BUREAU OF RECLAMATION

Deer Creek Intake Project Final Environmental Assessment and Finding of No Significant Impact

Wasatch County, Utah

PRO-EA-21-005
Interior Region 7 – Upper Colorado Basin
Provo Area Office
Provo, Utah

U.S. Department of the Interior October 2022

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U.S. Department of the Interior October 2022

U.S. Department of the Interior
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Provo Area Office
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FINDING OF NO SIGNIFICANT IMPACT

Environmental Assessment Deer Creek Intake Project
Wasatch, Utah

EA-21-005

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I. Introduction

After nearly 80 years of operation, the Deer Creek Dam intake and guard gates are approaching the end of their design life. With difficult accessibility and manufacturer parts no longer being available, there is no straightforward way to perform maintenance or to repair or replace the gates if they fail. The potential risk of invasive species may limit the ability to deliver water to downstream users with the current infrastructure. These concerns present a significant challenge to preserving the functionality of the Deer Creek Dam outlet works.

The proposed improvements to the existing facilities includes modifying the existing intake to accept a bulkhead plug, rehabilitation of the guard gates, and a new microtunnel bypass. These improvements would offer improved defense mechanisms against aquatic invasive species, provide consistent water quality for downstream users, provide a straightforward way of maintaining or replacing the guard gates, thus extending the life of the Deer Creek Dam outlet works. Extensive feasibility studies and evaluations of potential alternatives have been completed to consider numerous potential alternatives to determine the Proposed Action.

II. Alternatives

The environmental assessment (EA) analyzed two alternatives: the No Action and the Proposed Action.

<u>No Action</u>

Under the No Action Alternative, the Bureau of Reclamation (Reclamation) would not authorize the modifications needed to alter the intake or other existing infrastructure. Deer Creek Dam would continue to operate with the original, existing infrastructure. If the infrastructure were to fail there would be no redundancy in place and many downstream users and environmental resources could be impacted.

<u>Proposed Action</u>

Under the Proposed Action, Reclamation would authorize structural modifications to the intake and water delivery system of the Deer Creek Dam. The Proposed Action consists of three main components:

1) modification of the existing intake to accept a bulkhead that can be stored off site when not in use;
2) rehabilitation of the existing guard gates; and
3) a new 68” micro-tunnel drilled horizontally to provide bypass piping during construction and act as an additional intake after project completion. Additional isolation valves will also be installed in a new vault where the bypass plumbing ties into the existing penstocks.

These components are described in detail in Section 2.5 of this EA. Construction methodologies and risk management are also detailed in this EA document in Section 2.5.1.

III. Environmental Commitments

The commitments found in Chapter 4 of the final EA are incorporated into this Finding of No Significant Impact (FONSI) by reference and considered part of the Proposed Action. The environmental commitments must be implemented as outlined in the final EA.

IV. Summary of Impacts

Environmental resources were initially considered in the final EA, but five resources were analyzed in detail under a No Action Alternative and a Proposed Action Alternative. Effects to the remaining resources are summarized below.

- Water Quality – There would be no overall negative impact to water quality.
- Waters of the U.S. – There would be no net loss of wetland and riparian areas in and around the reservoir. The project will fall under Nationwide Permit 7.
- Wildlife Resources – Disturbance-related habitat loss would occur but would be minimal in the scope of the surrounding available habitat.
- Cultural Resources – The Proposed Action would not have an adverse effect on cultural resources.
- Migratory Birds including Bald and Golden Eagles –Surveys of raptor nests were completed for the project area. Three nests were determined to be inactive and one nest was active (pair of golden eagles). Reclamation and the United States Fish and Wildlife Service (USFWS) have been actively consulting since the discovery of nest locations and surrounding terrain characteristics. There is a nest near US 189 and recreational areas which suggests the pair is tolerant of human disturbance and that the Proposed Action would not have a significant impact to the nest.

V. Finding of No Significant Impact

Based on a review of the final EA and its supporting documents, implementing the Proposed Action will not significantly affect the quality of the human or natural environment, individually or cumulatively with other actions in the area. No environmental effects meet the definition of significance in context or intensity as defined in 40 CFR 1508.27. Consequently, an Environmental Impact Statement (EIS) is not required for this Proposed Action.

VI. Decision

The Proposed Action to authorize modifications to Deer Creek intake and guard gates will not significantly affect the human or natural environment as summarized above. Furthermore, the Proposed Action meets the purpose and need identified for the project and discussed in this EA. The No Action alternative does not meet the purpose or need for the Project. Based on the lack of significant effects to the human environment and because the No Action alternative does not meet the purpose and need of the Project, it is Reclamation's decision, therefore, to implement the Proposed Action as described in the attached EA.

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1 Introduction

1.1 Background

After nearly 80 years of operation, the Deer Creek Dam intake and guard gates are approaching the end of their useful life. With difficult accessibility and manufacturer parts no longer being available, there is not a straightforward way to perform maintenance or to repair or replace the gates if they fail. Additionally, the future potential risk of invasive species may limit the ability to deliver water to downstream users with the current infrastructure as the intake could become blocked or covered. These concerns present a significant challenge to preserving the functionality of the Deer Creek Dam outlet works.

Deer Creek Dam and Reservoir is located on the Provo River in Wasatch County approximately 16 miles northwest of Provo, Utah. Due to population growth and severe water shortages in the area during the 1930's, Provo City along with several other Utah County communities joined with Salt Lake City and local irrigation interests to form the Provo River Water Users Association (Association). The Association sponsors the Bureau of Reclamation's (Reclamation) Provo River Project (PRP), of which Deer Creek Dam and Reservoir are key features. Water delivered through the Deer Creek Dam outlet works provides a portion of the water supply for nearly half of Utah's population and is the primary source for five of the largest water treatment plants in the state.

The US Congress authorized construction of the PRP in 1935 as part of the National Industrial Recovery Act. Reclamation constructed Deer Creek Dam and Reservoir between 1938 and 1941. In 1951, the Deer Creek Power Plant was authorized for construction at the base of the dam. The hydroelectric power plant was completed in 1958 and consists of two 2,475 kilowatt (kW) generators which provide over 25.8 million kilowatt hours (kWh) per year on average. Construction of all PRP facilities was completed by 1963. The Association entered into several agreements with Reclamation to repay construction costs and assume operation and maintenance responsibilities for all Provo River Project facilities. These responsibilities include managing water deliveries to shareholders, releases to the Provo River, and power generation, in addition to maintaining the structures and their associated facilities and equipment. It did not include end of life replacement.

Deer Creek Dam is a zoned earth-fill structure which consists of 2.81 million cubic yards (cy) of fill. The dam is 235 feet high and has a crest length of 1,304 feet. At the northwest abutment is a concrete chute spillway with a capacity of 12,000 cubic feet per second (cfs). The spillway is controlled by two radial gates. Near the southeast abutment are the outlet works, which consist of an intake, concrete-lined tunnel, gate chamber with two hydraulic guard gates, and two steel penstocks leading to the power plant. The capacity of the outlet works is 1,500 cubic feet per second. Selected drawings from the original design package are included in Appendix A.

Deer Creek Reservoir is approximately 6 miles long with 18 miles of shoreline. At full capacity, it contains 153,445 acre-feet with a surface area of approximately 2,700 acres, an average depth of 65 feet, and a maximum depth of 137 feet. Of the full capacity, approximately 150,161 acre-feet is active pool, and the remaining 3,284 acre-feet is dead pool. Water stored in the reservoir is used for irrigation, municipal, and industrial use in many communities along the Wasatch Front, and for the continuous deliveries of required instream flows to the lower Provo River. With the establishment of the Deer Creek State Park in 1971, it has also become a popular recreation site for activities such as boating, fishing, sailing, swimming, windsurfing, and camping. Deer Creek Reservoir is vital to Utah's economy, both for water supply and for recreation.

Provo River Project water stored in Deer Creek Reservoir consists of Weber River water diverted through the Weber-Provo Diversion Canal, Duchesne River water diverted through the Duchesne Tunnel, and Provo River peak flows. Central Utah Project water is also stored on a space available basis in Deer Creek Reservoir. The Provo River Project provides a supplemental water supply for irrigation in Utah, Salt Lake, Summit, and Wasatch Counties as well as a major water supply for municipal and industrial uses in northern Utah County and the Salt Lake Valley (Figure 1-1).

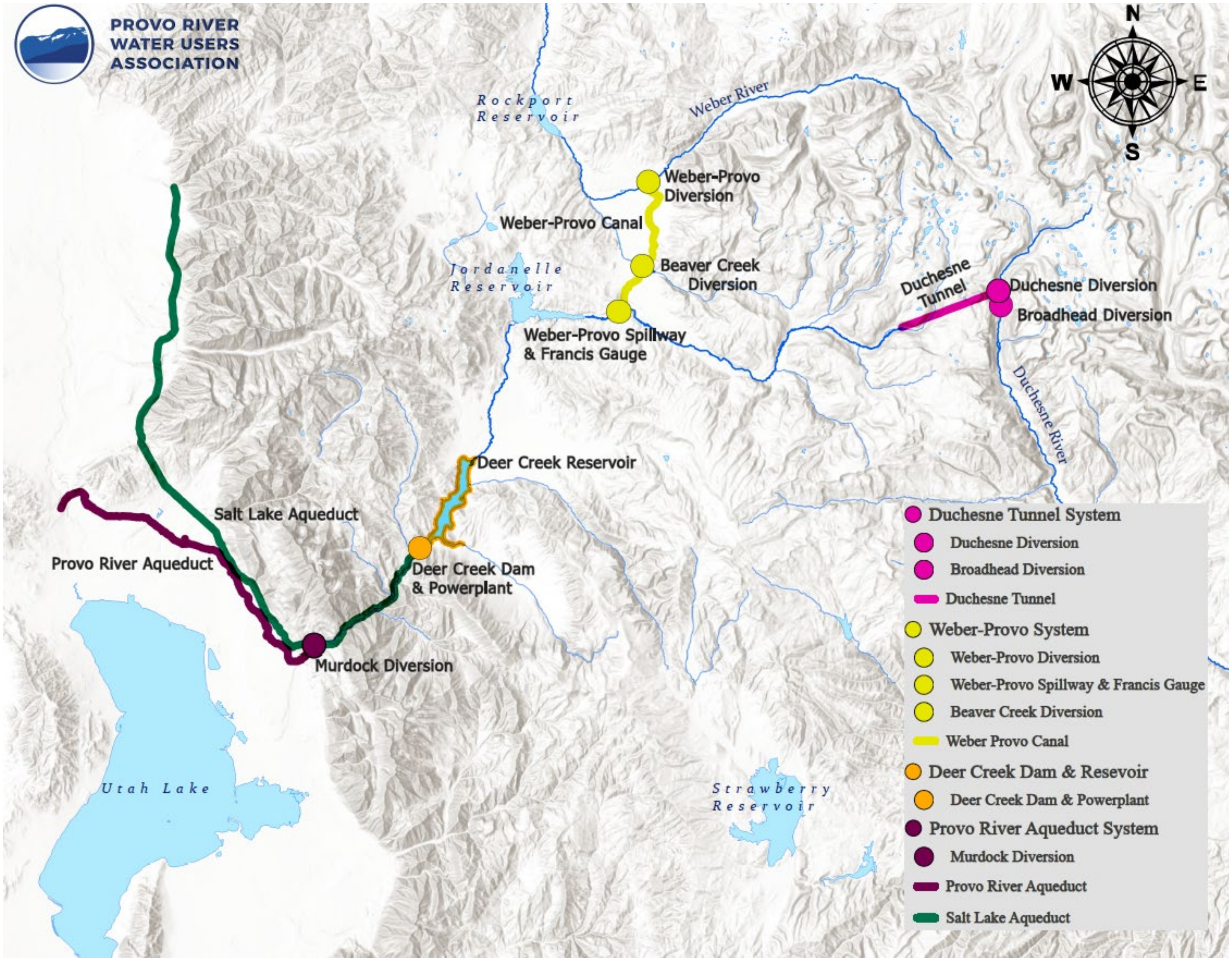

Figure 1-1 Provo River Project Overview

Reclamation has prepared this environmental assessment (EA) to comply with procedural requirements of the National Environmental Policy Act of 1969 (NEPA) and regulations outlined by the Council on Environmental Quality and Department of the Interior. This EA analyzes the potential impacts of the Proposed Action in comparison with the No Action Alternative. Under the No Action Alternative, the intake and outlet works (including guard gates) 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).

1.1.1 Project Drivers

There are several factors that have led the Association to consider building a new intake or modifying the existing intake and improving the existing Deer Creek Dam outlet works guard gates. Critical components of the infrastructure are aging and approaching the end of their useful life. The Quagga mussel poses a long-term threat to water supply. Other environmental and operational concerns affect the Association's ability to ensure safe and reliable water delivery to shareholders and the downstream ecosystem. A new intake bulkhead, Foul Resistant Coatings (FRC) on the trash racks, rehabilitated guard gates, and a new bypass pipe would not only address these issues, but also provide redundancy and isolation that ensure sustainability for many years to come.

<u>Aging Infrastructure</u>

Functional guard gates are an important element of flow control, safe isolation, maintaining power generation, penstock inspection, and water supply reliability at Deer Creek Dam. The bonneted guard gate valves are original equipment. They have been in operation for eighty years with no simple means to perform maintenance or repairs.

The guard gates do not function as originally designed. A 2017 test performed by the Association revealed that an excessive amount of hydraulic pressure was required to open the gates under an unbalanced condition. The tubing that supplies hydraulic fluid to operate the guard gates was recently replaced by the Association. The guard gates were tested in March 2020 under balanced conditions and the replacement of the tubing did not resolve the excessive hydraulic pressure problem. Therefore, it was determined that the guard gates need to be rehabilitated or replaced.

Similar to the tunnel, guard gates, and penstocks; the existing intake structure was a part of the original construction of the dam completed in 1941. The hexagonal intake structure has been submerged at the bottom of Deer Creek Reservoir since it was built on dry ground. The inlets to the dam outlet works are protected by trash racks that sit 26 feet from the reservoir bottom, stand approximately 20 feet tall and surround the six sides of the structure. It is important to note that there is currently no way to isolate the intake structure from the rest of the outlet works (hence the need for a bulkhead in the proposed design).

<u>Aquatic Invasive Species: Quagga Mussel</u>

Aquatic invasive species (AIS), specifically the Quagga mussel, are considered a long-term threat to Deer Creek Reservoir. Utah has been actively trying to slow the spread of Quagga mussel ever since Lake Mead became infested in 2007 and the subsequent infestation of Lake Powell in 2013. As part of this effort, the Utah Division of Wildlife Resources have documented that the water body most frequently visited directly after a boat is removed from Lake Powell is Deer Creek Reservoir. The most prevalent spread of mussels is through the attachment to the exterior surfaces of a boat or transport in the ballast tank of a boat. A water sample in October 2014 tested positive for Quagga mussel DNA in the reservoir. Deer Creek State Park in coordination with the Division of Wildlife Resources instituted both prevention and containment procedures that have effectively shown that the species is not in the reservoir. It has been three years since Deer Creek Reservoir was classified as a Suspect Water Body at risk for Quagga mussels. However, the threat still remains high that it is just a matter of time before Quagga mussels are introduced into Deer Creek Reservoir and an infestation occurs.

Quagga mussels create both environmental and economic challenges. They tend to push out native aquatic species and can release toxins that can lead to a Harmful Algal Bloom (HAB) (see Section 1.4.2). They can also infest shorelines and discourage recreational use. Of utmost concern for this report is the potential for Quagga mussels attaching to the outlet works infrastructure and impairing or impeding entirely the ability to deliver water downstream.

Planning for Quagga mussel mitigation will be incorporated as a key component for design of any potential alternatives and will be discussed in depth in the Affected Environment Section 3.2. To date only Quagga mussel DNA has been found in Deer Creek Reservoir; no adults or veligers have been detected. Should Quagga mussels be observed, the intake would be taken offline and painted with an FRC coating to protect against blockage or potential proliferation of the species.

<u>Environment</u>
The potential environmental impacts on Deer Creek Reservoir and the downstream lower Provo River will influence both the design and construction of the proposed intake project.

Deer Creek Reservoir is designated as a Class 3A cold water, Blue Ribbon fishery. Uninterrupted flow to the lower Provo River is a top priority for water shareholders and maintaining seasonal hydrology patterns is also critical from an environmental perspective. Fish habitat is a priority consideration for project design and construction considerations.

