for Indian tribes or individuals. The Department of the Interior's policy is to recognize and fulfill its legal obligations to identify, protect, and conserve the trust resources of Federally recognized Indian tribes and tribal members, and to consult with tribes on a Government-to-Government basis whenever plans or actions affect tribal trust resources, trust assets, or tribal safety (see Departmental manual, 512 DM 2). Under this policy, as well as

Reclamation's ITA policy, Reclamation is committed to carrying out its activities in a manner which avoids adverse impacts to ITAs when possible, and to mitigate or compensate for such impacts when it cannot. All impacts to ITAs, even those considered nonsignificant, must be discussed in the trust analyses in NEPA compliance documents and appropriate compensation or mitigation must be implemented.

Trust assets may include lands, minerals, hunting and fishing rights, traditional gathering grounds, and water rights. Impacts to ITAs are evaluated by assessing how the action affects the use and quality of ITAs. Any action that adversely affects the use, value, quality or enjoyment of an ITA is considered to have an adverse impact to the resources. There are no known ITAs in the project area vicinity, and no ITA concerns were identified by potentially affected tribes during the tribal consultation process. Because there are no ITAs within the project vicinity, implementation of the Action Alternative would have no effect on ITAs.

3.5 Environmental Justice

Executive Order 12898, established Environmental Justice as a Federal agency priority to ensure that minority and low-income groups are not disproportionately affected by Federal actions. The Canal is located in Wasatch County. The estimated Wasatch County population for 2014 was 27,714. Statistics for the year 2010, the most recent census data, shows a county population of 25,530, consisting (9.5 percent) of individuals living below poverty level (U.S. Census Bureau).

Implementation of the Proposed Action would not disproportionately (unequally) affect any low-income or minority communities within the project area. The reason for this is that the proposed project would not involve major facility construction, population relocation, health hazards, hazardous waste, property takings, or substantial economic impacts. This action would therefore have no adverse human health or environmental effects on minority and low-income populations.

3.6 Cumulative Effects

In addition to project-specific impacts, Reclamation analyzed the potential for significant cumulative impacts to resources affected by the project and by other past, present, and reasonably foreseeable activities within the watershed. According to the Council on Environmental Quality's regulations for implementing NEPA (50 CFR §1508.7), a "cumulative impact" is an impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place

over a period of time. It focuses on whether the Proposed Action, considered together with any known or reasonably foreseeable actions by Reclamation, other Federal or state agencies, or some other entity combined to cause an effect. There is no defined area for potential cumulative effects.

Cumulative effects for this Project may include maintenance and repair work on the pipeline. Any impacts from this work would be temporary in nature with no long-term impacts. Based on resource specialists’ review of the Proposed Action, Reclamation has determined that this action would not have a significant adverse cumulative effect on any resources.

3.7 Summary of Environmental Effects

Table 3-3 summarizes environmental effects under the No Action and the Proposed Action.

**Table 3-3
Summary of Environmental Effects**

Project Resource	No Action	Proposed Action
Geology and Soils Resources	No Effect	No Effect
Visual Resources	No Effect	No Effect
Cultural Resources	No Effect	Adverse Effect to Site 42WA293
Paleontological Resources	No Effect	No Effect
Wilderness and Wild and Scenic Rivers	No Effect	No Effect
Hydrology and Water Quality	No Effect	No Effect
Groundwater Resources	No Effect	No Effect
Health, Safety, Air Quality, and Noise	No Effect	No Effect
Prime and Unique Farmlands	No Effect	No Effect
Wetlands and Riparian Resources	No Effect	No Effect
Wildlife Resources	No Effect	No Effect
Threatened, Endangered, and Sensitive Species	No Effect	No Effect
Recreation	No Effect	No Effect
Socioeconomics	No Effect	No Effect
Public Safety, Access and Transportation	No Effect	No Effect
Water Rights	No Effect	No Effect
Indian Trust Assets	No Effect	No Effect
Environmental Justice	No Effect	No Effect
Cumulative Effects	No Effect	No Effect

Chapter 4 Environmental Commitments

Environmental Commitments, along with Minimization Measures in Section 2.5 have been developed to lessen the potential adverse effects of the Proposed Action.

4.1 Environmental Commitments

The following environmental commitments will be implemented as an integral part of the Proposed Action.

1. **Additional Analyses** - If the Proposed Action were to change significantly from that described in this EA because of additional or new information, or if other spoil, or work areas beyond those outlined in this analysis are required outside the defined Project construction area, additional environmental analyses may be necessary.
2. **UPDES Permit** - A UPDES Permit will be required from the State of Utah before any discharges of water, if such water is to be discharged as a point source into a regulated water body. Appropriate measures will be taken to ensure that construction related sediments will not enter the stream either during or after construction. Settlement ponds and intercepting ditches for capturing sediments will be constructed, and the sediment and other contents collected will be hauled off the site for appropriate disposal upon completion of the Project.
3. **Fugitive Dust Control Permit** - The Division of Air Quality regulates fugitive dust from construction sites, requiring compliance with rules for sites disturbing greater than one-quarter of an acre. Utah Administrative Code R307-205-5, requires steps be taken to minimize fugitive dust from construction activities. Sensitive receptors include those individuals working at the site or motorists that could be affected by changes in air quality due to emissions from the construction activity.
4. **Cultural Resources** - In the case that any cultural resources, either on the surface or subsurface, are discovered during construction, Reclamation's Provo Area Office archaeologist shall be notified and construction in the area of the inadvertent discovery will cease until an

assessment of the resource and recommendations for further work can be made by a professional archaeologist. Any person who knows or has reason to know that he/she has inadvertently discovered possible human remains on Federal land, he/she must provide immediate telephone notification of the discovery to Reclamation's Provo Area Office archaeologist. Work will stop until the proper authorities are able to assess the situation onsite. This action will promptly be followed by written confirmation to the responsible Federal agency official, with respect to Federal lands. The Utah SHPO and interested Native American Tribal representatives will be promptly notified. Consultation will begin immediately. This requirement is prescribed under the Native American Graves Protection and Repatriation Act (43 CFR Part 10); and the Archaeological Resources Protection Act of 1979 (16 U.S.C. 470).

5. **Paleontological Resources** - Should fossils be encountered by the proponent during ground disturbing actions, construction must be suspended until a qualified paleontologist can be contacted to assess the find.

6. **Wildlife Resources**

Migratory Bird Protection

- a. Perform any ground-disturbing activities or vegetation treatments before migratory birds begin nesting or after all young have fledged.
- b. If activities must be scheduled to start during the migratory bird breeding season, take appropriate steps to prevent migratory birds from establishing nests in the potential impact area. These steps could include covering equipment and structures and use of various excluders (e.g., noise). Prior to nesting, birds can be harassed to prevent them from nesting on the site.
- c. If activities must be scheduled during the migratory bird breeding season, a site-specific survey for nesting birds should be performed starting at least 2 weeks prior to ground-breaking activities or vegetation treatments. Established nests with eggs or young cannot be moved, and the birds cannot be harassed (see b., above), until all young have fledged and are capable of leaving the nest site.
- d. If nesting birds are found during the survey, appropriate spatial buffers should be established around nests. Vegetation treatments or ground-disturbing activities within the buffer areas should be

postponed until the birds have left the nest. Confirmation that all young have fledged should be made by a qualified biologist.

Raptor Protection

Raptor protection measures will be implemented to provide full compliance with environmental laws. Raptor surveys will be developed using the Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances (Romin and Muck 2002), to ensure that the proposed project will avoid adverse impacts to raptors, including bald and golden eagles. Locations of existing raptor nests and eagle roosting areas will be identified prior to the initiation of project activities. Appropriate spatial buffer zones of inactivity will be established during breeding, nesting, and roosting periods. Arrival at nesting sites can occur as early as December for certain raptor species. Nesting and fledging can continue through August. Wintering bald eagles may roost from November through March.

7. **Previously Disturbed Areas** - Construction activities will be confined to previously disturbed areas where possible for such activities as work, staging, and storage, waste areas and vehicle and equipment parking areas. Vegetation disturbance will be minimized as much as possible.
8. **Public Access** - Construction sites will be closed to public access. Temporary fencing, along with signs, will be installed to prevent public access.
9. **Disturbed Areas** - All disturbed areas resulting from the Project will be smoothed, shaped, contoured, and rehabilitated to as near the pre-Project construction condition as practicable. After completion of the construction and restoration activities, disturbed areas will be seeded at appropriate times with weed-free, native seed mixes having a variety of appropriate species (especially woody species where feasible) to help hold the soil around structures, prevent excessive erosion, and to help maintain other riverine and riparian functions. The composition of seed mixes will be coordinated with wildlife habitat specialists and Reclamation biologists. Weed control on all disturbed areas will be required. Successful revegetation efforts must be monitored and reported to Reclamation, along with photos of the completed Project.

Chapter 5 Consultation and Coordination

5.1 Introduction

This chapter details consultation and coordination between Reclamation and other Federal, state, and local Government Agencies, Native American Tribes, and the public during the preparation of this EA. Compliance with NEPA, is a Federal responsibility that involves the participation of all of these entities in the planning process. NEPA requires full disclosure about major actions taken by Federal agencies and accompanying alternatives, impacts, and potential mitigation of impacts.

5.2 Public Involvement

On August 27, 2015, the Company mailed scoping letters to property owners within the Canal right-of-way notifying them of the Project and inviting them to an open house. The mailed letters also included an invitation to participate in a 30-day public comment period.

On February 16, 2016, the draft EA was provided to 27 members of the public and State and Federal Government agencies for a 30-day comment period which ended on March 18, 2016. Four comments letters were received. They are available in the administrative record. All comments were considered and relevant issues addressed in the Final EA.

5.3 Native American Consultation

Reclamation conducted Native American consultation throughout the public involvement process. A consultation letter and copy of the Class III Cultural Resource Inventory Report were sent to the Ute Indian Tribe of the Uintah and Ouray Reservation, and the Northern Band of Shoshoni Nation of Utah on February 1, 2016. This consultation was conducted in compliance with 36 CFR 800.2(c)(2) on a Government-to-Government basis. Through this effort the tribe is given a reasonable opportunity to identify any concerns about historic properties; to advise on the identification and evaluation of historic properties, including those of traditional religious and cultural importance; to express their views on the effects of the Proposed Action on such properties; and to participate in the resolution of adverse effects. Reclamation received no response from the consulted tribes.

5.4 Utah Geological Survey

Reclamation requested a paleontological file search from the UGS on January 29, 2016, to determine the nature and extent of paleontological resources within the APE. A single resource was found near the project area. This resource is not significant. Unless vertebrate fossils are discovered as a result of construction activities, this project should have no impact on paleontological resources.

5.5 Utah State Historic Preservation Office

A copy of the Class III Cultural Resource Inventory Report and a determination of historic properties affected for the Proposed Action were submitted to the SHPO on January 27, 2016. SHPO concurred with Reclamation's determination on February 4, 2016. A MOA was developed to detail the steps to mitigate the damage to eligible site 42WA293. The MOA was signed by Reclamation, SHPO, and the Daniel Irrigation Company on April 18, 2016.

Chapter 6 Preparers

The following is a list of preparers who participated in the development of the EA. They include engineering and environmental preparers, Reclamation team members, and Federal, State and Company members.

Engineering and Environmental Preparers

Name	Title	Company
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Mr. Zachary Nelson	Archaeologist, Cultural and Paleontological Resources	Bureau of Reclamation
Mr. David Nielsen	Geologist, Geology and Soils	Bureau of Reclamation
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Mr. David Snyder	Wetlands and Riparian, CWA	Bureau of Reclamation

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Name	Title	Company
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Ms. Amy Defreese	Ecologist	U.S. Fish and Wildlife Service
Ms. Jena Lewinson	Terrestrial Botanist	U.S. Fish and Wildlife Service

Chapter 7 Acronyms and Abbreviations

Acronyms	Meaning/Description
APE	Area of Potential Effect
BIA	Bureau of Indian Affairs
Canal	Daniel Irrigation Service Canal
CFR	Code of Federal Regulations
cfs	Cubic Feet Per Second
Company	Daniel Irrigation Company
CWA	Clean Water Act
District	Central Utah Water Conservancy District
DEQ	State of Utah Department of Environmental Quality
DWRi	State of Utah Division of Water Rights
EA	Environmental Assessment
ESA	Endangered Species Act
FONSI	Finding of No Significant Impact
ITAs	Indian Trust Assets
MSL	Mean Sea Level
NEPA	National Environmental Policy Act
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
O&M	Operation and Maintenance
Reclamation	U.S. Bureau of Reclamation
SHPO	Utah State Historic Preservation Office
SOP	Standard Operating Procedures
UGS	Utah Geological Service
UPDES	Utah Pollution Discharge Elimination System
USFWS	U.S. Fish and Wildlife Service
U.S.C	United States Code
ULT	Ute-ladies' -tresses
USACE	US Army Corps of Engineers
WCWEP	Wasatch County Water Efficiency Project

Chapter 8 References

Baxter, Jon R. and Syanna T. Madsen, 2015. A Cultural Resource Inventory for the Proposed Daniel Irrigation Canal Improvement Project Southeast of Daniel, Wasatch County, Utah. Bighorn Archaeological Consultants, L.L.C. Orem, Utah.

Biek, Hylland, Welsh, Lowe. 2003. Geologic Map of the Center Creek Quadrangle, Wasatch County, Utah. Scale 1:24,000. Utah Geological Survey Open-File-Report M-192.

Intermountain Antiquities Computer System (IMACS) Form for site 42WA293. On file, Utah State Historic Preservation Office, Salt Lake City, Utah.

Utah DEQ Interactive Map <http://enviro.deq.utah.gov/>

Utah Division of Water Rights <http://waterrights.utah.gov/default.asp>

U.S. EPA Website <http://www3.epa.gov/enviro/>

U.S. Census Bureau Website
<http://quickfacts.census.gov/qfd/states/49/49051.html>

Figures

- Figure 1 Project Overview
- Figure 2 Land Ownership
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- Figure 4 Hydrology
- Figure 5 Vegetation
- Figure 6 Soils
- Figure 7 Wildlife