<u>Operational Reliability</u>
Operational reliability to the Association's shareholders and other water users that provide critical irrigation and drinking water to the most populated region of the state is a primary project driver. This also means planning for reliability that supports downstream fish habitats as well as uninterrupted water supply during proposed construction activities and ensuring delivery obligations into the future.

1.2 Statement of Purpose and Need

The purpose and need for the Proposed Action at Deer Creek Dam is to maintain the capacity and operational reliability to deliver water to downstream waters. The Deer Creek Dam serves a significant portion of Utah's water supply. Existing intake and guard gate infrastructure is aging after nearly 80 years of operation and needs to be updated to ensure reliable water delivery.

The purpose and need for the Proposed Action is to:

- address aging infrastructure to ensure reliability;
- protect the environment and avoid downstream environmental impacts;
- provide reliability and capabilities to address potential threats from invasive species;
- maintain dam security compliance with the Reclamation Safety of Dams Act of 1978;
- create access to infrastructure for long-term maintenance;
- provide bypass flow and redundancy to the Association for water supply obligations; and
- provide isolation capabilities for infrastructure components.

1.3 Federal Decision

The federal decision to be made is whether to implement the Proposed Action.

1.4 Relevant Regulations, Permits and Authorizations

Implementation of the Proposed Action may require a number of authorizations or permits from state and federal agencies. Reclamation is the lead federal agency for this EA. This EA is prepared in compliance with all applicable federal statutes, regulations, and Executive Orders (EO).

1.4.1 National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321 et seq.)

- Procedures for Implementing NEPA (33CFR 230; ER 200-2-2)
- Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500 et seq. and 43 CFR 46 et seq.)

1.4.2 Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq,) and related Statutes and Orders

- Fish and Wildlife Coordination Act of 1958, as amended (16 U.S.C. 661 et seq.)
- Secretarial Order 3206, American Indian Tribal Rights, Federal-Tribal Trust responsibilities, and the Endangered Species Act

1.4.3 National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 et seq.) and related Statutes, Regulations and Orders

- American Indian Religious Freedom Act of 1978 (42 U.S.C. 1996)
- Archaeological Resources Protection Act of 1979 (16 U.S.C. 470)
- Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001 et seq.)
- Protection and Enhancement of the Cultural Environment (EO 11593)

1.4.4 Clean Water Act (CWA) of 1972, as amended (33 U.S.C. 1251 et seq.) and related Orders

- Protection of Wetlands (EO 11990)

1.4.5 Other Statutes, Regulations and Orders

- Clean Air Act of 1972, as amended (42 U.S.C. 7401 et seq.)
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, 1994
- Floodplain Management (EO 11988)
- Wild and Scenic Rivers, 1968 (Public Law 90-542; 16 U.S.C 1271 et seq.)

2 Alternatives

2.1 Introduction

This chapter describes the features of the No Action and Proposed Action Alternatives and includes a brief description of alternatives considered but eliminated from consideration and those considered through the feasibility study. It presents the alternatives in comparative form.

2.2 Alternatives Considered but Eliminated from Consideration

Early alternatives were considered that required the reservoir to be drained so construction activities could access the intake and existing infrastructure in the dry. These alternatives were considered as a viable means of construction but were eliminated from further consideration because of the extreme drought conditions and concern that if the water were drained, water supply may not be able to recover for the foreseeable future. Additional alternatives were developed in the Deer Creek Intake Project Feasibility Study (Feasibility Study) dated February 2021, prepared by Advanced Engineering and Environmental Services (AE2S).

2.3 Alternatives Considered and Evaluated

The AE2S feasibility report identified nine alternatives to address the intake structure and four alternatives to address the aging guard gates. The feasibility level phase evaluated this list of alternatives and the findings were used to make a recommendation to Reclamation's decision makers on which alternative should be carried forward to final design. All the feasibility level alternatives listed below would meet required safety guidelines. Other technical factors were considered during the evaluation process and are presented in the AE2S feasibility study. Alternatives were ranked/eliminated for not meeting purpose and need of the project, accomplishing risk reduction but at greater cost than other alternatives, or because impacts to the environment would be greater than a similar alternative, as described below.

2.3.1 Intake Upgrade/Replacement Alternatives

Alternatives 1 through 3 for the intake are all tall intake structures that extend from the floor of the reservoir to above the water surface of the reservoir or tower intakes. They each include a bridge for access. Some common elements across all the alternatives include modification of the existing intake, a minimum of two inlets at similar elevations to the existing intake, aquatic invasive species mitigation, excellent water quality, and seismic design. A major difference between Alternatives 1-3 and Alternatives 4-7 is that the latter alternatives are fully submerged and would not include a road or bridge for vehicle access from the dam. An extensive analysis of the alternatives considered can be found in the Feasibility Study. Table 2-1 provides the selection criteria considered by the project team and Table 2-2 includes scores for each alternative based on the selection criteria.

Table 2-1 Factors for Criteria Consideration for Intake Alternatives

Category	Criteria	Examples
Shareholder Acceptance	Reliability / Redundancy	• Reliability of isolation • Layers of redundancy – now versus later • Reliability of structure, lateral stability, seismic • Concrete deflects less – better operation possible after earthquake • Concrete is heavier – added mass may help with seismic frequency • Steel is easier for future modifications • Carbon steel is stronger than stainless steel but has higher risk of corrosion • Lateral forces related to height • Slope stability
Shareholder Acceptance	Cost	• Funding required • Total estimated cost
Shareholder Acceptance	Risk Management	• Construction risk – change orders (e.g., what if concrete is cast wrong?) • Simplicity of construction • Weight and constructability (e.g., barge/crane requirements) • Operational risk: diving considerations • Long-term operational risks • Slope stability
Operational Consideration	Equipment Flexibility	• Manual or remote valve operation • Ability to select water levels (e.g., number of gates) • Flow control
Operational Consideration	Access / Maintenance	• Inspect tunnel • Inspect interior of intake • Frequency of inspections • Drive/walk/dive to structure (road/building to house equipment) • Venting/buoyancy/dewatering • Ease of maintenance – including various times of year
Operational Consideration	Future Expandability	• Phasing considerations (including future gates) • Ability to adapt to changed conditions/regulations/seismic • Future foundation • Cost/risk of expansion
Sustainability and Resiliency	Quagga Mussel	• Adequate mitigation strategy • Address potential adaptation/mutation risk • Dissolved oxygen levels • Foul-resistant coatings • Depth • Temperature
Sustainability and Resiliency	Water Quality / Fish	• Emerging water quality concerns • Intake entrance velocity consideration • Water quality choices at various elevations • Gates versus triple offset butterfly valves
Sustainability and Resiliency	Longevity	• Impact of ice, wind, and waves • Corrosion • Length of useful life • Resiliency to earthquake, landslide, and avalanche

Table 2-2 Scoring for Intake Alternatives

Category	**Criteria**	**Alternatives Score**								
-	-	**1**	**2**	**3**	**5a**	**5b**	**6a**	**6b**	**4**	**7**
Shareholder Acceptance	Reliability/Redundancy	9	7	8	9	7	8	6	4	7
Shareholder Acceptance	Cost	1	1	2	4	6	6	8	8	10
Shareholder Acceptance	Risk management	1	3	3	2	4	3	5	6	8
Operational Considerations	Equipment flexibility	8	9	9	7	6	7	6	5	5
Operational Considerations	Access/Maintenance	9	8	8	5	5	5	5	5	7
Operational Considerations	Future Expandability	7	9	8	6	2	6	2	4	6
Sustainability & Resiliency	Quagga mussel	8	8	8	9	9	9	9	9	9
Sustainability & Resiliency	Water Quality/Fish	6	6	6	5	5	5	5	5	5
Sustainability & Resiliency	Longevity	7	6	5	9	8	9	8	8	8
Total Score	-	**56**	**57**	**57**	**56**	**52**	**58**	**54**	**54**	**65**

2.3.2 Guard Gate Alternatives

The need to provide for isolation of select components of infrastructure as well as flexibility to protect downstream water quality of the Provo River in a contamination event required the rehabilitation or replacement of the existing guard gates on the two penstock lines. The following alternatives were identified and evaluated in the Feasibility Study (AE2S, February 2021). All four guard gate alternatives are feasible with all of the intake alternatives. Table 2-3 provides the selection criteria for the guard gate alternatives. Table 2-4 shows the scoring for the alternatives based upon the selection criteria. As with the intake alternatives, an extensive analysis of the alternatives considered can be found in the Feasibility Study.

Table 2-3 Factors for Criteria Consideration for Guard Gate Alternatives

Category	Criteria	Examples
Shareholder Acceptance	Reliability / Redundancy	• Reliability of isolation • New gates & new butterfly valves • Old gates still house old body/settings • Existing parts get lower score than new parts
Shareholder Acceptance	Cost	• Total estimated cost
Shareholder Acceptance	Construction Risk	• Risk associated with penetration dives • Diving considerations • Spatial challenge • Convey butterfly valves through tunnel • Schedule issues • Safety issues
Shareholder Acceptance	Long-Term Risk	• Front line work is hard – intake needed • Plugs • Ease of repair • Rely on guard gates
Operational Consideration	Access / Maintenance	• Ease of access for staff • Depends on intake being built first • Upstream isolation required • Future rehabilitation

Table 2-4 Scoring for Guard Gate Alternatives

Category	**Criteria**	**Alternatives Score**			
-	-	**1**	**2**	**3**	**4**
Shareholder Acceptance	Reliability/Longevity	8	8	4	7
Shareholder Acceptance	Cost	1	6	8	10
Shareholder Acceptance	Construction Risk	6	8	1	3
Shareholder Acceptance	Long-term Risk	7	7	3	8
Operational Considerations	Access/Maintenance	5	5	1	6
Total Score	-	**27**	**34**	**17**	**34**

2.4 No Action

Under the No Action Alternative, the Proposed Action would not be implemented. The No Action Alternative presents the reasonably foreseeable future conditions in the absence of the proposed project. Under the No Action Alternative, there would be no structural or operational changes to the Deer Creek Dam intake structure or guard gates. The existing guard gates would continue to deteriorate until they become inoperable in the open or closed position and there would remain no means of isolation or method to deliver water downstream. There would continue to be no access to critical infrastructure for maintenance. There would also continue to be no means of bypass for the existing intake to ensure the continuous delivery of water to the lower Provo River for required instream flows and drinking water deliveries. This alternative does nothing to reduce the risk of infrastructure failure which would continue to get worse over time. The existing intake would be highly susceptible to Quagga mussel infestation. This alternative would not meet the purpose of or need for the Proposed Action.

2.5 Proposed Action (Preferred Alternative)

In September 2021, what had become known as Option B developed into the Proposed Action alternative. Since the No Action Alternative presents significant risk for infrastructure failure and would at that point no longer facilitate the Association meeting its water delivery obligations, the Proposed Action is preferred moving forward.

The Proposed Action includes structural modifications to the outlet works of the Deer Creek Dam, incorporating these four main components:

1) Refurbished trash racks for AIS mitigation;
2) New 144" bulkhead to provide for isolation;
3) Refurbished guard gates for increased reliability; and
4) A new 68" microtunnel bypass and vault to provide for redundancy.

Figure 2-1 shows an overview of the Proposed Action in more detail. It includes a new 68" micro-tunnel that will serve as a bypass during construction of the intake structure improvements and then be available as a separate intake going forward. This avoids the extensive cost of pumping bypass water during construction and allows for flexibility of operations in the future. It also includes the construction of a vault to provide access to the new isolation valves, connection joints, and electrical and communication equipment, and existing infrastructure.

The new bulkhead provides the isolation needed to support future maintenance and inspection of the 144" diameter tunnel which has never been taken offline. The 68" micro-tunnel, used as a bypass during construction, would be available as an additional inlet going forward. Additionally, the existing operations building will be expanded by approximately 3,000-4,000 square feet to provide temporary construction office facilities during the project and long-term storage of bulkheads and other materials.

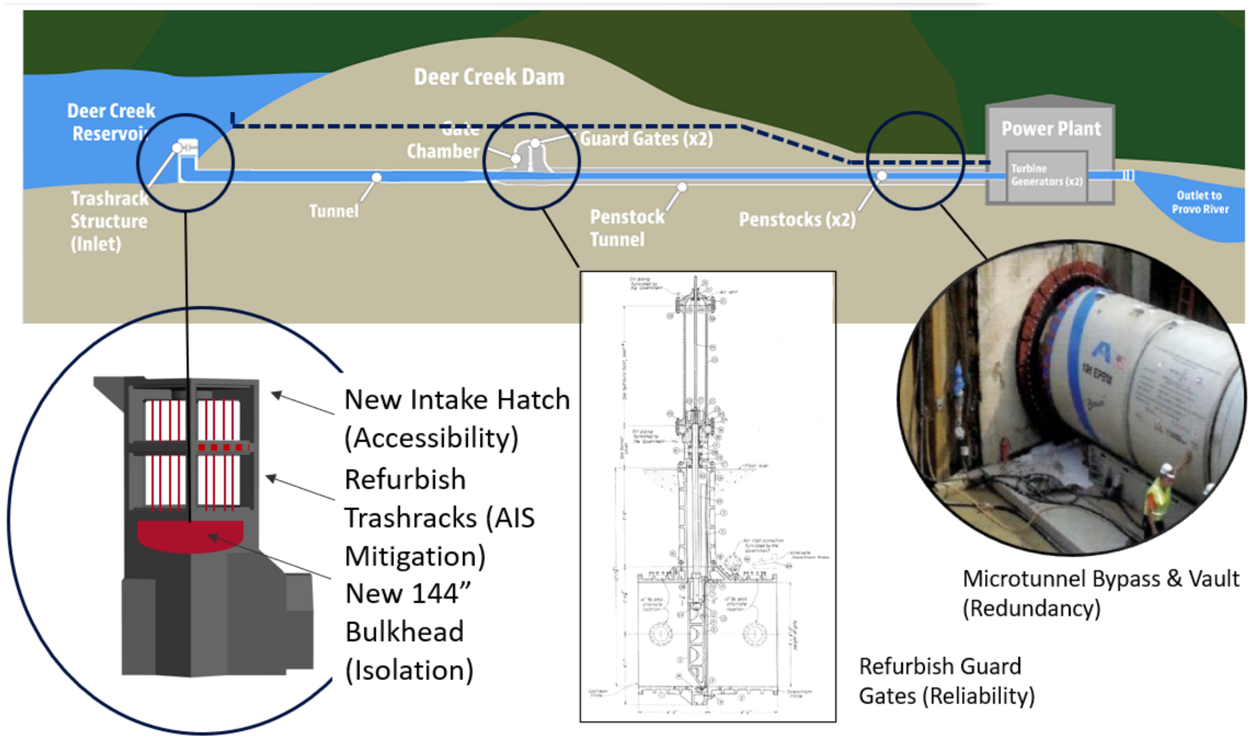

Figure 2-1 Diagram Detailing Proposed Action Components

In relation to the proposed 72” microtunnel bypass and vault for redundancy, a technical memorandum was prepared to address potential impacts on flow and downstream conditions, particularly for fish species. This provided analysis of impacts from the proposed project and concluded that fish species would be protected by the construction methodology and addition of redundancy to the system. Temperatures with the proposed intake and bypass resemble historical data and seasonal gradients and would be considerably below critical temperatures. Fish can tolerate temperature fluctuations of this nature and fish would seek thermal refugia and leave any conditions as necessary.

2.5.1 Intake Operations

Although it is too early to speculate on all the potential operational uses of the new intake and bypass piping, comment can be made on how it could have been used in past scenarios that occurred in the region. One scenario where a bypass helps is when a forest fire is followed by a rain event that creates excessive turbidity in the lowest elevations of a reservoir. This situation has occurred numerous times as shown in the Table 2-5.

Table 2-5 Fire History and Debris Flow Location

Year of Fire	Fire or Debris Flow Location
2003	Cascade II
2013	Near Starvation Reservoir
2014	Taylor Mountain Road and Near Strawberry Reservoir
2015	Deer Creek Reservoir
2018	Deer Creek Reservoir
2018	Dollar Ridge Fire (Impacted Duchesne Valley WTP)
2020	Range Fire near Don A Christiansen WTP
2020	East Fork Fire near Upper Stillwater Reservoir
2021	East Fork Debris Flow near Upper Stillwater Reservoir

The 2018 fire near Deer Creek Reservoir for example, produced increased turbidity in the Provo River near 650 NTU (at the Olmsted Diversion area). This in turn feeds raw water to the Don A Christiansen Water Treatment Plant that is held to EPA and State of Utah water quality standards of 0.1 NTU (max). In situations like this, dam operators could stop flow from the old intake that is at a lower elevation in Deer Creek Reservoir and could open the bypass intake to allow less turbid water to be transported downstream to the Provo River. This is just an example of how the new intake and bypass piping can be used to protect water quality from forest fires and excessive turbidity.

Another positive use of the bypass would occur if maintenance of the original intake or tunnel necessitated these facilities being isolated and taken offline for repairs or cleaning. Without the new bypass pipe, flow to downstream ecosystems, water-treatment-plants, etc. would be interrupted if the original infrastructure was offline for any reason; however, once the new bypass pipe is operational, all downstream ecosystems, water treatment plants are protected with this redundant flow path.

Other scenarios where a bypass would help the operation and maintenance may include blending the water from the new bypass with the old intake. This is anticipated to occur in relatively short timeframes to ensure water quality remains consistent and would not be impacted if the bypass was needed for emergency use.

2.5.2 Construction Methodologies and Design Features to Mitigate Risk

The Proposed Action includes working in the wet, which requires appropriate construction methodologies, barge access plans, and risk mitigation to complete the project. Such considerations have been developed to ensure safety for Deer Creek Dam, the public, and the environment.

Proposed construction will be phased via the six major work events shown below. Engineered solutions were developed to continue the flow of water downstream to protect the Provo River ecosystems during all times while isolating any work events in Deer Creek Reservoir that may produce turbidity. Maintaining flow releases from Jordanelle and Deer Creek is critical, particularly for the June sucker. However, these turbidity events would involve limestone (bedrock) that are either small sand particles or small rock pieces. Sand or small rock particles have been found to settle within minutes and will not remain in suspension; turbidity events will be short lived and particles will settle to the bottom of the reservoir quickly). Turbidity events can be isolated via turbidity curtains described below:

1) Turbidity Curtain and Benching/Excavation
2) Microtunnel
3) Bypass Piping
4) Guard Gate and Intake Rehabilitation
5) Tunnel Condition Assessment
6) Testing all Components
7) 7) Deer Creek Power Plant Operations Building expansion

2.5.2.1 Turbidity Curtain and Benching/Excavation

Turbidity curtains are flexible/impermeable barriers that contain sediment in work zones so that water quality is not impacted. These curtains float at the top of the water surface and drape down to the bottom of the reservoir where they are weighted/anchored to ensure sediment does not travel under the curtain. A typical drawing of the curtain and anchor system is shown in Figure 2-2. Turbidity curtains will be in position whenever work may produce turbidity which includes the following events: 1) benching/excavating, 2) exit of the microtunnel, and 3) cutting and renovating the old intake; however, when the water quality is the same on both sides of the curtain, the contractor may lower the curtains in order to mobilize/stage equipment.

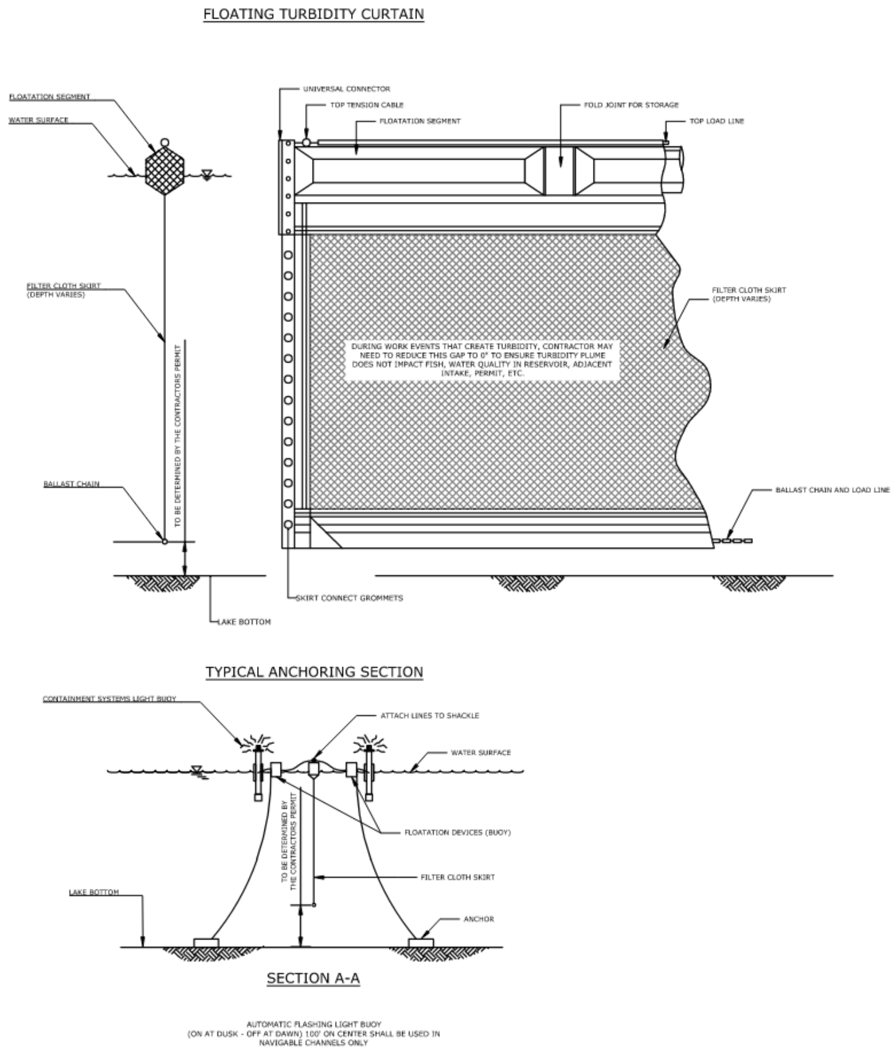

Figure 2-2 Drawing of a Turbidity Curtain and Anchor System

Turbidity curtains rely on settling to remove suspended solids and as discussed above, the limestone particles are anticipated to settle quickly (as no colloidal particles have been encountered). Currently, the engineered plans require turbidity curtains around both the microtunnel exit portal and around the intake to allow for phasing and to allow non-impacted water to flow downstream. Curtains will be installed with slack to accommodate different surface water elevations and they will be procured for the exact side slope and contours found in the area adjacent to the work zones. Figure 2-3 shows a drawing of how the curtain is anchored to allow for open water work, turbidity curtain shown in yellow. The contractor will also be using a water quality monitoring sonde that is permanently attached to a buoy to provide real time turbidity information to ensure water flowing downstream is not impacted.

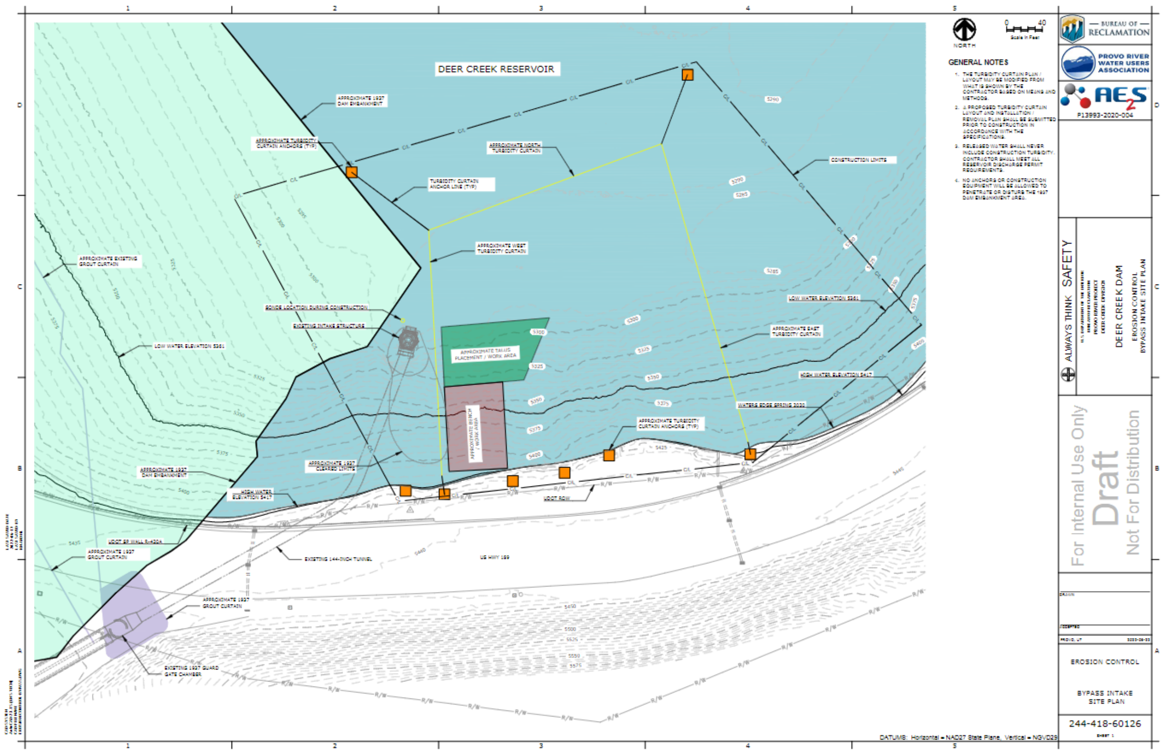

Figure 2-3 Drawing of Anchoring Plan for Open Water Work, Turbidity Curtain in Yellow

The mountain that serves as the reservoir side slope is steep; benching will be required to ensure tunneling equipment exits the mountain properly. Benching is anticipated in one location at the microtunnel exit portal. It is anticipated that the contractor may use a combination of rock chisels, rock breakers, mill heads, or ripper shanks as shown in Figure 2-4, depending on water depth. The rock chisels, rock breakers, mill heads, or ripper shanks would be mounted on a long reach excavation arm, depicted in Figure 2-5. Excavated limestone would be sidecast and not removed; however, this material is already underwater and is only being relocated to accommodate benching.

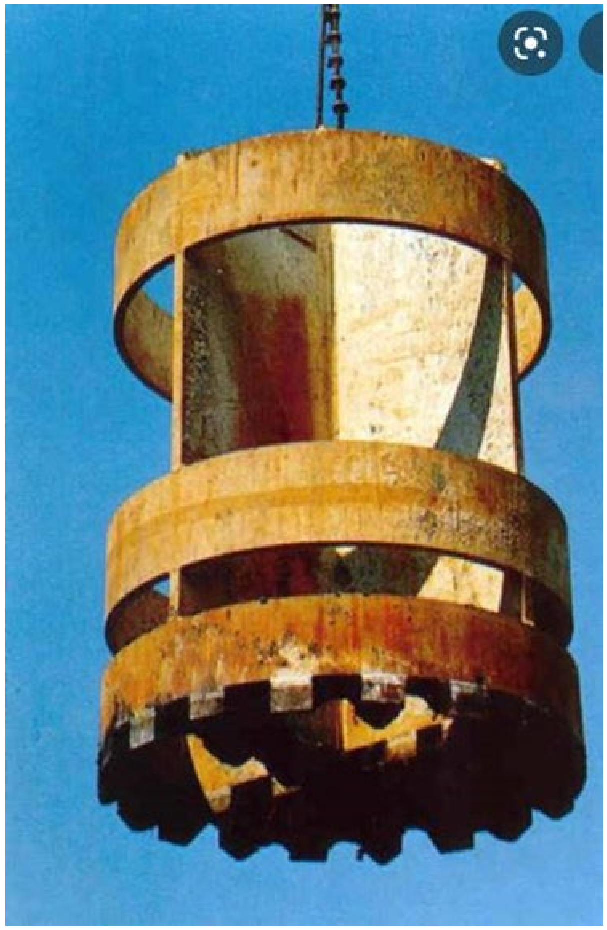

Figure 2-4 Photo of a Rock Chisel or Rock Breaker Used to Break up Limestone

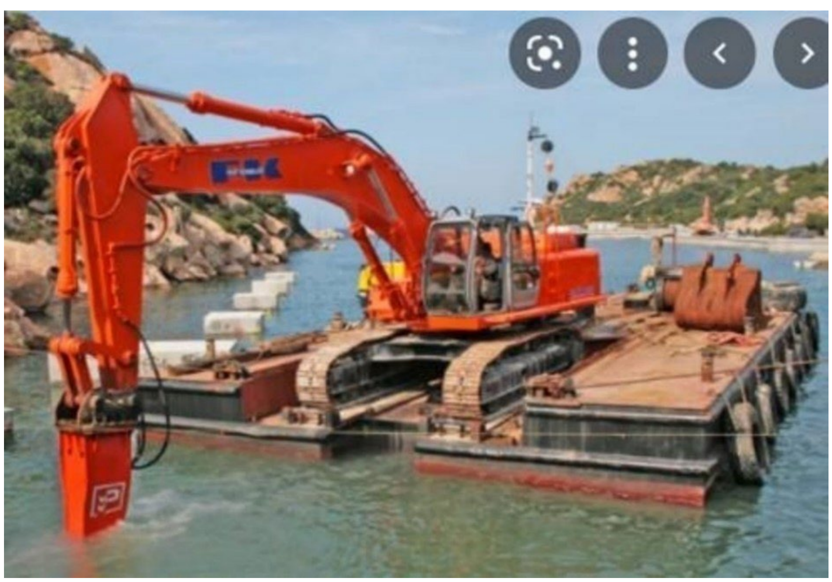

Figure 2-5 Barge from which the Rock Chisel or Rock Breaker Could be Operated

2.5.2.2 Microtunnel

The microtunnel boring machine (MTBM), shown in Figure 2-6, is set at a launch portal after pregrouting is completed and an area near the power plant is benched. Pipe, as shown in Figure 2-7, is attached to the MTBM and "pipe-jacking" is used to advance the pipe over 800 feet towards the exit portal. MTBMs are accurately controlled by balancing cutter heads, thrust pressure, and slurry with groundwater and earth pressures. The slurry is stopped short of the exit to prevent it from entering Deer Creek Reservoir; clear water is used for face pressure as the MTBM approaches the exit portal. MTBMs use carbide blade cutter heads that pulverize the bedrock as the MTBM advances and smaller rock particles are removed via slurry lines. Any debris removed in this process will be hauled out to a nearby disposal site; slurry cuttings will not remain on-site. The current design includes a 68-inch ID with 69 ½-inch OD with a 1-inch annular space for finish grouting.

Figure 2-6 Microtunnel Boring Machine

Figure 2-7 PermaLok Pipe for Microtunnel Boring

Prior to beginning the microtunneling, an exit portal will be constructed by removing loose talus and installing a precast exit portal. Removing loose talus (approximately 550 cy) and limestone (approximately 266 cy) reduces the risk of unstable ground conditions and allows the mountain to be benched for the MTBM exits. Loose talus/limestone on the existing reservoir sideslopes will be sidecast and not removed from Deer Creek Reservoir. The exit portal headwall will include a soft eye so that the MTBM can properly exit while protecting the geologic stability. After the MTMB exits, the initial pipe with an elastomeric seal prevents the reservoir from leaking into the annular space until finish grouting can be completed. This process is known as a wet recovery microtunnel as the MTBM is disconnected from the pipe and pulled to the surface via barges and cranes. Figure 2-8 shows the barge system for wet recovery and Figure 2-9 shows the MTBM being removed from the water.