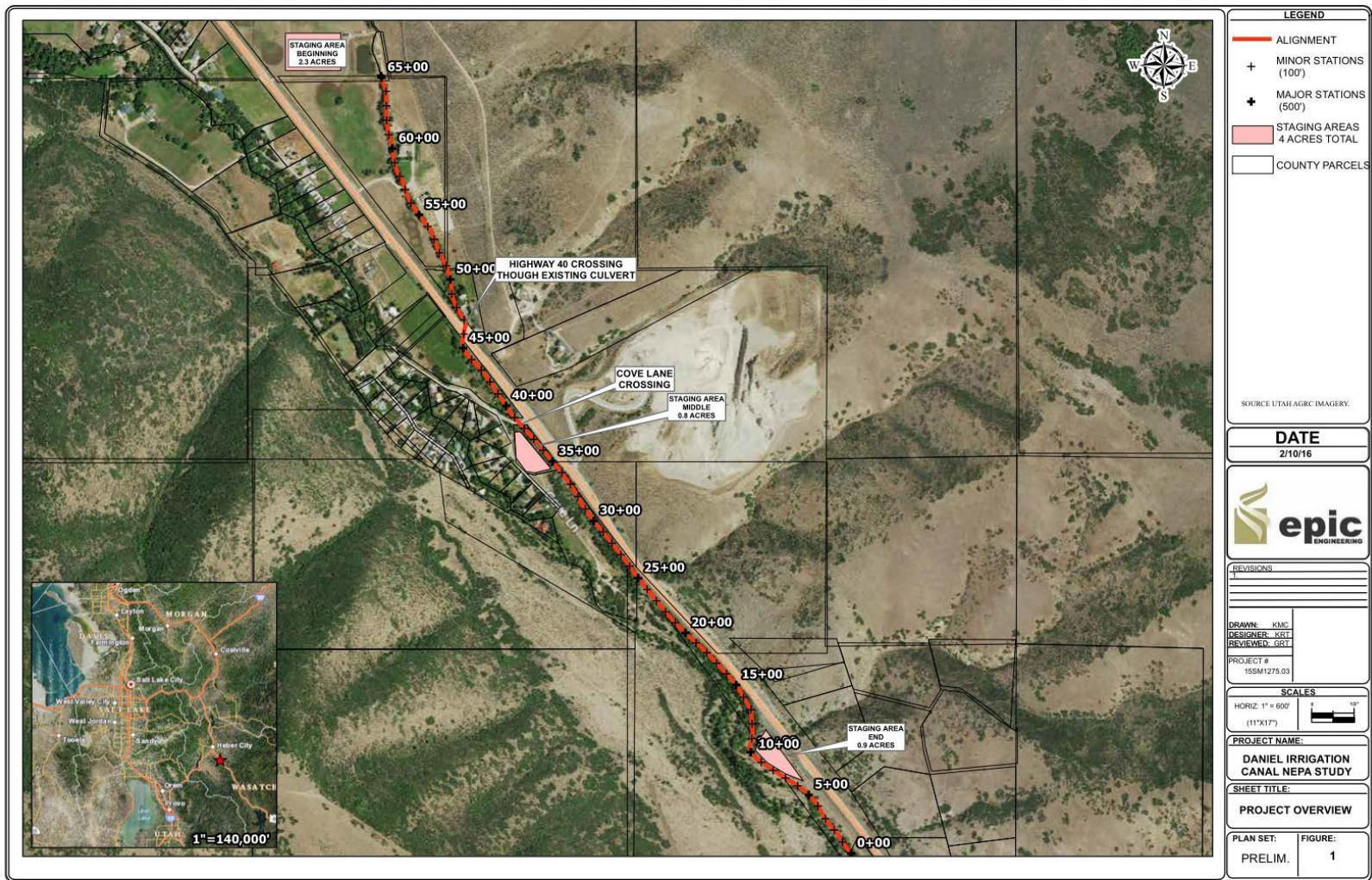


Figure 1 – Project Overview

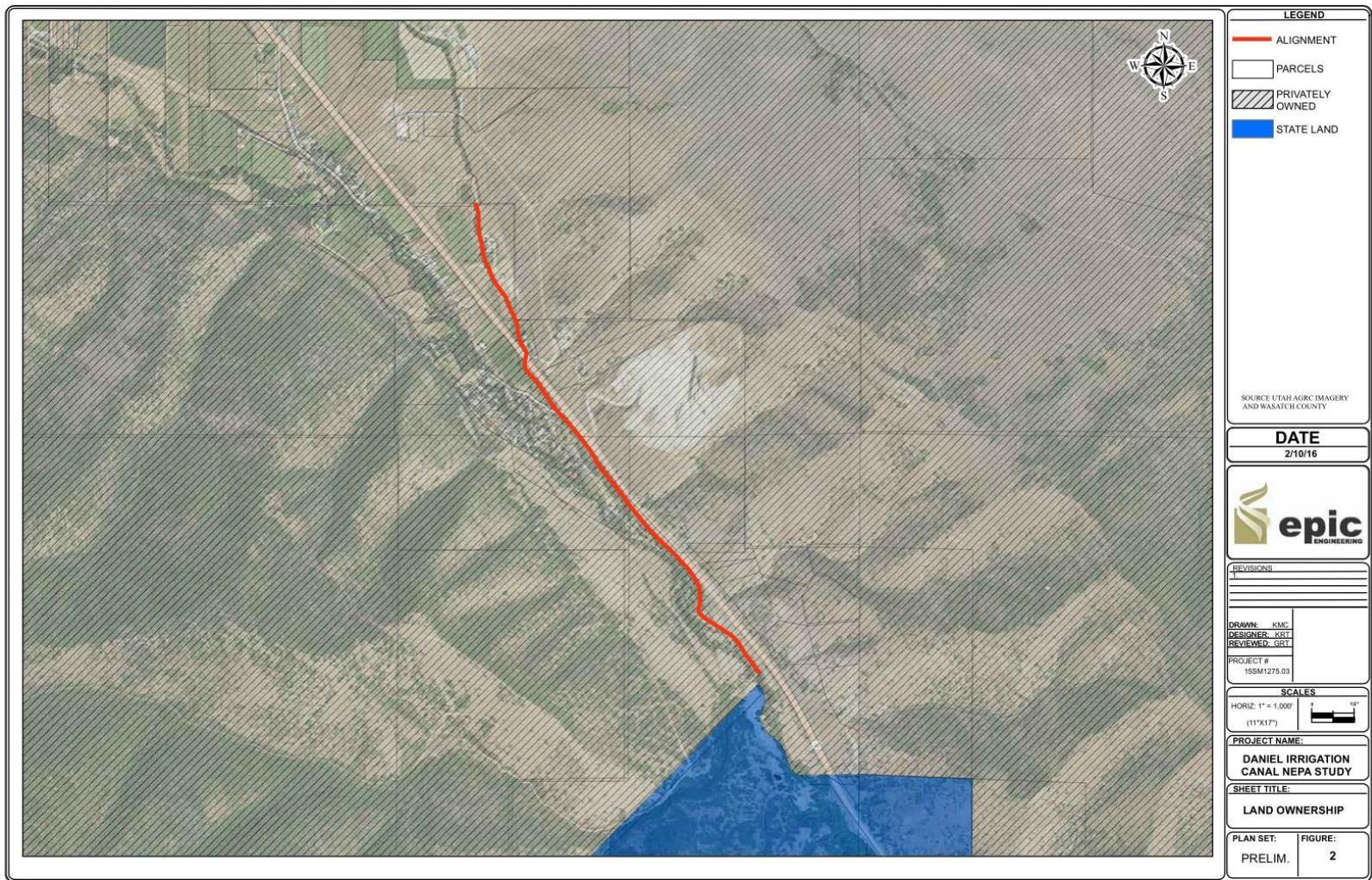


Figure 2 –Land Ownership

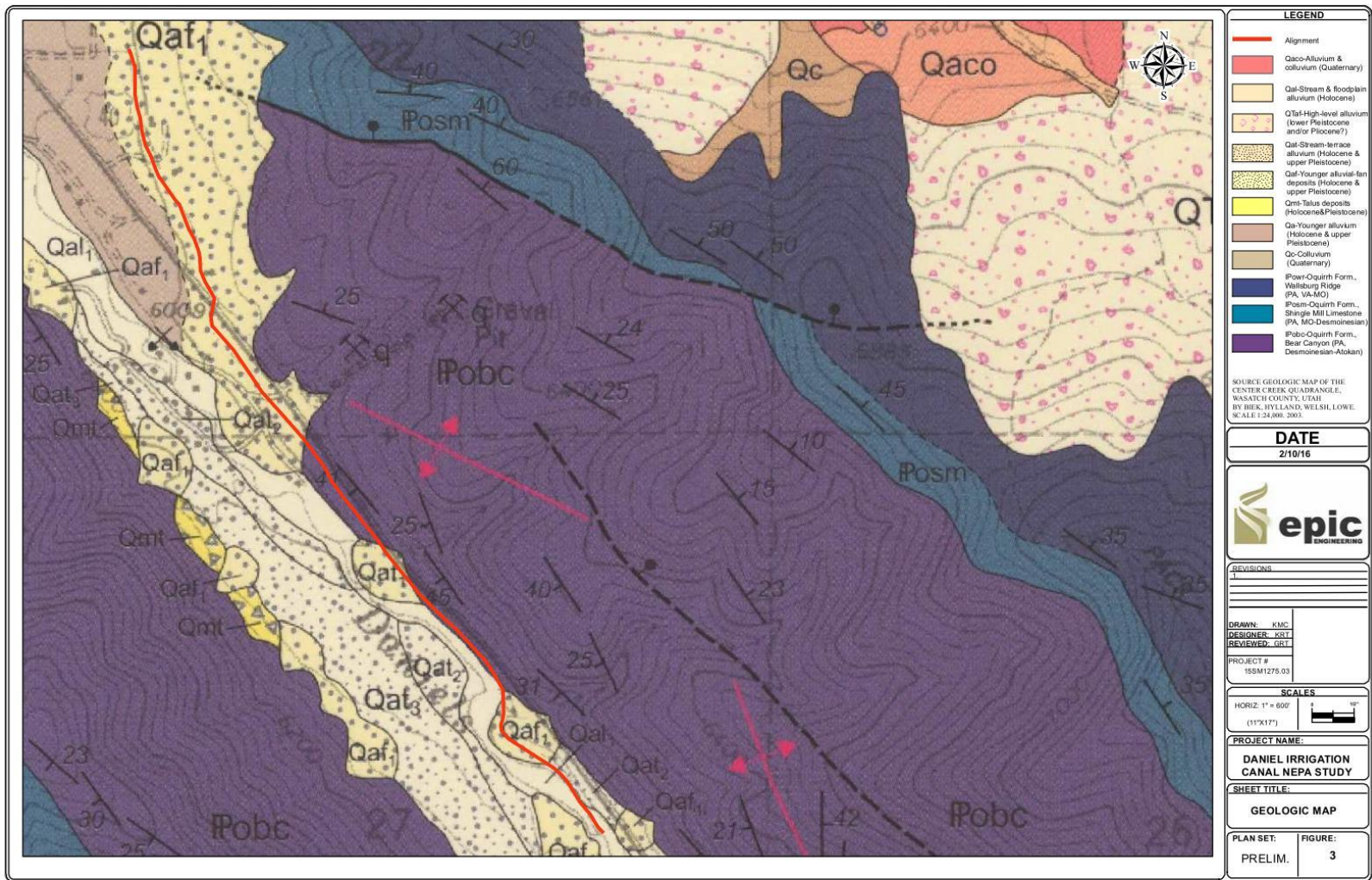
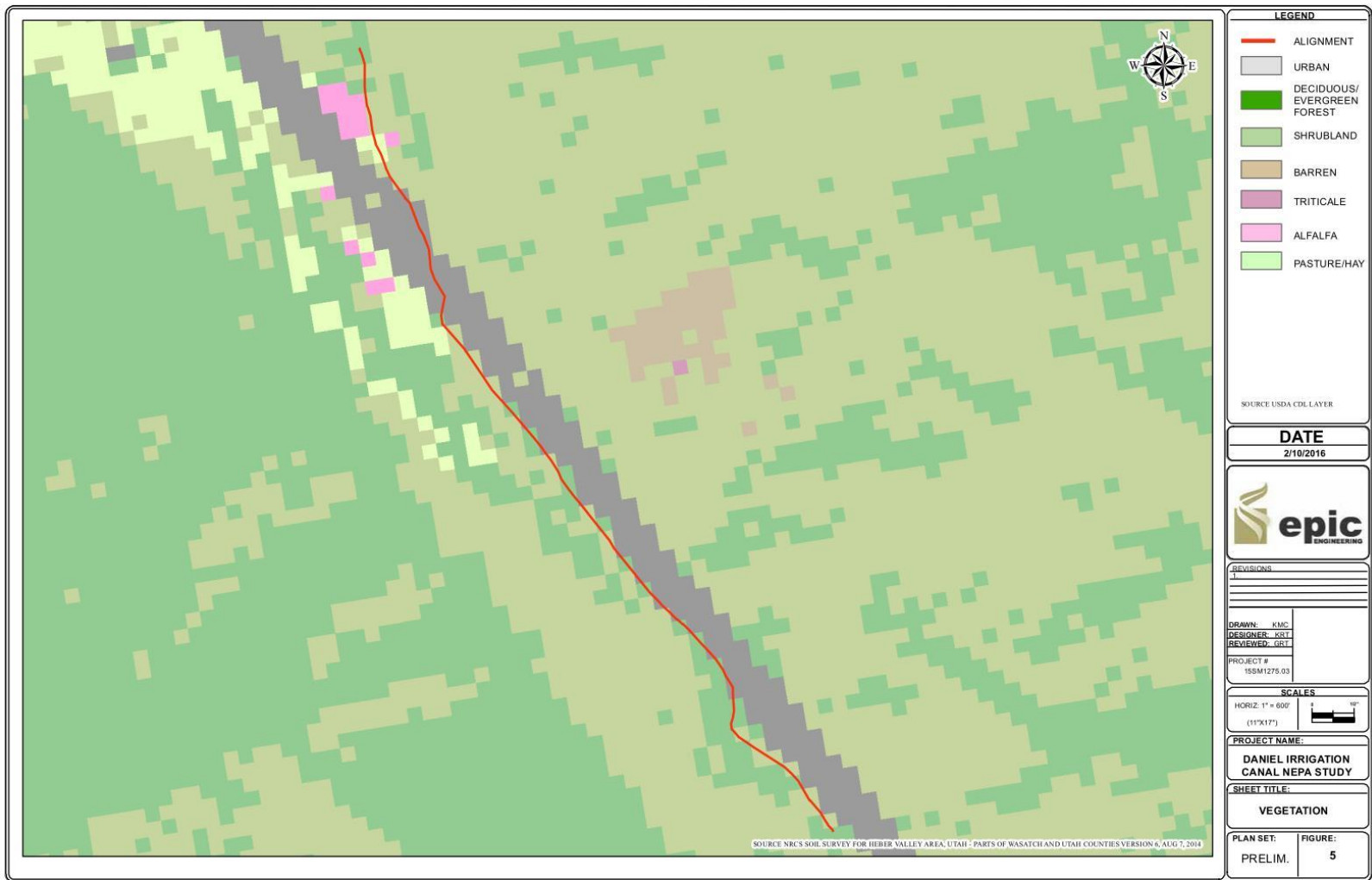