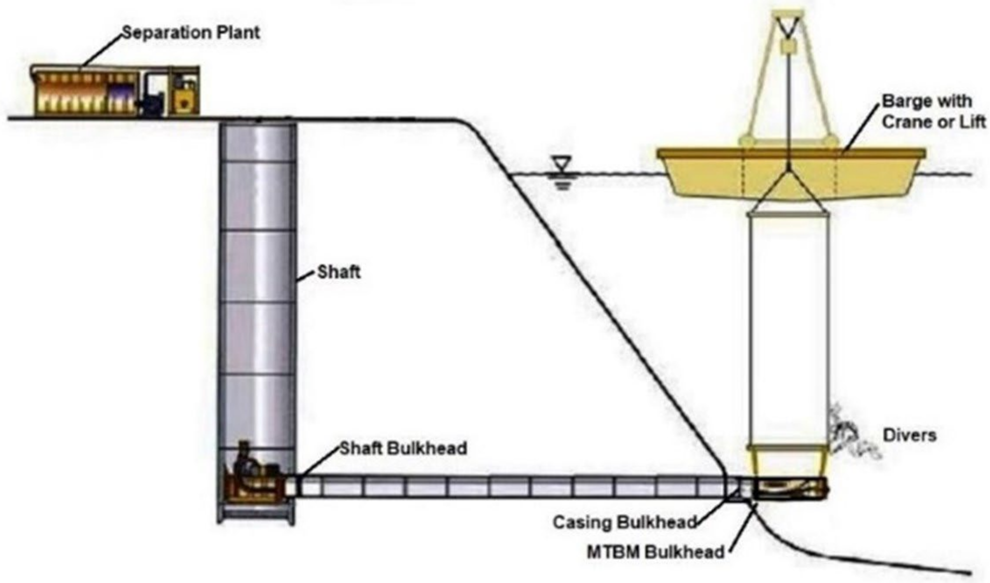

Figure 2-8 Barge to Complete Wet Recovery of Microtunnel Boring Machine

Figure 2-9 Wet Recovery of a Microtunnel Boring Machine

2.5.2.3 Bypass Piping

The new 68-inch microtunnel will allow bypass flows from approximately 600 cubic feet per second (cfs) to 1100 cfs while the original tunnel and intake are taken offline as shown in Figure 2-10 below.

The bypass pipe connection to the penstocks will occur inside a vault for easy access to new valves and the microtunnel. The guard gates would then be rehabilitated.

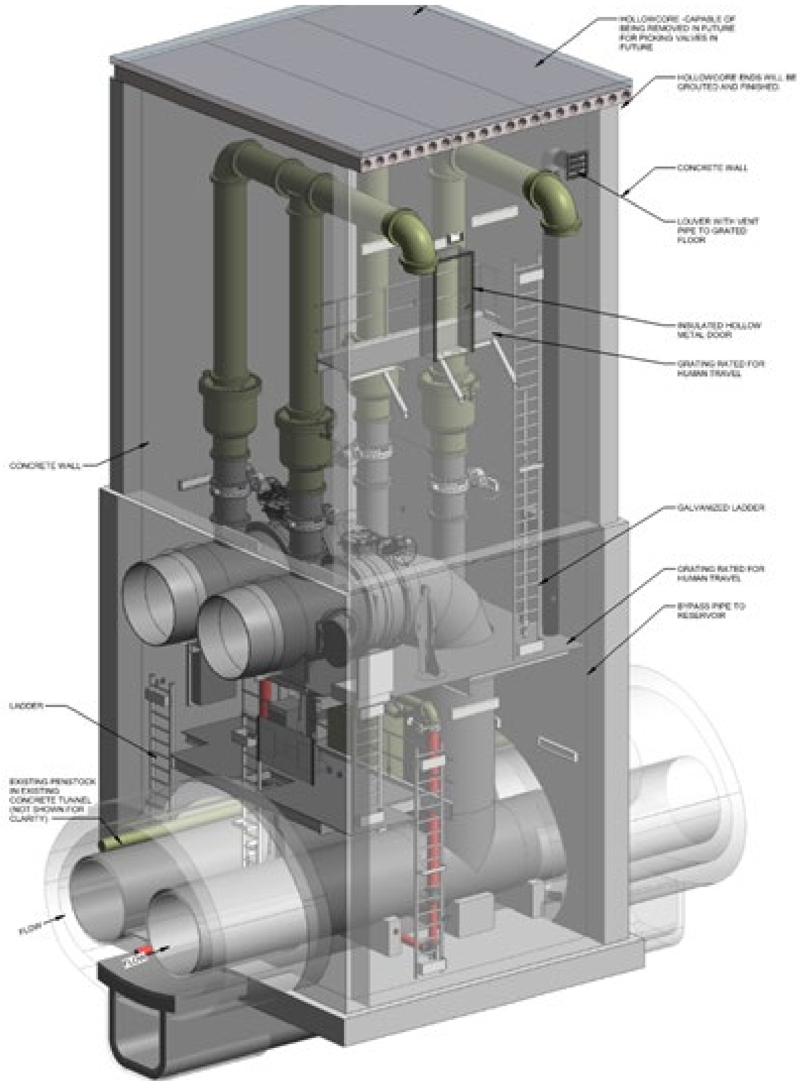

Figure 2-10 Bypass Piping Diagram

2.5.2.4 Guard Gate and Intake Rehabilitation

With the new bypass piping in place and providing water deliveries, guard gate and intake bulkhead work can begin. Guard gate wearing components will be removed, rehabilitated, and restored as shown in Figure 2-11 below.

GG2 Parts List

DEER CREEK INTAKE PROJECT

Provo River Water Users Association

Part Number	Description	Action
1	Upstream Frame	Inspect
2	Downstream Frame	Inspect
3	Bonnet	Inspect
4	Bonnet Cover	Inspect
5	Gate Leaf	Rehab/Recoat
6	Gate Still	Replace
7	Horizontal Leaf Seat	Replace
8	Vertical Leaf Seat	Replace
9	Bonnet Seat	Replace
10	Horizontal Frame Seat	Replace
11	Vertical Frame Seat	Replace
12	Leaf Recess Cover	Refurbish
13	5/8" X 1 1/2" Cap screw	Refurbish
14	1" X 2 3/4" Cap screw	Refurbish
15	3/4" X 3 1/4" Studs with Nut	Refurbish
15A	7/8" X 3 5/8" Studs with Nut	Refurbish
16	1 1/2" X 6 1/2" Studs with Nut	Refurbish
17	Studs with Nuts	Refurbish
18	1 1/2" X 5 3/4" Bolt with Nut	Refurbish
19	1" X 4" Tac Bolt	Refurbish
20	Cylinder	Refurbish
21	Cylinder Head	Refurbish
22	Piston	Refurbish
23	Piston Ring	Refurbish
24	Stem	Refurbish
25	Stem Extension	Refurbish
26	Locking Key	Refurbish
27	Key Retainer	Refurbish
28	Top Leaf Nut	Refurbish
29	Bottom Leaf Nut	Refurbish
30	Cylinder Gasket	Replace
31	1 1/2" Oil Packing	Replace
32	4 3/4" Oil Packing	Replace
33	4 3/4" Water Packing	Replace
34	1 1/2" Packing Seat	Replace
35	1 1/2" Packing Gland	Refurbish
36	4 3/4" Packing Seat	Replace
37	4 3/4" Packing Seat	Replace
38	4 3/4" Packing Gland	Refurbish
39	1 5/8" Stud	Refurbish
40	1 5/8" Stud	Refurbish
41	3/4" Stud	Refurbish
42	5/8" Stud	Refurbish
43	Fillister Head Capscrew	Refurbish
44	Fillister Head Capscrew	Refurbish

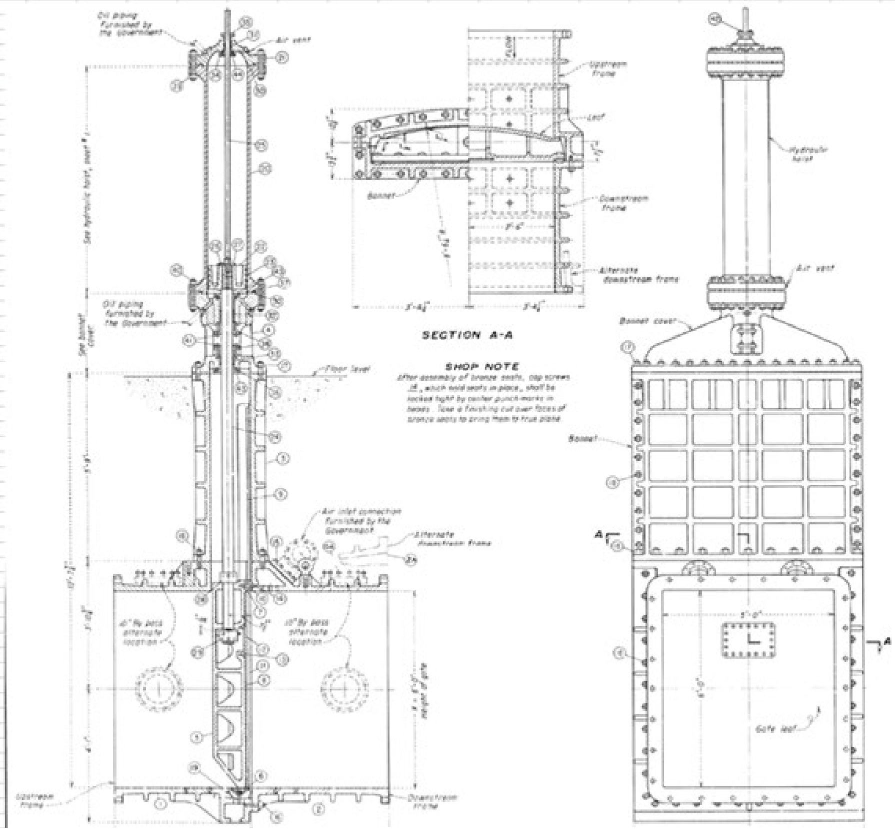

Figure 2-11 Diagram of the Bulkhead Gate

A sidewall beam in the existing intake will be cut and temporarily removed to allow for placement of a 192-inch bulkhead for isolating the original intake and tunnel.

2.5.2.5 Tunnel Condition Assessment

After the intake modifications are completed, the new 144-inch bulkhead can isolate the tunnel so it can be taken offline for condition assessment. This will be the first time in over 80-years that engineers will be able to walk inside the 144-inch tunnel and perform inspections. A visual inspection was completed in 2020 via a remote operated vehicle (ROV) and the tunnel appeared to be aging well. Buoyant forces were analyzed with the tunnel drained to ensure an empty tunnel will not be adversely impacted.

2.5.2.6 Testing all Components

With all bypass and intake infrastructure in place, all operating scenarios will be tested such as 1) water flowing through the bypass only, 2) water flowing through the intake only, 3) water flowing through both the bypass and intake, 4) discharge flows through both penstocks, 5) discharge flows through each separate penstock with the other isolated.

2.5.2.7 Proposed Operations Building Expansion

Construction operations will need conference rooms, office space, and features. The Association is considering their options of either creating temporary offices that would only remain during construction activities, or expanding the existing Operations Building. The Association is considering expanding the existing Operations Building so that these spaces would be available long-term, post construction as added space for operational activities and bulkhead storage. If this is the option chosen, preliminary expansion plans are for approximately 3,000 to 4,000 square feet and are shown in Figure 2-12 . This addition would be built on an existing Reclamation easement. These expansion plans are still potential, should they not occur there would be no impact. If the expansion did occur the environmental impacts are anticipated to be minimal and would be managed with BMPs to control erosion and sedimentation during construction.

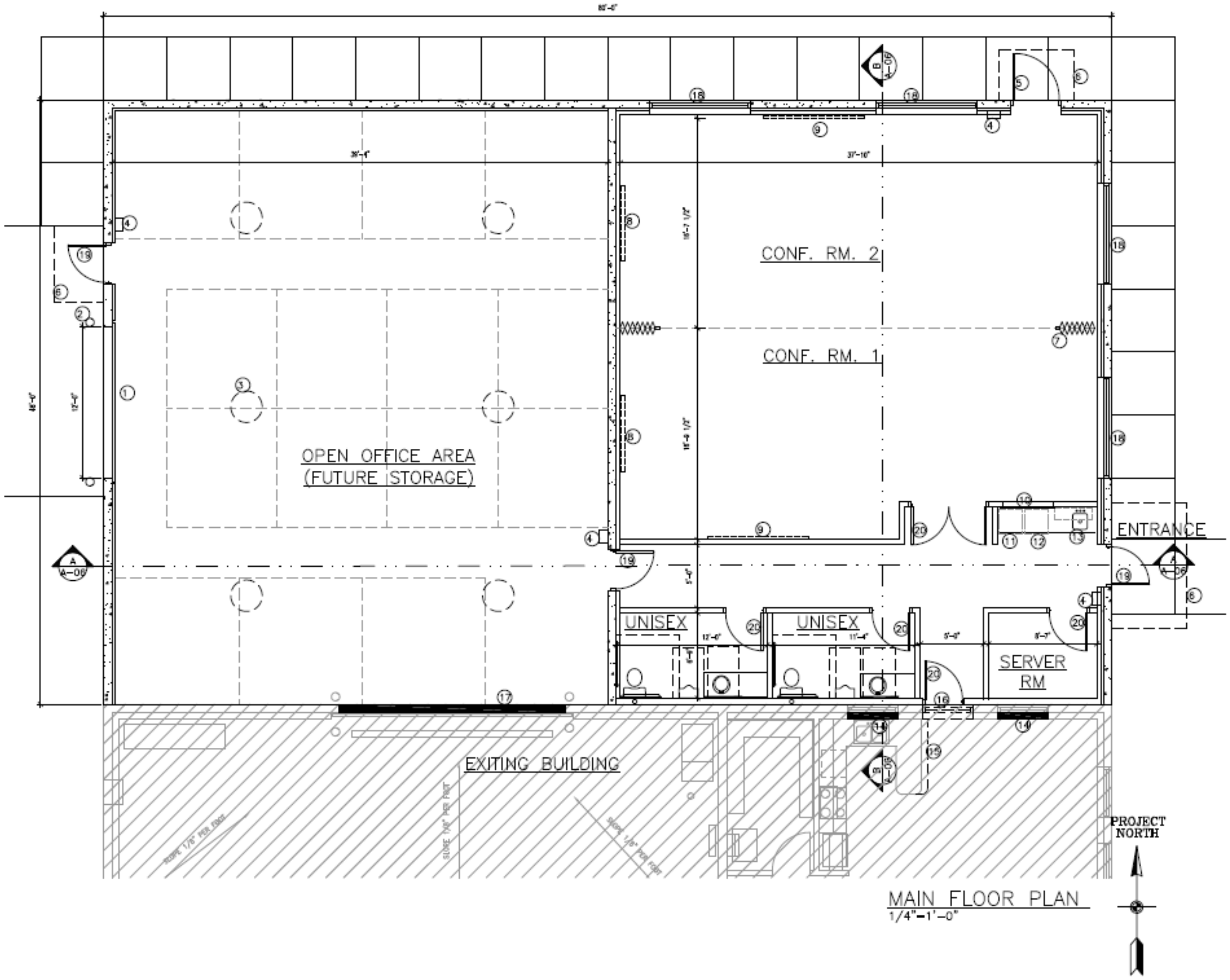

Figure 2-12 Potential Operations Building Expansion

2.5.3 Construction Access and Site Planning

2.5.3.1 US 189 Yard at Spillway

Construction office facilities would be moved to the location shown in Figure 2-12. This plan would utilize the existing fencing and security entrances. Other areas of the yard would be graded as needed for the project facilitation.