Figure 3 – Geologic Map



Figure 4 – Hydrology



Figures 5 – Vegetation

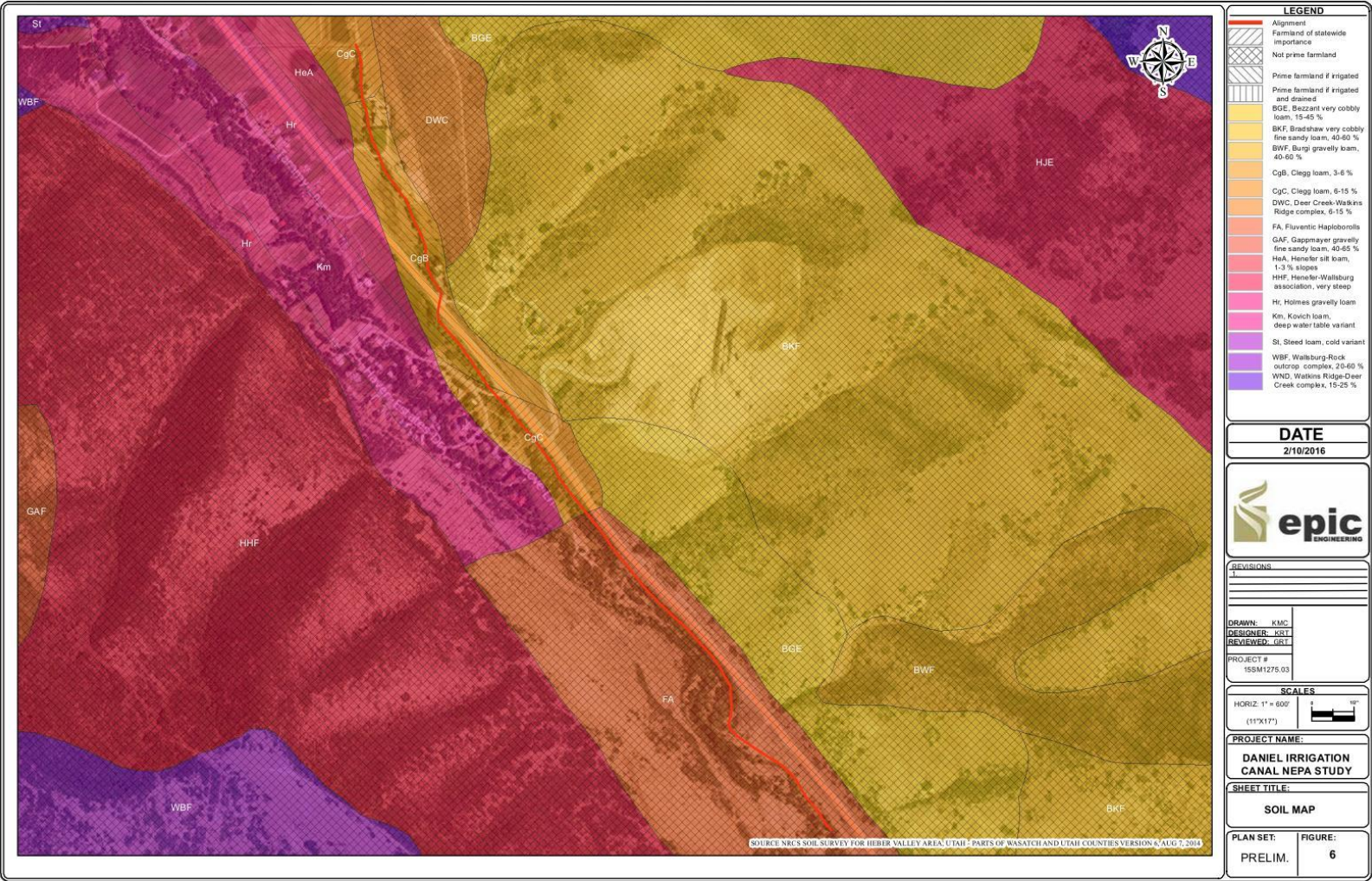


Figure – 6 Soils

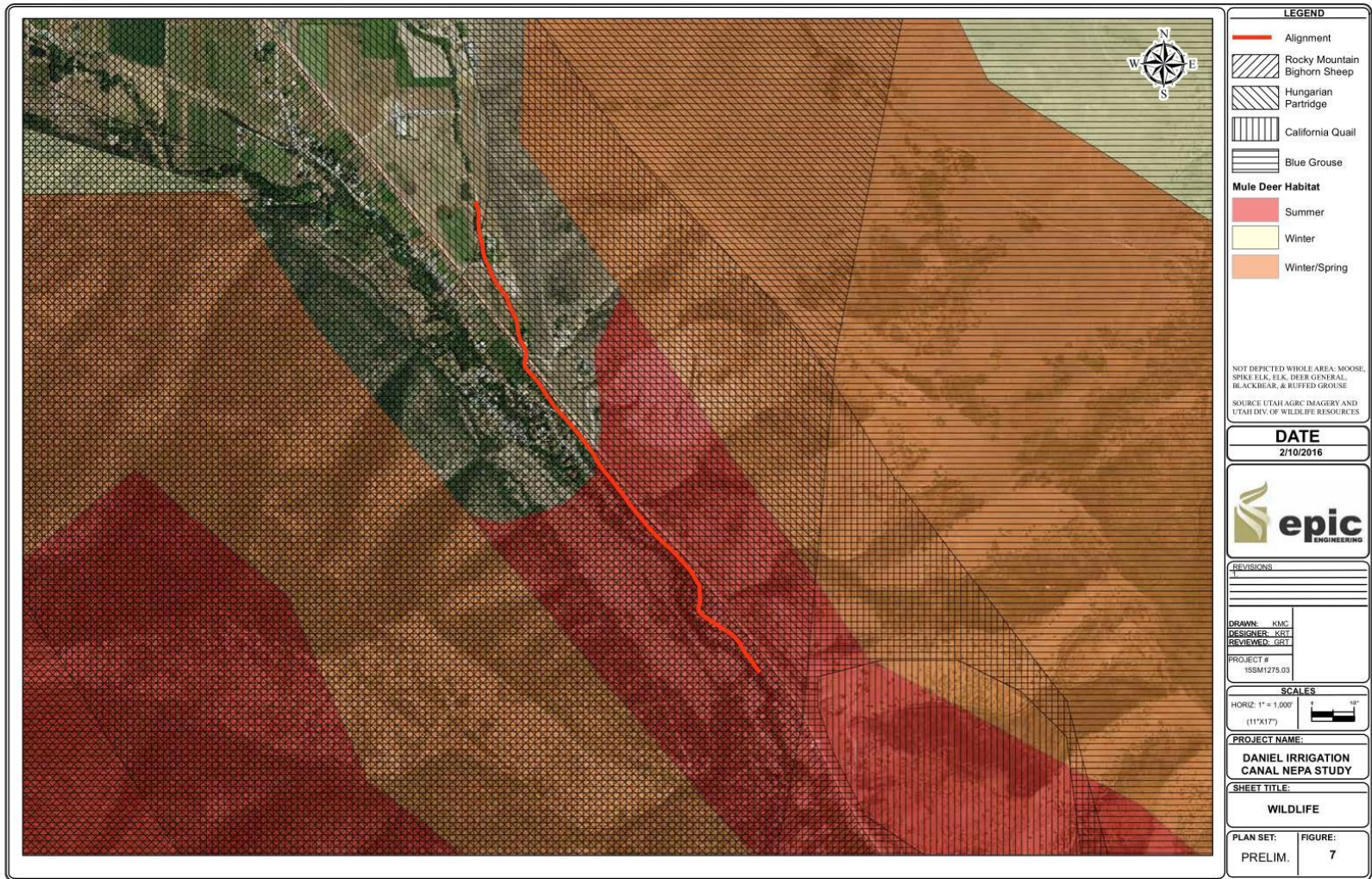


Figure 7 - Wildlife

Appendices

Appendix A Soil Map
Appendix B Photographs

Appendix A

Soil Map

MAP LEGEND		MAP INFORMATION	
<p>Area of Interest (AOI)</p> <ul style="list-style-type: none"> Area of Interest (AOI) <p>Soils</p> <ul style="list-style-type: none"> Soil Map Unit Polygons Soil Map Unit Lines Soil Map Unit Points <p>Special Point Features</p> <ul style="list-style-type: none"> Blowout Borrow Pit Clay Spot Closed Depression Gravel Pit Gravelly Spot Landfill Lava Flow Marsh or swamp Mine or Quarry Miscellaneous Water Perennial Water Rock Outcrop Saline Spot Sandy Spot Severely Eroded Spot Sinkhole Slide or Slip Sodic Spot 		<ul style="list-style-type: none"> Spoil Area Stony Spot Very Stony Spot Wet Spot Other Special Line Features <p>Water Features</p> <ul style="list-style-type: none"> Streams and Canals <p>Transportation</p> <ul style="list-style-type: none"> Rails Interstate Highways US Routes Major Roads Local Roads <p>Background</p> <ul style="list-style-type: none"> Aerial Photography 	<p>The soil surveys that comprise your AOI were mapped at 1:24,000. Please rely on the bar scale on each map sheet for map measurements.</p> <p>Source of Map: Natural Resources Conservation Service Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov Coordinate System: Web Mercator (EPSG:3857)</p> <p>Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.</p> <p>This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.</p> <p>Soil Survey Area: Heber Valley Area, Utah - Parts of Wasatch and Utah Counties Survey Area Data: Version 6, Aug 7, 2014</p> <p>Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.</p> <p>Date(s) aerial images were photographed: May 2, 2011—Aug 12, 2011</p> <p>The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.</p>

Map Unit Legend

Heber Valley Area, Utah - Parts of Wasatch and Utah Counties (UT622)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BGE	Bezzant very cobbly loam, 15 to 45 percent slopes	663.8	9.9%
BKF	Bradshaw very cobbly very fine sandy loam, 40 to 60 percent slopes	700.4	10.5%
BWF	Burgi gravelly loam, 40 to 60 percent slopes	234.4	3.5%
Ca	Center Creek loam	31.4	0.5%
CgA	Clegg loam, 1 to 3 percent slopes	29.6	0.4%
CgB	Clegg loam, 3 to 6 percent slopes	52.3	0.8%
CgC	Clegg loam, 6 to 15 percent slopes	43.0	0.6%
DcA	Deer Creek loam, 1 to 3 percent slopes	32.8	0.5%
DcC	Deer Creek loam, 3 to 10 percent slopes	19.7	0.3%
DWC	Deer Creek-Watkins Ridge complex, 6 to 15 percent slopes	153.3	2.3%
FA	Fluventic Haploborolls	261.5	3.9%
GAF	Gappmayer gravelly fine sandy loam, 40 to 65 percent slopes	323.0	4.8%
GPF	Gappmayer-Bradshaw association, very steep	59.6	0.9%
HeA	Henefer silt loam, 1 to 3 percent slopes	55.8	0.8%
HGF	Henefer-Gappmayer association, very steep	999.9	14.9%
HHF	Henefer-Wallsburg association, very steep	328.3	4.9%
HJC	Henefer soils, 6 to 10 percent slopes	45.9	0.7%
HJD	Henefer soils, 10 to 25 percent slopes	65.6	1.0%
HJE	Henefer soils, 25 to 50 percent slopes	710.0	10.6%
Hk	Holmes cobbly sandy loam	0.7	0.0%
Hm	Holmes cobbly sandy loam, channeled	20.4	0.3%
Hr	Holmes gravelly loam	308.1	4.6%

Heber Valley Area, Utah - Parts of Wasatch and Utah Counties (UT622)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Km	Kovich loam, deep water table variant	89.2	1.3%
MaB	Manila silt loam, 3 to 6 percent slopes	27.0	0.4%
MaC	Manila silt loam, 6 to 10 percent slopes	0.5	0.0%
RdA	Rasband loam, 1 to 3 percent slopes	20.5	0.3%
RdC	Rasband loam, 3 to 10 percent slopes	18.0	0.3%
RO	Rock land	89.5	1.3%
St	Steed loam, cold variant	50.1	0.7%
WBF	Wallsburg-Rock outcrop complex, 20 to 60 percent slopes	463.0	6.9%
WcC	Watkins Ridge silt loam, 6 to 15 percent slopes	2.0	0.0%
WNC	Watkins Ridge-Deer Creek complex, 6 to 15 percent slopes	191.0	2.9%
WND	Watkins Ridge-Deer Creek complex, 15 to 25 percent slopes	558.6	8.3%
YaB	Yeates Hollow loam, 2 to 5 percent slopes	47.8	0.7%
Totals for Area of Interest		6,696.8	100.0%

Map Unit Description (Brief, Generated)

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

The Map Unit Description (Brief, Generated) report displays a generated description of the major soils that occur in a map unit. Descriptions of non-soil (miscellaneous areas) and minor map unit components are not included. This description is generated from the underlying soil attribute data.

Additional information about the map units described in this report is available in other Soil Data Mart reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the Soil Data Mart reports define some of the properties included in the map unit descriptions.

Report—Map Unit Description (Brief, Generated)

Heber Valley Area, Utah - Parts of Wasatch and Utah Counties

Map Unit: BGE—Bezzant very cobbly loam, 15 to 45 percent slopes

Component: Bezzant (90%)

The Bezzant component makes up 90 percent of the map unit. Slopes are 15 to 45 percent. This component is on mountainsides. The parent material consists of colluvium and/or slope alluvium over residuum weathered from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the R047XA461UT Mountain Stony Loam (mountain Big Sagebrush) ecological site. Irrigated land capability classification is 4e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 50 percent. There are no saline horizons within 30 inches of the soil surface.

Component: WATKINS RIDGE (5%)

Generated brief soil descriptions are created for major components. The WATKINS RIDGE soil is a minor component.

Component: DEER CREEK (5%)

Generated brief soil descriptions are created for major components. The DEER CREEK soil is a minor component.

Map Unit: BKF—Bradshaw very cobbly very fine sandy loam, 40 to 60 percent slopes

Component: Bradshaw (85%)

The Bradshaw component makes up 85 percent of the map unit. Slopes are 40 to 60 percent. This component is on mountainsides. The parent material consists of colluvium derived from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the R047XA461UT Mountain Stony Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. There are no saline horizons within 30 inches of the soil surface.

Component: BURGI (5%)

Generated brief soil descriptions are created for major components. The BURGI soil is a minor component.

Component: AGASSIZ (5%)

Generated brief soil descriptions are created for major components. The AGASSIZ soil is a minor component.

Component: ROCK OUTCROP (5%)

Generated brief soil descriptions are created for major components. The ROCK OUTCROP soil is a minor component.

Map Unit: BWF—Burgi gravelly loam, 40 to 60 percent slopes

Component: Burgi (90%)

The Burgi component makes up 90 percent of the map unit. Slopes are 40 to 60 percent. This component is on mountainsides. The parent material consists of colluvium derived from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 6 percent. This component is in the R047XA410UT Mountain Gravelly Loam (oak) ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 6 percent. There are no saline horizons within 30 inches of the soil surface.

Component: WALLSBURG (5%)

Generated brief soil descriptions are created for major components. The WALLSBURG soil is a minor component.

Component: ROCK OUTCROP (5%)

Generated brief soil descriptions are created for major components. The ROCK OUTCROP soil is a minor component.

Map Unit: Ca—Center Creek loam

Component: Center Creek (90%)

The Center Creek component makes up 90 percent of the map unit. Slopes are 1 to 3 percent. This component is on stream terraces. The parent material consists of alluvium derived from andesite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 48 inches during January, February, March, April, May, June, July, August, September, October, November, December. Organic matter content in the surface horizon is about 6 percent. This component is in the R047XA006UT Semiwet Fresh Streambank (narrowleaf Cottonwood) ecological site. Nonirrigated land capability classification is 3w. Irrigated land capability classification is 3w. This soil does not meet hydric criteria.

Component: OTHER SOILS (5%)

Generated brief soil descriptions are created for major components. The OTHER SOILS soil is a minor component.

Component: Poorly drained soils (5%)

Generated brief soil descriptions are created for major components. The Poorly drained soils soil is a minor component.

Map Unit: CgA—Clegg loam, 1 to 3 percent slopes

Component: Clegg (95%)

The Clegg component makes up 95 percent of the map unit. Slopes are 1 to 3 percent. This component is on alluvial fans. The parent material consists of slope alluvium derived from andesite and sedimentary rocks. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the R047XA430UT Mountain Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 4c. Irrigated land capability classification is 3c. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 28 percent. There are no saline horizons within 30 inches of the soil surface.

Component: DEER CREEK (5%)

Generated brief soil descriptions are created for major components. The DEER CREEK soil is a minor component.

Map Unit: CgB—Clegg loam, 3 to 6 percent slopes

Component: Clegg (95%)

The Clegg component makes up 95 percent of the map unit. Slopes are 3 to 6 percent. This component is on alluvial fans. The parent material consists of slope alluvium derived from andesite and sedimentary rocks. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the R047XA430UT Mountain Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 4e. Irrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 28 percent. There are no saline horizons within 30 inches of the soil surface.

Component: DEER CREEK (5%)

Generated brief soil descriptions are created for major components. The DEER CREEK soil is a minor component.

Map Unit: CgC—Clegg loam, 6 to 15 percent slopes

Component: Clegg (100%)

The Clegg component makes up 100 percent of the map unit. Slopes are 6 to 15 percent. This component is on alluvial fans. The parent material consists of slope alluvium derived from andesite and sedimentary rocks. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the R047XA430UT Mountain Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 6e. Irrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 28 percent. There are no saline horizons within 30 inches of the soil surface.

Map Unit: DcA—Deer Creek loam, 1 to 3 percent slopes

Component: Deer Creek (95%)

The Deer Creek component makes up 95 percent of the map unit. Slopes are 1 to 3 percent. This component is on alluvial fans. The parent material consists of slope alluvium derived from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the R047XA432UT Mountain Loam (oak) ecological site. Nonirrigated land capability classification is 4c. Irrigated land capability classification is 3c. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 50 percent. There are no saline horizons within 30 inches of the soil surface.

Component: MANILA (5%)

Generated brief soil descriptions are created for major components. The MANILA soil is a minor component.

Map Unit: DcC—Deer Creek loam, 3 to 10 percent slopes

Component: Deer Creek (95%)

The Deer Creek component makes up 95 percent of the map unit. Slopes are 3 to 10 percent. This component is on alluvial fans. The parent material consists of slope alluvium derived from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the R047XA432UT Mountain Loam (oak) ecological site. Nonirrigated land capability classification is 4e. Irrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 50 percent. There are no saline horizons within 30 inches of the soil surface.

Component: MANILA (5%)

Generated brief soil descriptions are created for major components. The MANILA soil is a minor component.

Map Unit: DWC—Deer Creek-Watkins Ridge complex, 6 to 15 percent slopes

Component: Deer Creek (50%)

The Deer Creek component makes up 50 percent of the map unit. Slopes are 10 to 15 percent. This component is on swales. The parent material consists of slope alluvium derived from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the R047XA432UT Mountain Loam (oak) ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 50 percent. There are no saline horizons within 30 inches of the soil surface.

Component: Watkins Ridge (35%)

The Watkins Ridge component makes up 35 percent of the map unit. Slopes are 6 to 15 percent. This component is on ridges, knolls. The parent material consists of colluvium and/or slope alluvium derived from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This component is in the R047XA430UT Mountain Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 6e. Irrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 50 percent. There are no saline horizons within 30 inches of the soil surface.

Component: COBBLY SURFACE SOILS (10%)

Generated brief soil descriptions are created for major components. The COBBLY SURFACE SOILS soil is a minor component.

Component: BEZZANT (5%)

Generated brief soil descriptions are created for major components. The BEZZANT soil is a minor component.

Map Unit: FA—Fluventic Haploborolls

Component: Fluventic Haploborolls (90%)

The Fluventic Haploborolls component makes up 90 percent of the map unit. Slopes are 1 to 6 percent. This component is on streams, canyons. The parent material consists of alluvium derived from mixed sources. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is frequently flooded. It is not ponded. A seasonal zone of water saturation is at 42 inches during January, February, March, April, May, June, July, August, September, October, November, December. Organic matter content in the surface horizon is about 4 percent. This component is in the R047XA006UT Semiwet Fresh Streambank (narrowleaf Cottonwood) ecological site. Nonirrigated land capability classification is 6w. Irrigated land capability classification is 6w. This soil does not meet hydric criteria. There are no saline horizons within 30 inches of the soil surface.

Component: Poorly drained soils (10%)

Generated brief soil descriptions are created for major components. The Poorly drained soils soil is a minor component.