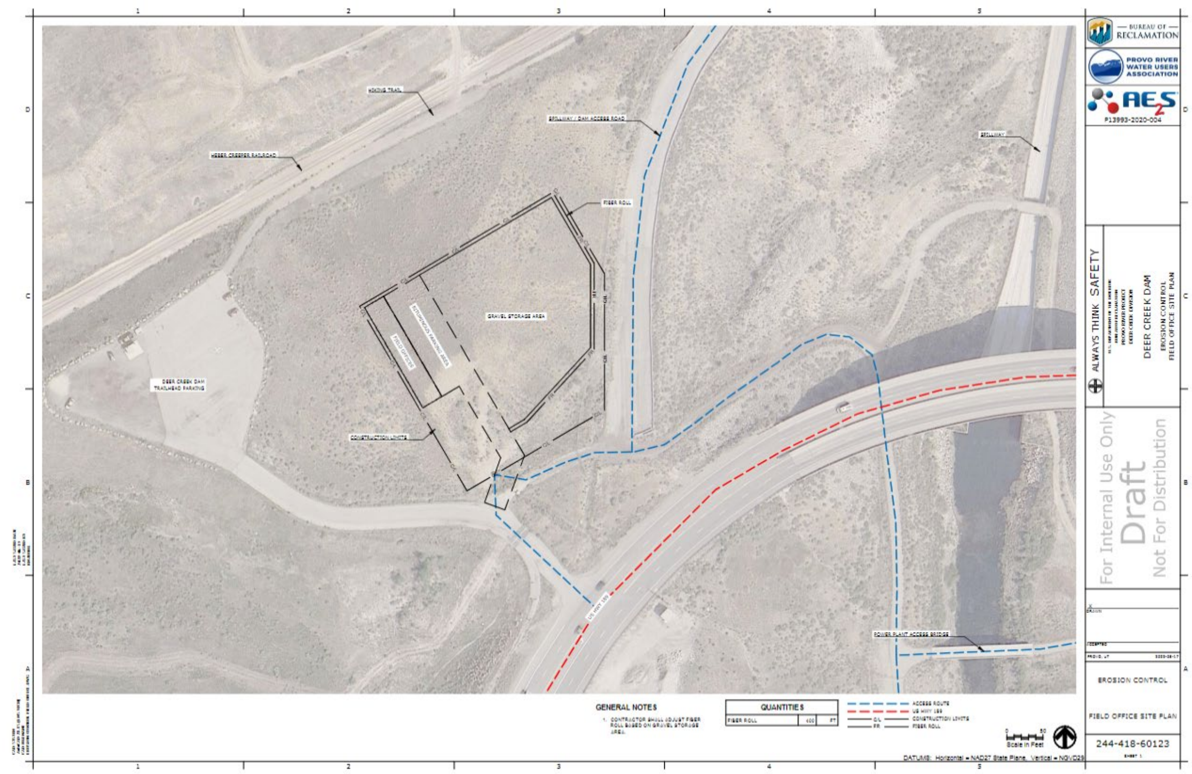

Figure 2-13 Proposed Site Access off US 189

2.5.3.2 Construction Marina

Access to the water would occur via the existing Sailboat Beach marina with some minor improvements, shown in Figure 2-13. Road access to Sailboat Beach would need to be widened and paved to handle the anticipated barges, cranes, equipment, and boats over the project duration. The design assumes that roads would need to be maintained during the life of the project and repaved when the project is completed. Two security gates are planned. A boat/equipment contained washing area has been identified in the parking lot to ensure compliance with washing standards to prevent AIS. Some adjacent trails would be blocked from the public to ensure safety and reduce risk of civilians gaining access to the project site. There is no intent to disturb existing pavilions and restroom facilities. If the reservoir is full, grass and sand areas may be disturbed. The project would restore areas of disturbance post-construction. Danforth anchors/dead man anchors would be used for barge stabilization.

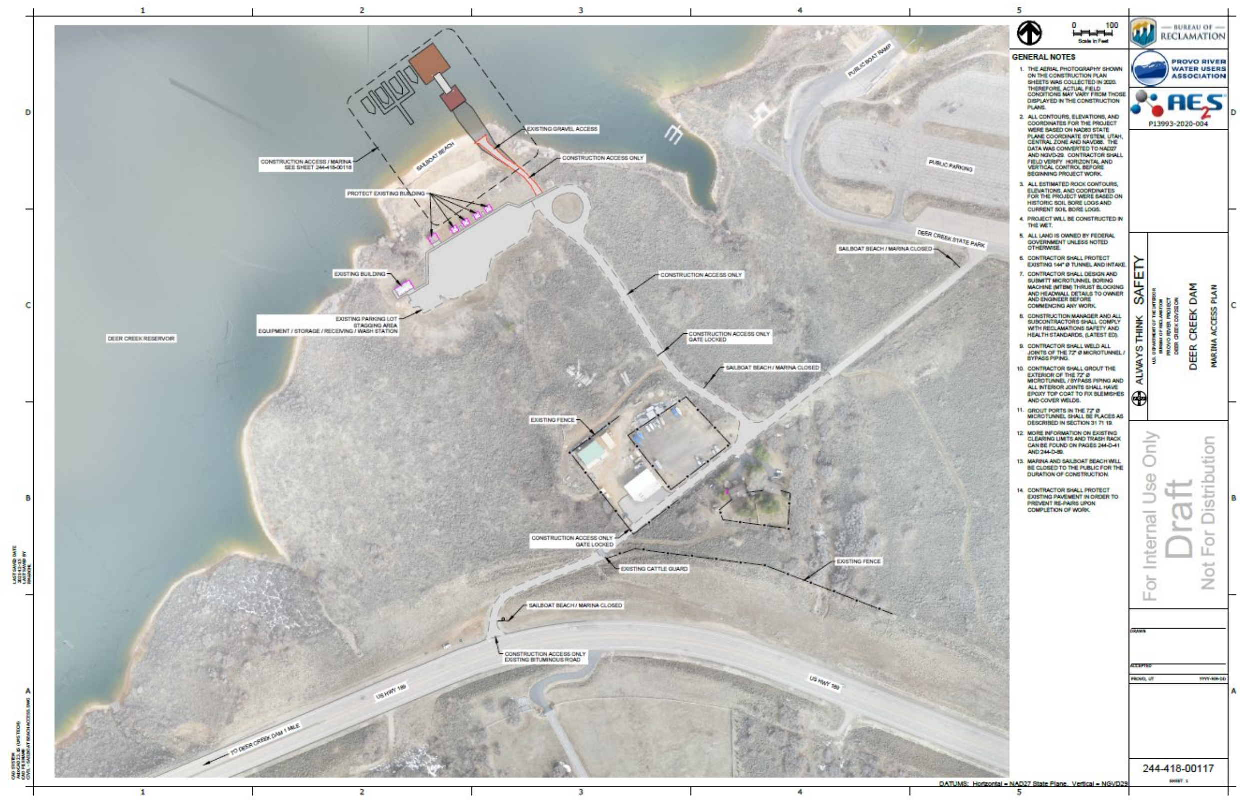

Figure 2-14 Proposed Staging Area for Marina Access

Barges could be loaded and accessed via Sailboat Beach where steel ramps would provide access to the barge in the water. The access would stay in place for the construction period and would be dependent upon the water level. In times of high reservoir levels, the ramp may need to be pulled more onto shore or pushed further out into the water as levels drop to access the barge.

The steel ramp for a low water level is detailed in Figure 2-14 and shows how the reservoir side slope is too severe for safe loading of trucks and equipment and thus will require minor excavation that would be replaced to its original contours upon completion of the project.

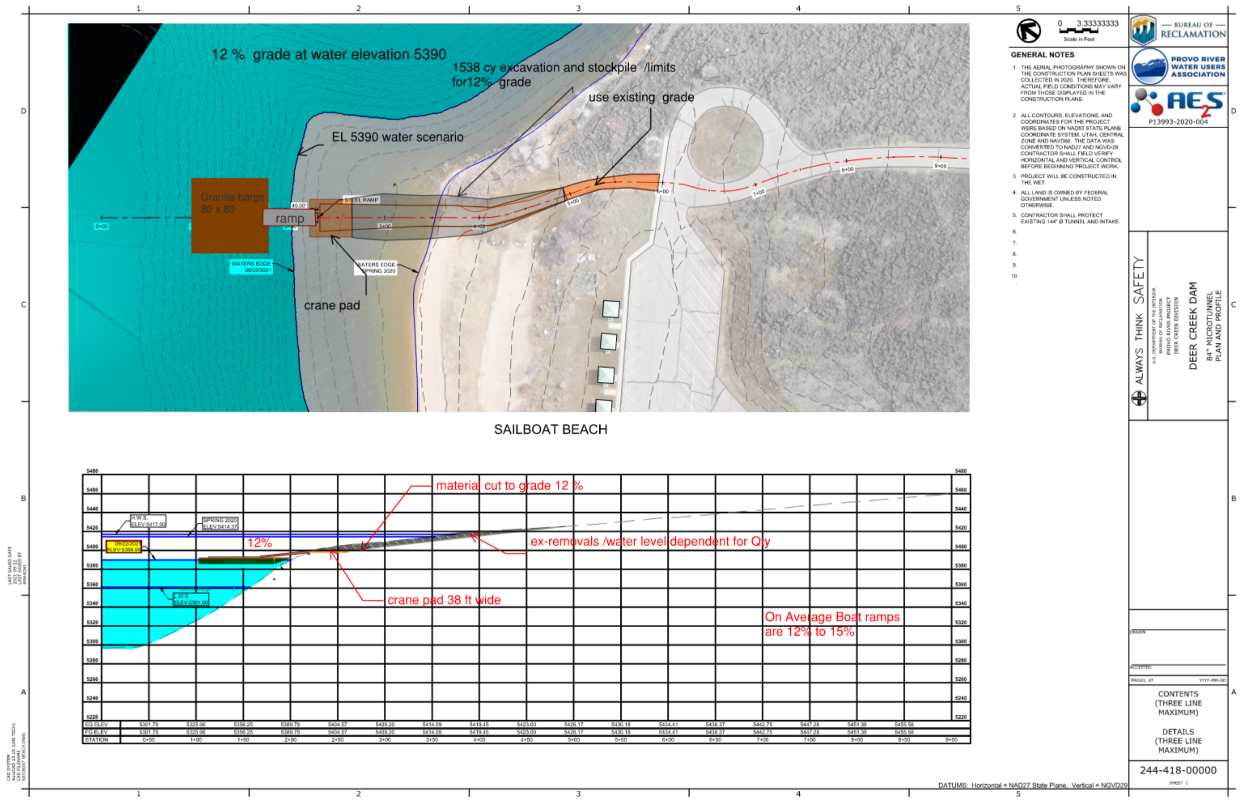

Figure 2-15 Sailboat Beach Access with Steel Ramp to Barge

2.5.3.3 Phase 1 Barge Configuration

Barges are planned to be used to complete the work near the dam and will be used for the exit portal benching work and assisting the MTBM wet recovery. During this time, turbidity curtains will contain the work zone turbidity while unaffected water will flow to the original outlet works and will not be affected by the exit portal benching or MTBM work activities. Turbidity curtains for this configuration will rely on anchors. Four types of anchors are being considered including buried, drilled, Danforth, and dead man anchors. As much as practicable, the anchors would be designed and overlapped to be used for Phase 1, as well as Phase 2. The turbidity curtains would have breaks for barge entry and exit as needed and as water quality permits.

2.5.3.4 Phase 2 Barge Configuration

After the bypass pipe is operational, work will shift to modifying the existing intake shown in Figure 2-15.

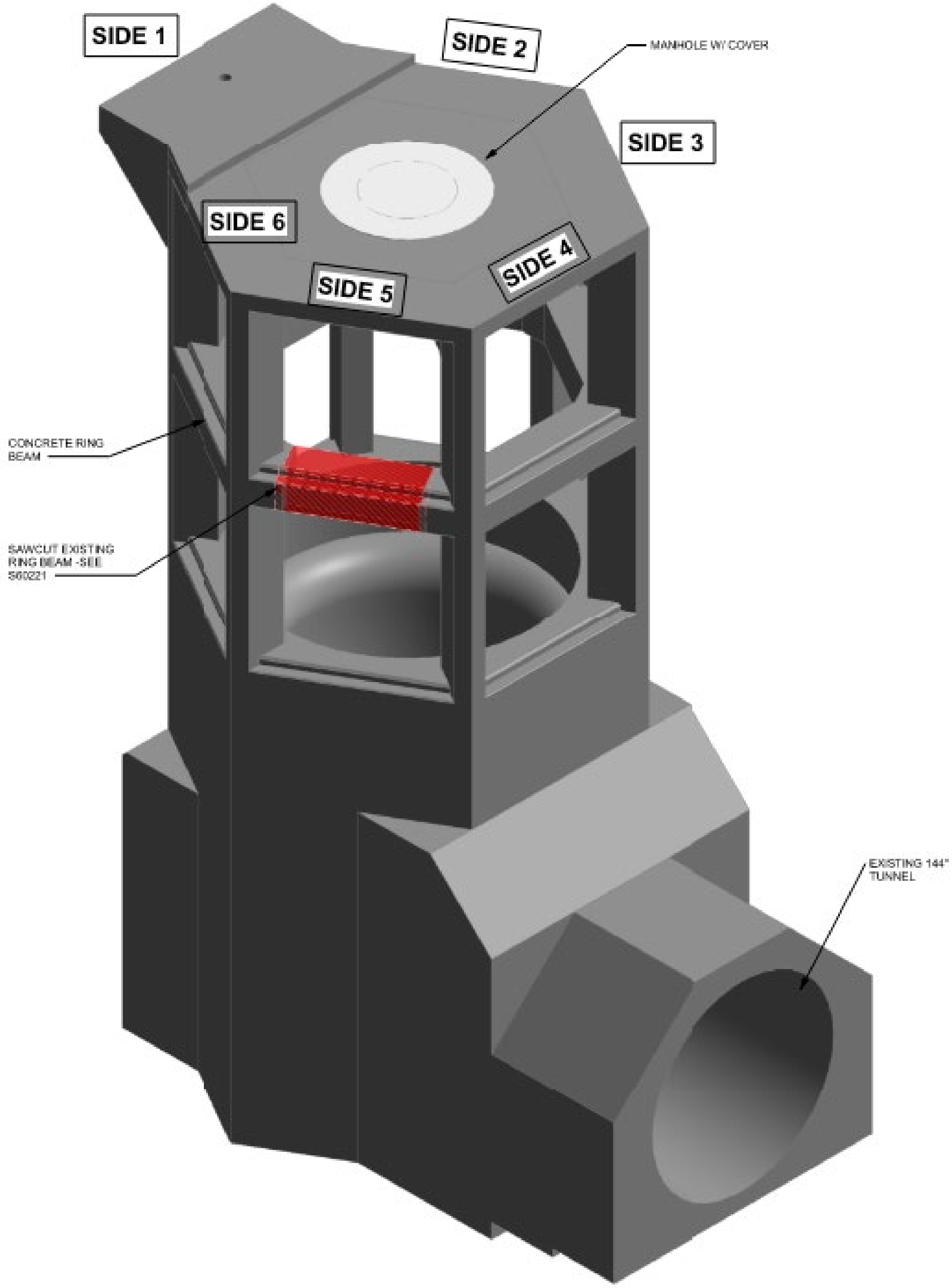

Figure 2-16 Existing Intake with Removal of One Side of the Ring Beam

2.5.3.5 Drilling Access

In 2021 Reclamation drilled four additional geotechnical borings to inform the microtunnel and vault design. A temporary switchback road was constructed to allow drill rig access and is proposed to remain through construction. Once construction is complete the road can be removed and incorporated into the final design of the launch portal and proposed vault plans. The 2021 geotechnical access road is shown in Figure 2-16 and Figure 2-17.