Map Unit: GAF—Gappmayer gravelly fine sandy loam, 40 to 65 percent slopes

Component: Gappmayer (85%)

The Gappmayer component makes up 85 percent of the map unit. Slopes are 40 to 65 percent. This component is on foothill hillslopes. The parent material consists of colluvium and/or slope alluvium over residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, lithic, is 40 to 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This component is in the R047XA410UT Mountain Gravelly Loam (oak) ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: BRADSHAW (5%)

Generated brief soil descriptions are created for major components. The BRADSHAW soil is a minor component.

Component: WALLSBURG (5%)

Generated brief soil descriptions are created for major components. The WALLSBURG soil is a minor component.

Component: HENEFER (5%)

Generated brief soil descriptions are created for major components. The HENEFER soil is a minor component.

Map Unit: GPF—Gappmayer-Bradshaw association, very steep

Component: Gappmayer (55%)

The Gappmayer component makes up 55 percent of the map unit. Slopes are 40 to 65 percent. This component is on mountainsides. The parent material consists of colluvium and/or slope alluvium over residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, lithic, is 40 to 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This component is in the R047XA410UT Mountain Gravelly Loam (oak) ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

Component: Bradshaw (35%)

The Bradshaw component makes up 35 percent of the map unit. Slopes are 40 to 60 percent. This component is on mountainsides. The parent material consists of colluvium derived from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the R047XA461UT Mountain Stony Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. There are no saline horizons within 30 inches of the soil surface.

Component: HENEFER (5%)

Generated brief soil descriptions are created for major components. The HENEFER soil is a minor component.

Component: WALLSBURG (5%)

Generated brief soil descriptions are created for major components. The WALLSBURG soil is a minor component.

Map Unit: HeA—Henefer silt loam, 1 to 3 percent slopes

Component: Henefer (90%)

The Henefer component makes up 90 percent of the map unit. Slopes are 1 to 3 percent. This component is on alluvial fans. The parent material consists of colluvium and/or slope alluvium derived from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This component is in the R047XA430UT Mountain Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 3s. Irrigated land capability classification is 3c. This soil does not meet hydric criteria.

Component: DEER CREEK (5%)

Generated brief soil descriptions are created for major components. The DEER CREEK soil is a minor component.

Component: MANILA (5%)

Generated brief soil descriptions are created for major components. The MANILA soil is a minor component.

Map Unit: HGF—Henefer-Gappmayer association, very steep

Component: Gappmayer (35%)

The Gappmayer component makes up 35 percent of the map unit. Slopes are 40 to 65 percent. This component is on mountainsides. The parent material consists of colluvium and/or slope alluvium over residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, lithic, is 40 to 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This component is in the R047XA410UT Mountain Gravelly Loam (oak) ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Henefer (35%)

The Henefer component makes up 35 percent of the map unit. Slopes are 25 to 50 percent. This component is on mountainsides. The parent material consists of colluvium and/or slope alluvium derived from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This component is in the R047XA430UT Mountain Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Henefer (20%)

The Henefer component makes up 20 percent of the map unit. Slopes are 25 to 50 percent. This component is on mountainsides. The parent material consists of colluvium and/or slope alluvium derived from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This component is in the R047XA430UT Mountain Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: ROCK OUTCROP (10%)

Generated brief soil descriptions are created for major components. The ROCK OUTCROP soil is a minor component.

Map Unit: HHF—Henefer-Wallsburg association, very steep

Component: Wallsburg (35%)

The Wallsburg component makes up 35 percent of the map unit. Slopes are 20 to 60 percent. This component is on mountainsides. The parent material consists of colluvium over residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, lithic, is 12 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R047XA446UT Mountain Shallow Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 2 percent.

Component: Henefer (35%)

The Henefer component makes up 35 percent of the map unit. Slopes are 25 to 50 percent. This component is on mountainsides. The parent material consists of colluvium and/or slope alluvium derived from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This component is in the R047XA430UT Mountain Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Henefer (20%)

The Henefer component makes up 20 percent of the map unit. Slopes are 25 to 50 percent. This component is on mountainsides. The parent material consists of colluvium and/or slope alluvium derived from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This component is in the R047XA430UT Mountain Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: ROCK OUTCROP (10%)

Generated brief soil descriptions are created for major components. The ROCK OUTCROP soil is a minor component.

Map Unit: HJC—Henefer soils, 6 to 10 percent slopes

Component: Henefer (60%)

The Henefer component makes up 60 percent of the map unit. Slopes are 6 to 10 percent. This component is on alluvial fans. The parent material consists of colluvium and/or slope alluvium derived from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This component is in the R047XA430UT Mountain Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 3e. This soil does not meet hydric criteria.

Component: Henefer (30%)

The Henefer component makes up 30 percent of the map unit. Slopes are 6 to 10 percent. This component is on alluvial fans. The parent material consists of colluvium and/or slope alluvium derived from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This component is in the R047XA430UT Mountain Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 3e. This soil does not meet hydric criteria.

Component: MANILA (5%)

Generated brief soil descriptions are created for major components. The MANILA soil is a minor component.

Component: DEER CREEK (5%)

Generated brief soil descriptions are created for major components. The DEER CREEK soil is a minor component.

Map Unit: HJD—Henefer soils, 10 to 25 percent slopes

Component: Henefer (60%)

The Henefer component makes up 60 percent of the map unit. Slopes are 10 to 25 percent. This component is on alluvial fans, foot slope hillslopes. The parent material consists of colluvium and/or slope alluvium derived from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This component is in the R047XA430UT Mountain Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 6e. Irrigated land capability classification is 6e. This soil does not meet hydric criteria.

Component: Henefer (30%)

The Henefer component makes up 30 percent of the map unit. Slopes are 10 to 25 percent. This component is on foot slope hillslopes, alluvial fans. The parent material consists of colluvium and/or slope alluvium derived from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This component is in the R047XA430UT Mountain Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 6e. Irrigated land capability classification is 6e. This soil does not meet hydric criteria.

Component: DEER CREEK (5%)

Generated brief soil descriptions are created for major components. The DEER CREEK soil is a minor component.

Component: MANILA (5%)

Generated brief soil descriptions are created for major components. The MANILA soil is a minor component.

Map Unit: HJE—Henefer soils, 25 to 50 percent slopes

Component: Henefer (60%)

The Henefer component makes up 60 percent of the map unit. Slopes are 25 to 50 percent. This component is on mountainsides. The parent material consists of colluvium and/or slope alluvium derived from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This component is in the R047XA430UT Mountain Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: Henefer (30%)

The Henefer component makes up 30 percent of the map unit. Slopes are 25 to 50 percent. This component is on mountainsides. The parent material consists of colluvium and/or slope alluvium derived from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This component is in the R047XA430UT Mountain Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

Component: DEER CREEK (5%)

Generated brief soil descriptions are created for major components. The DEER CREEK soil is a minor component.

Component: MANILA (5%)

Generated brief soil descriptions are created for major components. The MANILA soil is a minor component.

Map Unit: HK—Holmes cobbly sandy loam

Component: Holmes (100%)

The Holmes component makes up 100 percent of the map unit. Slopes are 1 to 3 percent. This component is on alluvial fans, stream terraces. The parent material consists of alluvium derived from mixed sources. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R047XA461UT Mountain Stony Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 6s. Irrigated land capability classification is 4s. This soil does not meet hydric criteria.

Map Unit: Hm—Holmes cobbly sandy loam, channeled

Component: Holmes (100%)

The Holmes component makes up 100 percent of the map unit. Slopes are 1 to 3 percent. This component is on stream terraces. The parent material consists of alluvium derived from mixed sources. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R047XA461UT Mountain Stony Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 6s. Irrigated land capability classification is 4s. This soil does not meet hydric criteria.

Map Unit: Hr—Holmes gravelly loam

Component: Holmes (85%)

The Holmes component makes up 85 percent of the map unit. Slopes are 1 to 3 percent. This component is on stream terraces, alluvial fans. The parent material consists of alluvium derived from mixed sources. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R047XA461UT Mountain Stony Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 6s. Irrigated land capability classification is 4s. This soil does not meet hydric criteria.

Component: RASBAND (5%)

Generated brief soil descriptions are created for major components. The RASBAND soil is a minor component.

Component: STEED COLD VARIANT (5%)

Generated brief soil descriptions are created for major components. The STEED COLD VARIANT soil is a minor component.

Component: CENTER CREEK (5%)

Generated brief soil descriptions are created for major components. The CENTER CREEK soil is a minor component.