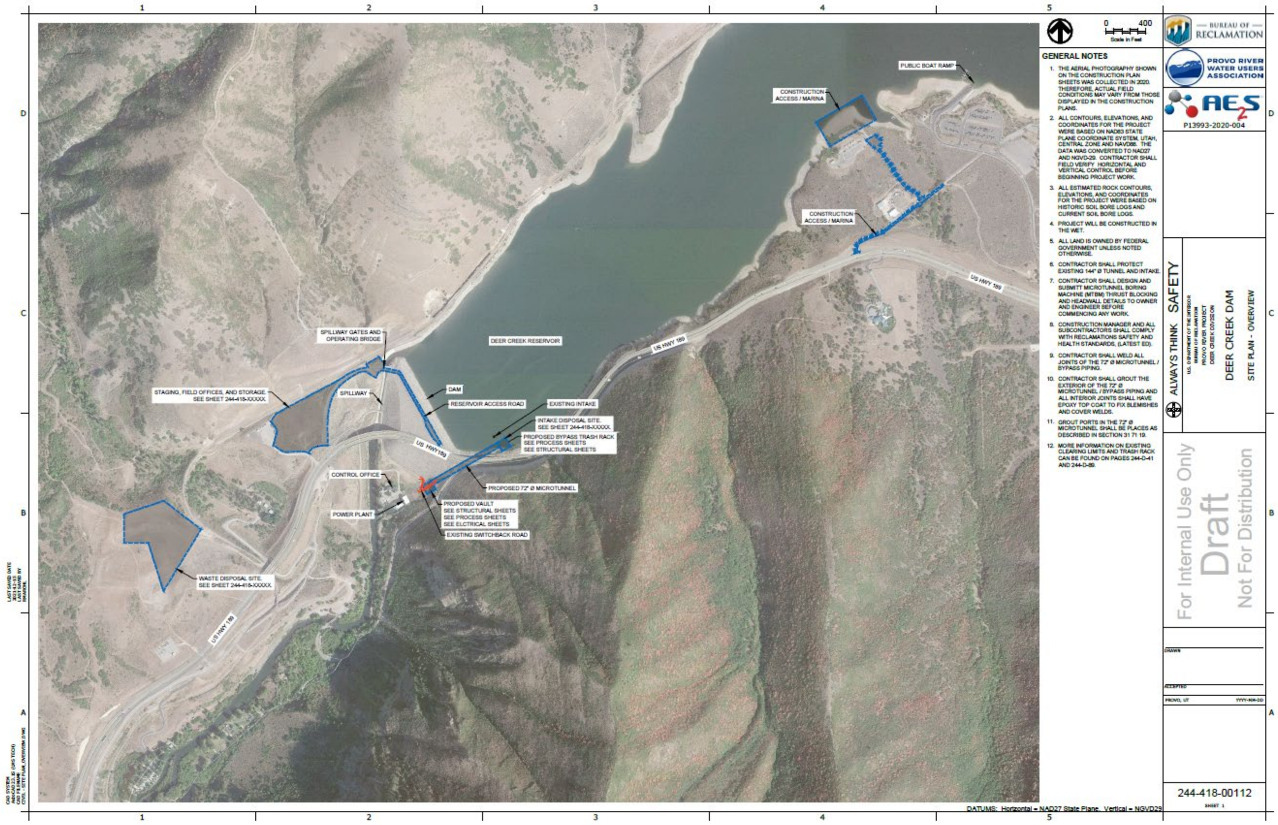

Figure 2-17 Site Location of Borings and Access, or Switchback Road from the Geotechnical Phase

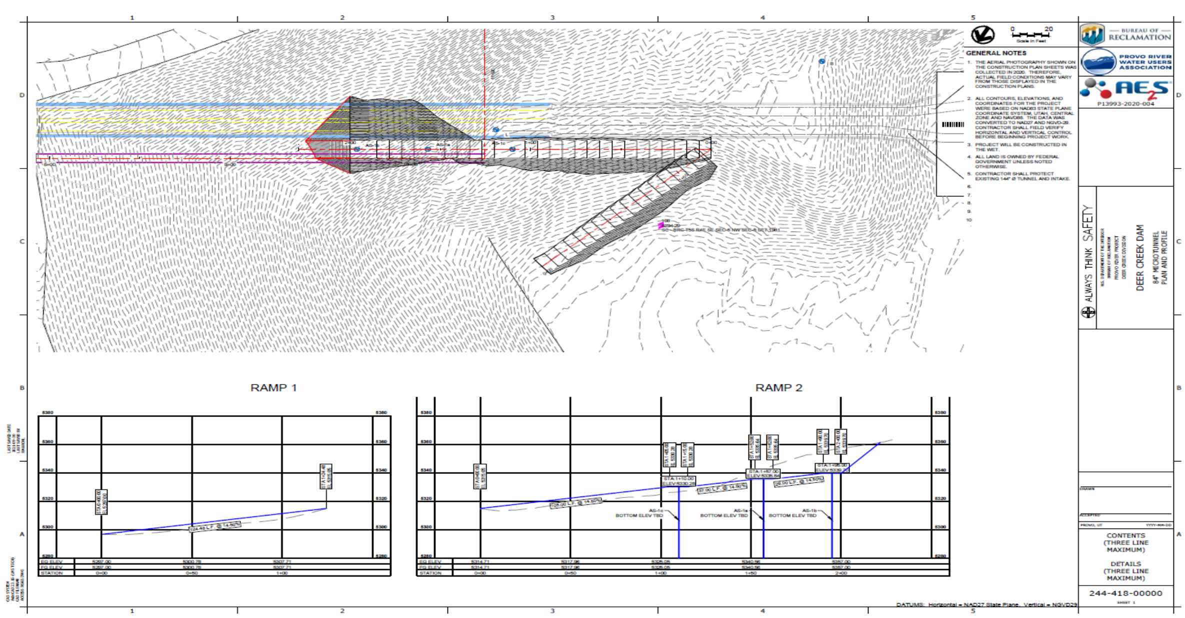

Figure 2-18 Detail for the Switchback Road Design

3 Affected Environment and Environmental Consequences

This chapter describes the environment that could be affected by the Proposed Action, including those resources that were considered but eliminated from detailed study. For those resources that were analyzed in detail, the present condition or characteristics of each resource are discussed first, followed by a discussion of the predicted impacts caused by the No Action and the Proposed Action.

3.1 Resources Considered but Eliminated from Detailed 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 provides the resources and rationale for considering but eliminating from detailed analysis.

Table 3-1 Resources Considered but Eliminated from Detailed Analysis

Resource	Rationale for Considering but Eliminating from Detailed Analysis
Geology and Soils	There would be no significant impact to geology or soil resources. There are no important geological features in the Project area and soils would be managed following the environmental commitments in chapter 5.
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 no Prime and Unique Farmland within the Project area. Therefore, there would be no impacts to this resource from the Proposed Action.
Recreation	The Project would have a negligible effect on recreation. The work in the Dam is beyond where recreation is allowed for use by the general public. The only minor impact may be transporting equipment at the time of staging; however, the public has access to other boat ramps and should not be impacted.
Visual	The Project would have negligible impacts to visual aesthetics because temporary impacts would be localized and not incompatible with the current aesthetics in the area, with no discernable long-term effects.
Health, Safety, Air Quality, Noise	Effects to these resources would be negligible, minimal, and/or mitigated where necessary through environmental commitments in Chapter 4 or through standard industry practices required in the specifications to the contractor. Such practices include but are not limited to dust abatement, traffic control, coordination with local emergency responders, limiting work hours to daytime, etc. Therefore, this resource was not considered in more detail.

Resource	Rationale for Considering but Eliminating from Detailed Analysis
Threatened and Endangered Species	There are no anticipated impacts on threatened and endangered species under the Proposed Action alternative other than minimal impacts to the threatened June sucker, which are discussed in Section 3.2.
Environmental Justice	The Proposed Action would have no significant impacts on Environmental Justice.
Socioeconomics	The Proposed Action would be anticipated to have a beneficial impact on socioeconomics by virtue of improving the infrastructure supplying water to the region.
Paleontological Resources	There are no anticipated impacts on paleontological resources.
Indian Trust Assets	There are no Indian Trust Assets in or near the project area based upon an analysis by Reclamation's archaeologist, Zachary Nelson, Ph.D. on 3/11/2022.

3.2 Water Quality

Deer Creek Reservoir is approximately 6 miles long with 18 miles of shoreline. At full capacity, it contains 153,445 acre-feet with a surface area of approximately 2,700 acres, an average depth of 65 feet, and a maximum depth of 137 feet. Of the full capacity, approximately 150,161 acre-feet is active pool and the remaining 3,284 acre-feet is dead pool. Water stored in the reservoir is used for irrigation, municipal and industrial use in many communities along the Wasatch Front, and for the continuous deliveries of required instream flows to the lower Provo River. Deer Creek Dam and Reservoir is vital to Utah in terms of recreation as well as water supply for the Association and other water users.

Water stored in Deer Creek Reservoir consists of Weber River water diverted through the Weber-Provo Diversion Canal, Duchesne River water diverted through the Duchesne Tunnel, and Provo River peak flows.

Typically, one of the primary advantages of a multi-level intake is the ability to find optimal water quality in the vertical water column to enhance fisheries, improve influent water to treatment plants, and provide safe supply for agricultural and industrial use. However, water in Deer Creek Reservoir is currently very safe and of high quality at all elevations in the vertical water column.

With adequate sunlight, nutrients such as nitrogen and phosphorous create an ideal environment for phytoplankton (algae) growth in water. Algae and light add oxygen to the water as a byproduct of photosynthesis and are an essential part of a healthy reservoir ecosystem. However, algae sink to the bottom of the reservoir when they die, and their decomposition process depletes oxygen. This process is called eutrophication, and excessive nutrient loading can affect aquatic life sustainability due to lack of oxygen.

Phosphorous is the leading contributor to nutrient loading that leads to eutrophication in Deer Creek Reservoir. The completion of Jordanelle Dam and Reservoir in 1995, which is upstream of Deer Creek Reservoir, helped reduce nutrient loading inflows into Deer Creek Reservoir by trapping phosphorous with retention and sedimentation. Further improvements were made through coordination with farmers and ranchers to prevent run-off from agriculture and feedlots as well as through other major projects such as the Provo River Restoration Project. Deer Creek Reservoir was considered very eutrophic during the 1980s but nutrient loading has since improved considerably and can now be classified as mesotrophic. With the significant decrease in phosphorous levels and its mesotrophic classification, Deer Creek Reservoir water is suitable for a wide range of uses, including Blue Ribbon fisheries, culinary water (with proper treatment), and irrigation.

Urbanization as well as sediment erosion from streambanks and reservoir shorelines is inevitable and will continue to affect nutrient loading in Deer Creek Reservoir. Measuring phosphate levels helps determine the potential for algal growth while measuring chlorophyll-a concentration defines actual algae content. Algae affects water transparency, which can be measured using a Secchi disk. Table 3-2 shows the relationship between these three parameters near the Deer Creek Dam.

The Total Maximum Daily Load (TMDL) targets developed by the state of Utah in 2002 for phosphorous and chlorophyll-a content in Deer Creek Reservoir are shown in red in Table 3-2. Surface and mid-level phosphorous levels generally stay below the TMDL. The hypolimnion can be a major source of phosphorous to surface layers when mixing happens in spring and fall. Spring runoff also affects nutrient loading. Phosphorous levels at reservoir bottom near the entrance to the reservoir, however, generally exceed the TMDL as levels steadily increase throughout the stratification months until turnover occurs in the fall. After the initial spring spike, chlorophyll-a levels remain fairly steady throughout the summer, well below the TMDL target. Chlorophyll-a levels (actual algal growth) follow mid-level and surface phosphorous levels, not reservoir bottom levels.

Table 3-2 Indication of Algal Growth near Deer Creek Dam in 2018

Parameter	Reservoir Level	19-Apr	24-May	14-Jun	18-Jul	15-Aug	24-Sep	25-Oct
Total Phosphorous (mg/L) TMDL: 0.025	Surface	0.02	-	0.01	0.01	0.02	0.03	0.02
Total Phosphorous (mg/L) TMDL: 0.025	Mid-level	0.05	0.01	0.01	0.02	0.01	0.03	0.02
Total Phosphorous (mg/L) TMDL: 0.025	Bottom	0.02	0.03	0.04	0.07	0.10	0.05	0.02
Chlorophyll-a (µg/L) TMDL: 5.1	Surface	24.6	2.4	2.5	2.5	2.4	2.6	2.2
Secchi disk depth (ft)	From surface	6.2	19.4	10.5	9.5	8.2	5.9	10.2

While algal growth and decay affect oxygen levels in the reservoir, most growth is not harmful to humans. However, phytoplankton such as blue-green algae (BGA), or cyanobacteria, produce cyanotoxins such as microcystins, and can create harmful algal blooms (HABs). BGA is identified by a foul taste and releases a strong odor as it decays. Conventional water treatment plants can generally remove the cyanotoxins, but a severe HAB event could pose challenges for downstream fisheries and raw water users.

Cyanobacteria levels in Deer Creek Reservoir remain below the threshold for human health developed by the World Health Organization (WHO). The Utah Department of Environmental Quality (DEQ) monitors for harmful algal blooms in Deer Creek Reservoir frequently in the upper end of the reservoir and in open water. This monitoring helps to warn Deer Creek State Park visitors of HABs and to discourage recreational use in contaminated areas. Algal blooms are more prevalent on the inlet side of the reservoir in the warmer months. Due to the excessive depth on the outlet side of the reservoir, HABs are not much of a concern for the current intake or the Proposed Action.

Total Suspended Solids and Turbidity

Total suspended solids (TSS) and turbidity are the most visible indicators of water quality. TSS is comprised of both organic and inorganic materials in the water column. Sediments like sand, silt, and clay typically make up most of the suspended solid count, but algae and bacteria can be present. Soil erosion, urban runoff, eroding streambanks, stirred-up reservoir bottom sediments from boating and other activities, and excessive algal growth can all add to the suspended solids in the reservoir. A TSS measurement provides a total quantity in mass of solids per unit volume of water.

Turbidity is an indirect measurement of suspended solids by determining the intensity of light that scatters off of the particles. Turbidity does not capture heavier solids that settle such as gravel and sand. Turbidimeters may also produce lower than actual turbidity readings because of dissolved materials that absorb light instead of reflecting it but remains a more accurate means of measuring turbidity than a Secchi disk that relies purely on human observation.

Table 3-3 shows TSS levels and turbidity readings in terms of Nephelometric Turbidity Units (NTUs) and feet of clarity with a Secchi disk near the existing intake. The highest concentration of suspended solids tends to be located near the surface and bottom of the reservoir. Midwater levels are relatively low with a peak during fall turnover mixing.

Table 3-3 Water Clarity near Deer Creek Dam in 2018

Parameter	Reservoir Level	19-Apr	24-May	14-Jun	18-Jul	15-Aug	24-Sep	25-Oct
Total Suspended Solids (mg/L)	Surface	8.0	-	4.0	-	4.0	4.0	4.0
Total Suspended Solids (mg/L)	Middle	5.0	-	11.0	-	4.0	-	-
Total Suspended Solids (mg/L)	Bottom	6.0	-	-	7.0	6.0	13.0	-
Turbidity (NTU)	Surface	2.3	1.0	2.3	2.1	1.7	3.1	1.9
Turbidity (NTU)	Middle	1.5	0.7	1.4	1.1	1.3	2.9	1.7
Turbidity (NTU)	Bottom	1.3	12.0	2.9	7.1	5.7	12.0	2.0
Secchi disk depth (ft)	From Surface	6.2	19.4	10.5	9.5	8.2	5.9	10.2

The turbidity levels observed are relatively low compared to other bodies of water throughout the United States, and flocculation and clarification processes in water treatment plants are well equipped to treat these levels of solids.

As stated in the project drivers for pursing the Proposed Action, AIS, specifically the Quagga mussel, are considered a long-term threat to Deer Creek Reservoir. Utah has been actively trying to slow the spread of Quagga mussel ever since Lake Mead became infested in 2007 and the subsequent infestation of Lake Powel in 2013. As part of this effort, the Utah Division of Wildlife Resources have documented that the water body most frequently visited directly after a boat is removed from Lake Powell is Deer Creek Reservoir. The most prevalent spread of mussels is through the attachment to the exterior surfaces of a boat or transport in the ballast tank of a boat. A water sample in October 2014 tested positive for Quagga mussel DNA in Deer Creek Reservoir. Deer Creek State Park in coordination with the Division of Wildlife Resources instituted both prevention and containment procedures that have effectively shown that the species is not in the reservoir. Subsequently, in January 2018 the Suspect Water Body designation was removed from Deer Creek Reservoir. Boat inspections and equipment washing by Deer Creek State Park staff are standard practice for any boats entering Deer Creek Reservoir. This project plans to apply Foul Release Coatings (FRC) on the new intake, old intake trash racks, and the new 72" butterfly valves within the new vault as a mitigation strategy for aquatic invasive species (i.e., Quagga mussels). This project is also providing isolation for the existing tunnel and the new bypass piping so that if FRCs are needed in these areas in the future they could be field applied.

<u>Fish</u>

Deer Creek Reservoir is designated as a Class 3A cold water, Blue Ribbon fishery. The temperature limit in the state of Utah for a Class 3A fishery is 20°C. Surface temperatures in Deer Creek Reservoir exceed the state guidelines during the summer months. The rainbow trout in Deer Creek Reservoir prefer water temperatures ranging from 7 to 18°C (45 to 64°F), while stream trout prefer temperatures ranging from 12 to 19°C (54 to 66°F). Table 3-4 shows the other types of fish in Deer Creek Reservoir.