Map Unit: Km—Kovich loam, deep water table variant

Component: Kovich (95%)

The Kovich component makes up 95 percent of the map unit. Slopes are 2 to 5 percent. This component is on flood plains, stream terraces. The parent material consists of alluvium derived from mixed sources. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is somewhat poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is high. Shrink-swell potential is low. This soil is rarely flooded. It is not ponded. A seasonal zone of water saturation is at 36 inches during April, May, June. Organic matter content in the surface horizon is about 8 percent. This component is in the R047XA004UT Interzonal Semiwet Fresh Meadow (meadow Sedge/tufted Hairgrass) ecological site. Irrigated land capability classification is 3w. This soil does not meet hydric criteria.

Component: Poorly drained soils (5%)

Generated brief soil descriptions are created for major components. The Poorly drained soils soil is a minor component.

Map Unit: MaB—Manila silt loam, 3 to 6 percent slopes

Component: Manila (90%)

The Manila component makes up 90 percent of the map unit. Slopes are 3 to 6 percent. This component is on alluvial fans. The parent material consists of slope alluvium derived from mixed sources. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R047XA432UT Mountain Loam (oak) ecological site. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 3e. This soil does not meet hydric criteria. There are no saline horizons within 30 inches of the soil surface.

Component: MODERATELY ERODED SOILS (5%)

Generated brief soil descriptions are created for major components. The MODERATELY ERODED SOILS soil is a minor component.

Component: DEER CREEK (5%)

Generated brief soil descriptions are created for major components. The DEER CREEK soil is a minor component.

Map Unit: MaC—Manila silt loam, 6 to 10 percent slopes

Component: Manila (90%)

The Manila component makes up 90 percent of the map unit. Slopes are 6 to 10 percent. This component is on alluvial fans. The parent material consists of slope alluvium derived from mixed sources. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is high. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R047XA432UT Mountain Loam (oak) ecological site. Nonirrigated land capability classification is 3e. Irrigated land capability classification is 3e. This soil does not meet hydric criteria. There are no saline horizons within 30 inches of the soil surface.

Component: MODERATELY ERODED SOILS (5%)

Generated brief soil descriptions are created for major components. The MODERATELY ERODED SOILS soil is a minor component.

Component: LIMEY SOILS (3%)

Generated brief soil descriptions are created for major components. The LIMEY SOILS soil is a minor component.

Component: Poorly drained soils (2%)

Generated brief soil descriptions are created for major components. The Poorly drained soils soil is a minor component.

Map Unit: RdA—Rasband loam, 1 to 3 percent slopes

Component: Rasband (95%)

The Rasband component makes up 95 percent of the map unit. Slopes are 1 to 3 percent. This component is on stream terraces. The parent material consists of alluvium derived from andesite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 6 percent. This component is in the R047XA430UT Mountain Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 4c. Irrigated land capability classification is 3c. This soil does not meet hydric criteria. There are no saline horizons within 30 inches of the soil surface.

Component: COBBLY SOILS (5%)

Generated brief soil descriptions are created for major components. The COBBLY SOILS soil is a minor component.

Map Unit: RdC—Rasband loam, 3 to 10 percent slopes

Component: Rasband (95%)

The Rasband component makes up 95 percent of the map unit. Slopes are 3 to 10 percent. This component is on stream terraces. The parent material consists of alluvium derived from andesite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 6 percent. This component is in the R047XA430UT Mountain Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 4e. Irrigated land capability classification is 3e. This soil does not meet hydric criteria. There are no saline horizons within 30 inches of the soil surface.

Component: COBBLY SOILS (5%)

Generated brief soil descriptions are created for major components. The COBBLY SOILS soil is a minor component.

Map Unit: RO—Rock land

Component: Rock land (100%)

Generated brief soil descriptions are created for major soil components. The Rock land is a miscellaneous area.

Map Unit: St—Steed loam, cold variant

Component: Steed (95%)

The Steed component makes up 95 percent of the map unit. Slopes are 1 to 3 percent. This component is on stream terraces, alluvial fans, flood plains. The parent material consists of alluvium derived from mixed sources. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the R047XA416UT Mountain Loamy Bottom (basin Wildrye) ecological site. Nonirrigated land capability classification is 7s. Irrigated land capability classification is 4s. This soil does not meet hydric criteria.

Component: COBBLY SURFACE SOILS (5%)

Generated brief soil descriptions are created for major components. The COBBLY SURFACE SOILS soil is a minor component.

Map Unit: WBF—Wallsburg-Rock outcrop complex, 20 to 60 percent slopes

Component: Wallsburg (70%)

The Wallsburg component makes up 70 percent of the map unit. Slopes are 20 to 60 percent. This component is on mountainsides. The parent material consists of colluvium over residuum weathered from sedimentary rock. Depth to a root restrictive layer, bedrock, lithic, is 12 to 20 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. This component is in the R047XA446UT Mountain Shallow Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 2 percent.

Component: Rock outcrop (20%)

Generated brief soil descriptions are created for major soil components. The Rock outcrop is a miscellaneous area.

Component: GAPPMAYER (10%)

Generated brief soil descriptions are created for major components. The GAPPMAYER soil is a minor component.

Map Unit: WcC—Watkins Ridge silt loam, 6 to 15 percent slopes

Component: Watkins Ridge (95%)

The Watkins Ridge component makes up 95 percent of the map unit. Slopes are 6 to 15 percent. This component is on foot hill hillslopes, alluvial fans. The parent material consists of colluvium and/or slope alluvium derived from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This component is in the R047XA430UT Mountain Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 6e. Irrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 50 percent. There are no saline horizons within 30 inches of the soil surface.

Component: COBBLY SURFACE SOILS (5%)

Generated brief soil descriptions are created for major components. The COBBLY SURFACE SOILS soil is a minor component.

Map Unit: WNC—Watkins Ridge-Deer Creek complex, 6 to 15 percent slopes

Component: Watkins Ridge (55%)

The Watkins Ridge component makes up 55 percent of the map unit. Slopes are 6 to 15 percent. This component is on ridges. The parent material consists of colluvium and/or slope alluvium derived from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This component is in the R047XA430UT Mountain Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 6e. Irrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 50 percent. There are no saline horizons within 30 inches of the soil surface.

Component: Deer Creek (35%)

The Deer Creek component makes up 35 percent of the map unit. Slopes are 6 to 15 percent. This component is on swales. The parent material consists of slope alluvium derived from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the R047XA432UT Mountain Loam (oak) ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 50 percent. There are no saline horizons within 30 inches of the soil surface.

Component: COBBLY SURFACE SOILS (10%)

Generated brief soil descriptions are created for major components. The COBBLY SURFACE SOILS soil is a minor component.

Map Unit: WND—Watkins Ridge-Deer Creek complex, 15 to 25 percent slopes

Component: Watkins Ridge (55%)

The Watkins Ridge component makes up 55 percent of the map unit. Slopes are 15 to 25 percent. This component is on ridges. The parent material consists of colluvium and/or slope alluvium derived from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. This component is in the R047XA430UT Mountain Loam (mountain Big Sagebrush) ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 50 percent. There are no saline horizons within 30 inches of the soil surface.

Component: Deer Creek (35%)

The Deer Creek component makes up 35 percent of the map unit. Slopes are 15 to 25 percent. This component is on swales. The parent material consists of slope alluvium derived from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the R047XA432UT Mountain Loam (oak) ecological site. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 50 percent. There are no saline horizons within 30 inches of the soil surface.

Component: COBBLY SURFACE SOILS (10%)

Generated brief soil descriptions are created for major components. The COBBLY SURFACE SOILS soil is a minor component.

Map Unit: YaB—Yeates Hollow loam, 2 to 5 percent slopes

Component: Yeates Hollow (95%)

The Yeates Hollow component makes up 95 percent of the map unit. Slopes are 2 to 5 percent. This component is on alluvial fans. The parent material consists of colluvium and/or slope alluvium derived from sedimentary rock. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is moderate. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is in the R047XA463UT Mountain Stony Loam (gambel Oak) ecological site. Nonirrigated land capability classification is 7s. Irrigated land capability classification is 3e. This soil does not meet hydric criteria.

Component: COBBLY SURFACE SOILS (5%)

Generated brief soil descriptions are created for major components. The COBBLY SURFACE SOILS soil is a minor component.

Data Source Information

Soil Survey Area: Heber Valley Area, Utah - Parts of Wasatch and Utah Counties
Survey Area Data: Version 6, Aug 7, 2014

Appendix B

Photographs



Photo 1: Typical Canal Cross-Section



Photo 2: Typical Canal Cross-Section



Photo 3: Typical Canal Cross-Section



Photo 4: Typical Canal Cross-Section



Photo 5: Diversion Structure



Photo 6: Diversion Structure



Photo 7: Box Culvert under Highway 40



Photo 8: Box Culvert under Highway 40