Table 3-4 Select Fish Species in Deer Creek Reservoir

Fish Species	Diet	Spawning Season	Temp. for Spawning (°C)**	Temp. for Growth (°C)**	Habitat
Black Crappie	small fish, invertebrates (primarily zooplankton, insects)	Spring and early summer	17	27	slow-moving warm water
Bluegill	small fish, zooplankton, insects, insect larvae, other invertebrates	Spring and summer	25	12	warm shallow water
Brown Trout	fish, amphibians, rodents, invertebrates (insects, snails, crayfish)	Fall	8	17	endures poor water quality well
Common Carp	anything	Early to late spring	21	-	shallow water
Crayfish	algae, moss, plants	Late winter and Spring	-	-	rocky, weedy shorelines (deep in winter)
Largemouth Bass	crayfish	Spring or summer	23	32	clear, vegetated water
Rainbow Trout	insects, small fish, invertebrates	Early to late spring	9	19	cooler water
Smallmouth Bass	crayfish	Spring	17	19	shallow, rocky, cool water
Utah Chub*	zooplankton, insects, small fish, plants	Late spring and summer	-	-	dense vegetation
Walleye	fish, amphibians, rodents, invertebrates (insects, snails, crayfish)	Spring	8	25	open water, vegetation beds
Yellow Perch	zooplankton, crayfish, small fish	Spring	12	29	clear, weedy water

* - species native to Utah
** - Temperatures are reported as maximum weekly averages

Construction activities can stir up settled fines on the bottom of the reservoir and lead to temporary concentrations of suspended solids in the reservoir and ultimately downstream in the lower river. These high turbidity levels put stress on fish as it negatively affects their breathing and overall activity level. A turbidity curtain is planned to substantially mitigate these risks. This physical barrier isolates the construction area from the rest of the reservoir and the existing intake. A similar barrier would provide protection for the fish species in Deer Creek Reservoir and downstream of the outlet works in the lower Provo River.

The proposed construction area is in close proximity to the existing intake, and some activities may require the structure to be isolated to the turbid conditions. Under these conditions, flow through the outlet works would be separated by turbidity curtains.

Uninterrupted flow to the lower Provo River is top priority for water shareholders but maintaining current hydrology patterns is also critical from an environmental perspective. Table 3-5 shows that spawning seasons vary for different species of fish, and proper flows need to be maintained throughout these seasons to not affect these delicate processes. Construction in the wet does not impact spawning seasons.

Table 3-5 Select Fish Species in Lower Provo River

Fish Species	Diet	Spawning Season	Temp. for Spawning (°C)**	Temp. for Growth (°C)**	Habitat
Brown Trout	fish, amphibians, rodents, invertebrates (insects, snails, crayfish)	Fall	8	17	endures poor water quality well
Common Carp	anything	Early to late spring	21	-	shallow water
Cutthroat Trout*	fish, amphibians, rodents, invertebrates (insects, snails, crayfish)	Spring	-	-	shallow, well-oxygenated gravel bottom
June Sucker*^	zooplankton	June	-	-	shallow saline waters (spawn in river)
Mountain Whitefish*	insects, fish eggs, small fish	Late fall to early winter	-	-	shallow, well-oxygenated gravel bottom
Rainbow Trout	insects, small fish, invertebrates	Early to late spring	9	19	cooler water
Walleye	fish, amphibians, rodents, invertebrates (insects, snails, crayfish)	Spring	8	25	open water, vegetation beds
White Bass	zooplankton, invertebrates, fish	Spring	17	28	lakes and rivers

* - species native to Utah
^ - threatened species
** - Temperatures are reported as maximum weekly averages

Standard operating procedures from 1937 won't change much as the goal is to keep water quality consistent with historic operations. Water temperature, dissolved oxygen, and phosphorus were discussed in the January 2022 TM entitled "Potential Impacts of proposed Intake/Bypass" and are reiterated below.

Water temperatures at the existing intake vary from month to month. The water column in the winter has consistent results no matter the depth; however, in May through August, the largest temperature ranges occur as depth varies. Figure 3-1 shows the average water temperature at the existing intake (blue) and the proposed intake/bypass (pink) from May through September, and how the temperatures varied between 2011 and 2019. The largest water temperature difference between the intake and proposed intake/bypass occurs in July, with an average of 3°F difference from the existing intake to the new bypass. The next largest temperature differential (between the existing intake and intake/bypass) is in June and August, with an average difference of 2.2 and 2.3°F, respectively. Therefore, the proposed intake/bypass will have the biggest impact to water temperature changes during the month of July (on average).

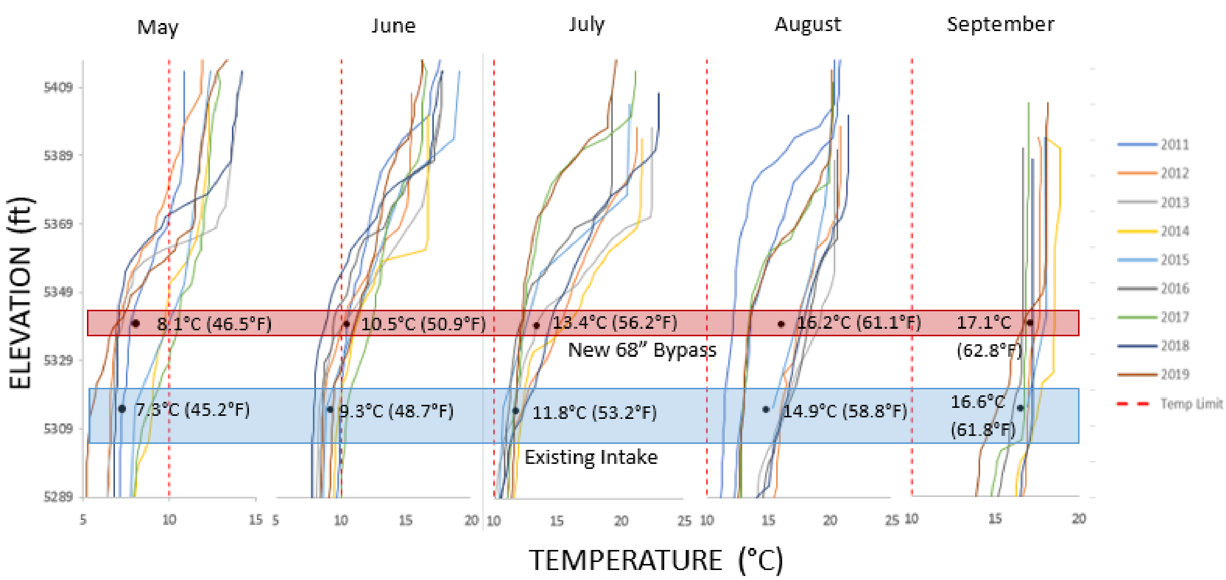

Figure 3-1 Water Temperature vs Elevation in May Through September

Figure 3-1 also shows that temperatures increase from May to September, with the average September high water temperature of 62.8°F at the proposed intake/bypass level and 61.8°F at the existing intake. The highest recorded temperature at both elevations occurred in 2014, when water reached temperatures of 18.5°C (65.3°F) and 17.6°C (63.7°F), respectively. Note this is still considerably less than the critical temperature for Provo River fish species.

In 2018 and 2019, September water temperatures only reaching 17.2°C (63.0°F) and 16.7°C (62.0°F) at the proposed intake/bypass elevation and 17.2°C (62.9°F) and 15.2°C (59.4°F) at the existing intake. These temperatures are less than the extreme temperatures found in 2014, and likely more reflective of temperatures anticipated during the upcoming construction seasons.

Dissolved oxygen (DO) is essential for the survival of fish and other river aquatic life. In addition to the DO in Deer Creek Reservoir, the water coming through the intake and power plant is discharged in a turbulent manner (on purpose) as this discharge method helps increase dissolved oxygen in the lower Provo River, allowing the water to entrap air.

Figure 3-2 is a chart showing the amount of dissolved oxygen available at different elevations in the reservoir (prior to increasing DO via turbulent discharge method). Notice how the fish will benefit from the proposed intake/bypass with higher DO levels. This is evident in July and August; however, in September the new bypass provides the largest boost.

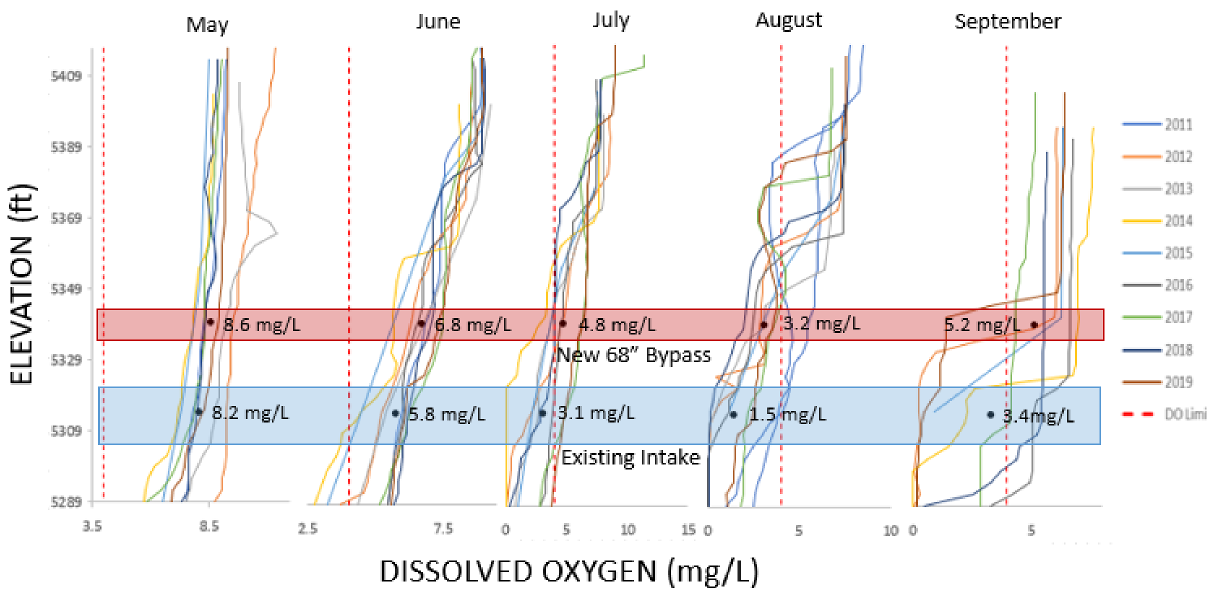

Figure 3-2 Dissolved Oxygen vs Elevation in May Through September

Phosphorous levels vary slightly from the elevation of the existing intake to the proposed intake/bypass, with the proposed intake/bypass elevation containing less phosphorous in the water. Table 3-6 shows the average phosphorous measured at the elevation of the existing intake and proposed intake/bypass from 2011 to 2019.

Table 3-6 Average Phosphorous (mg/L) in Reservoir from May through September

Elevation	May	June	July	August	September
Existing Intake	0.01	0.02	0.03	0.05	0.03
Proposed Intake/Bypass	0.01	0.01	0.02	0.02	0.03

As you can see from Table 3-7, the water quality remains consistent when comparing water from the existing intake and the proposed intake/bypass. The largest differences are summarized as follows:

Table 3-7 Proposed Intake/Bypass Differences from Existing Infrastructure

Proposed Bypass Impacts	Occurrence	Maximum Differential
Temperature	July	3 °F Higher Temperature
Dissolved Oxygen	September	1.8 mg/l Additional DO
Phosphorous	August	0.03 mg/L Less Phosphorous

3.2.1 Impacts on Water Quality

3.2.1.1 No Action

Under the No Action Alternative, the Project would not be built, and therefore would have no effect on water quality from construction activities. The Reservoir would not be modified. This means no temporary disturbance during construction. However, this also means no modification to guard gates or isolation of infrastructure and redundancy features. Should the guard gates become inoperable in an open or closed position, there would be no way for the existing, aging infrastructure to maintain water deliveries downstream. Not anticipating such needs would potentially mean leaving users without a water supply for a period of time while repairs are made or a solution found. The fish and the downstream Provo River environment depend on the in-stream flows; the No Action alternative puts them at risk if nothing is done. This alternative would not meet the purpose and need identified for the project.

3.2.1.2 Proposed Action

The Proposed Action would include project construction taking place in the water. To minimize any potential impacts to water quality, the Proposed Action will comply with stormwater requirements, including turbidity curtains to prevent any sediment issues in the water channel. Quagga mussel mitigation is also a driver of the project, and foul resistant coatings would be employed to minimize the potential for an infestation.

Turbidity curtains are flexible, impermeable barriers that contain sediment in work zones so water quality is not impacted. These curtains float at the top of the water surface and drape down to the bottom of the reservoir where they are weighted/anchored to ensure sediment does not travel under the curtain. Turbidity curtains will be in position whenever work may produce turbidity which includes the following events: 1) benching/excavating, and 2) exit of the microtunnel. However, when the water quality is the same on both sides of the curtain, the contractor may lower the curtains in order to mobilize staging equipment. Turbidity curtains rely on settling to remove suspended solids and as discussed above, the limestone particles are anticipated to settle quickly as no colloidal particles have been encountered. Turbidity curtains were discussed previously during construction methods and would be in place during construction to help meet permit designations, such as the Utah Stormwater Construction permit limitations on 10 NTU for turbidity. This is a common best management practice (BMP) during construction in open water and is an effective way to limit impacts from sedimentation and manage construction risks.

Trash racks are intended to prevent submerged debris from entering into the outlet works while maintaining water releases. There are several aspects of trash rack design that can mitigate Quagga mussel issues. The spacing between bars should be wide enough to still allow some flow in the event of mussel infestation. Potentially one of the most effective mussel mitigation strategies involves selection of a trash rack coating that prevents mussel attachment. The original Reclamation trash rack design drawings show the bar spacing is four inches on center which will not change with the new rehabilitation efforts.

3.3 Waters of the U.S.

Waters of the U.S. (WOTUS) provide important and beneficial environmental functions. Wetlands and surface waters aid the environment by protecting and improving water quality, providing fish and wildlife habitat, and storing floodwaters. Through section 404 of the Clean Water Act of 1972, as amended, the U.S. Army Corps of Engineers (USACE) is the permitting authority for the discharge of dredged or fill material into all Waters of the U.S.

According to the National Wetlands Inventory (NWI), Deer Creek Reservoir is classified as a lacustrine system and is considered a WOTUS as defined in 40 CFR 230.3.

3.3.1 Impacts on Wetlands

3.3.1.1 No Action

Under the No Action Alternative, the Project would not be built, and therefore there would be no negative effect on wetlands or other WOTUS. However, if the outlet works failed due to age, water could be prevented from flowing downstream and this would have a detrimental effect on the rivers and wetlands downstream.

3.3.1.2 Proposed Action

Under the Proposed Action, the Project design does not currently anticipate any impact on wetlands. Construction of the Proposed Action would include the discharge of fill material into a WOTUS (Deer Creek Reservoir) and would require a Section 404 permit from the USACE, though compensatory mitigation is likely not required. In discussions with staff from USACE, it was determined the Proposed Action would likely fall under nationwide permit 7 (see section 5.2) and require preconstruction notification.

One area of note is the benching for the microtunnel. In order to construct the exit portal, some existing tallus and limestone bedrock would need to be removed to provide a level surface in which to construct the exit portal retaining wall. This area is designated in pink in Figure 3-3. Excavated tallus is proposed to be placed in the green area shown in Figure 3-3. Figure 3-4 shows additional exit portal retaining wall design details. The proposed quantity of tallus removal is 972cy and the proposed quantity of bedrock benching is estimated to be 200cy.

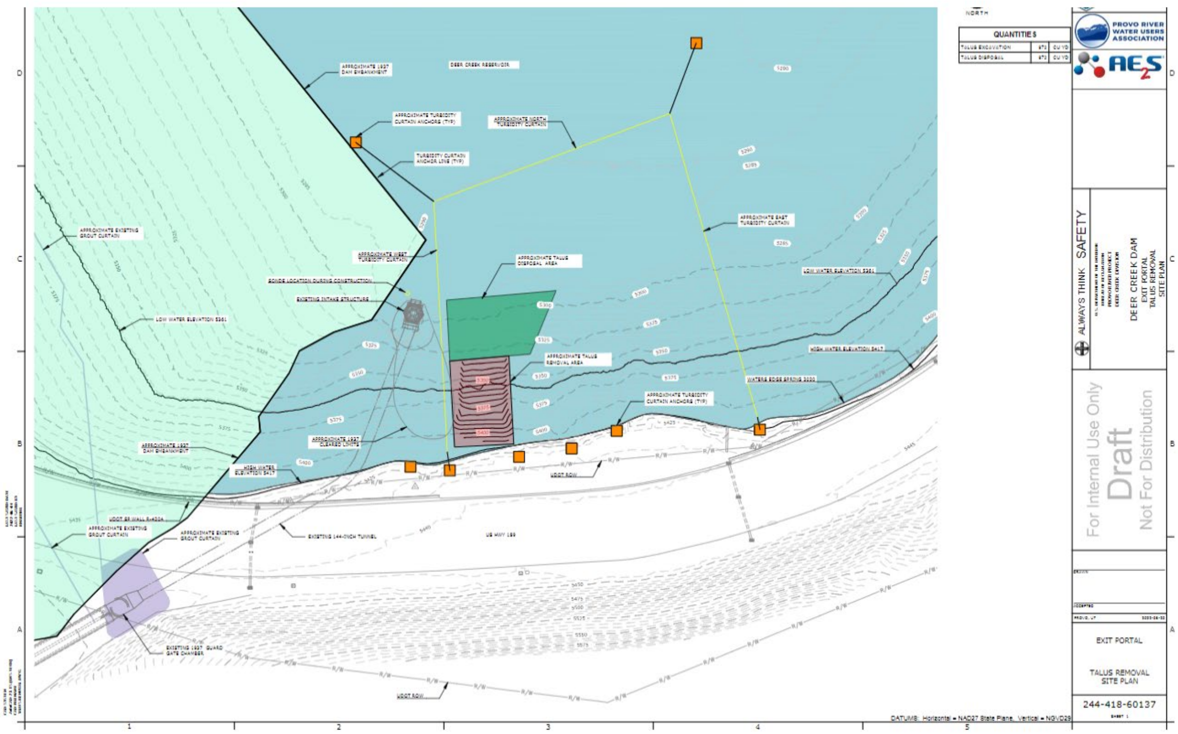

Figure 3-3 Talus Removal Area and Disposal Area to Support Microtunnel Exit Portal Construction

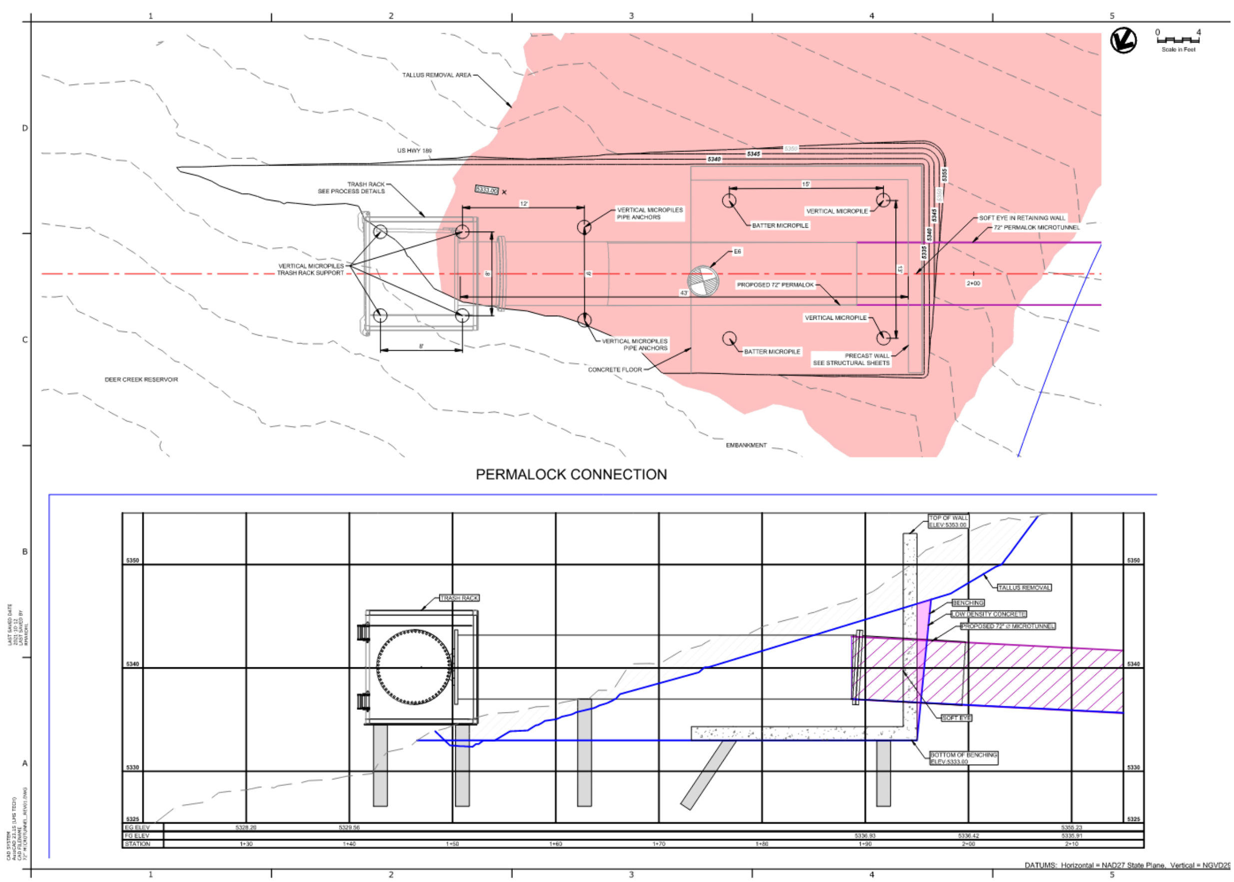

Figure 3-4 Detail of Proposed Benching and Access to Microtunnel

3.4 Migratory Birds including Bald and Golden Eagles

Surveys of raptor nests were completed for the project area. During initial surveys four nests were found near the project area; three nests were determined to be inactive, and one was active. The active nest was shown to be occupied by a pair of golden eagles during the initial surveys in 2021. Nest monitoring was conducted during the following nesting season (2022) which found the nest active and occupied again by a pair of golden eagles. Reclamation and United States Fish and Wildlife Service (USFWS) have been actively consulting since the discovery of nest locations and surrounding terrain characteristics. Figure 3-5 shows the raptor survey area including potential nesting habitat and a two-mile buffer area.

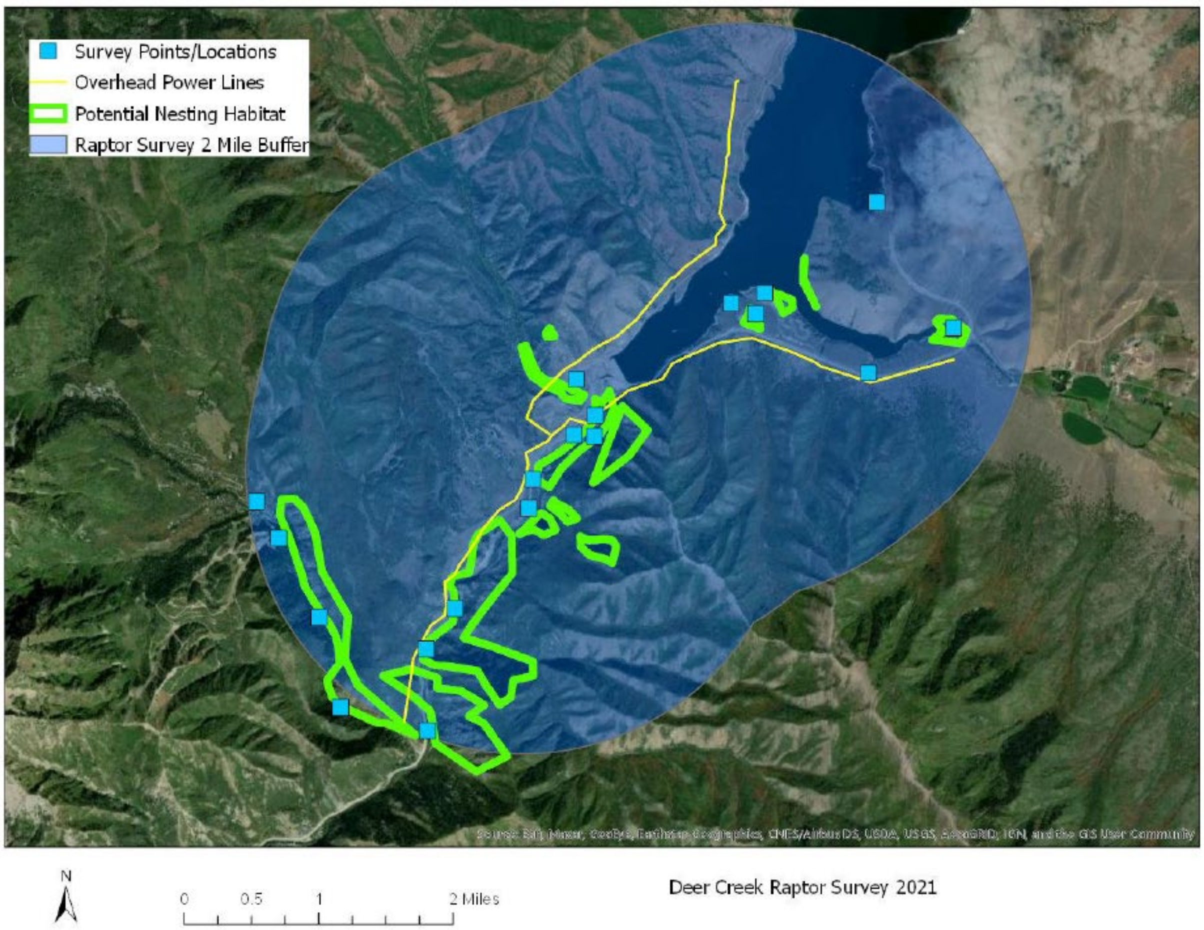

Figure 3-5 Raptor Survey including Potential Nesting Habitat and 2-Mile Buffer

3.4.1 Impacts to Raptors

3.4.1.1 No Action

Under the No Action Alternative, the Project would not be built, and therefore there would be no effects on raptors or their nests. Water and habitat conditions would remain the same.

3.4.1.2 Proposed Action

Under the Proposed Action there would be no significant effects to raptors. The surveys conducted found three nests that would not be impacted. There is a nest near US 189 and recreational areas which suggests the pair is tolerant of human disturbance and that the Proposed Action would not have substantial impact to the eagles. USFWS staff agreed with this determination. Therefore, there would be minimal, if any, impacts to raptors in the Project area.

3.5 Cultural Resources

Under 36 CFR Part 800 cultural resources are defined as physical or other expressions of human activity or occupation that are over 50 years in age. 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 National Historic Preservation Act of 1966, as amended (NHPA), mandates that Reclamation take into account the potential effects of a proposed Federal undertaking on historic properties. Section 106 defines historic properties 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.

3.5.1 Impacts on Cultural Resources

No sites or isolated occurrences were found within the study area or at Deer Creek State Park. Reclamation archaeologist Zachary Nelson, Ph.D. identified five historic cultural resources near or within the project area as seen in Table 3-8. The proposed project would modify the Deer Creek Dam Complex (Site 42WA531), which is ineligible for inclusion on the National Register of Historic Places.

Table 3-8 Historic cultural resources near or within the proposed project area

Site	Description	Eligibility	Impact
7327	Deer Creek Dam Bridge (Od 404)	Destroyed	No impact
108360/42WA531	Deer Creek Dam Complex	Ineligible	No impact
42WS112	Historic Heber Valley Railroad	Eligible	No impact
42WA177	Historic Government Camp Structures	Ineligible	No impact
42WS449	US-189 abandoned segment	Eligible	No impact

3.5.1.1 No Action

Under the No Action Alternative, the Project would not be built, and therefore there would be no adverse effects to cultural resources. Existing conditions would continue.

3.5.1.2 Proposed Action

The proposed action would have no effect on historic properties. Work in the wet would not impact new areas with any expected cultural resources. However, should any cultural resources be found during any construction activities, the work would immediately be halted, and the proper agencies notified until an archaeologist can be brought on site to evaluate conditions.

3.6 Environmental Justice

Executive Order 12898 sets the goal of Environmental Justice as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. The Environmental Justice EJScreen tool supported by the US Environmental Protection Agency was used to analyze the proposed project area.

Deer Creek Dam is located in Wasatch County Utah. No one lives at or along Deer Creek Reservoir. It is an area used for recreation so many local people use the area for tourism and activities like boating and fishing. Because the proposed project area is not within an incorporated city, the county demographics provide a better understanding of the area and environmental justice.

Wasatch County has a population of 34,788, with 95.4% identifying as white. The median household income for the County is $85,807. The percent of people in poverty is estimated at 4.7% (Small Area Income and Poverty Estimate, which may limit how it can be compared to other geographies).

Regionally, the area around Deer Creek and Wasatch County is at high risk for Wildfire Hazard Potential. Figure 3-6 shows the wildfire hazard potential for the area surrounding Deer Creek Dam.

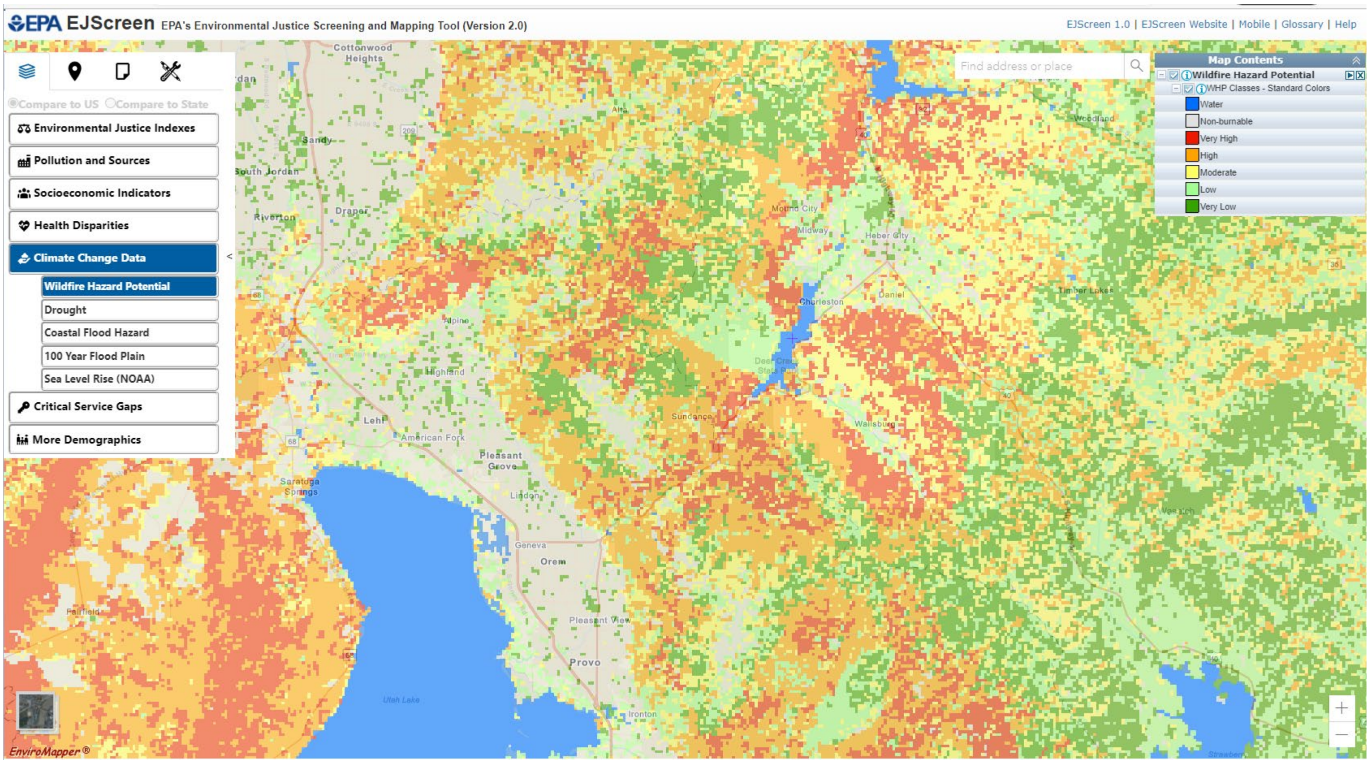

Figure 3-6 Fire Hazard Potential around Deer Creek Dam

Ground level ozone is also considered an environmental justice concern. Regionally the area has high ozone. This is not specific just to Deer Creek Dam; it is a local condition. Figure 3-7 shows ozone for the regional area around and including Deer Creek Dam.

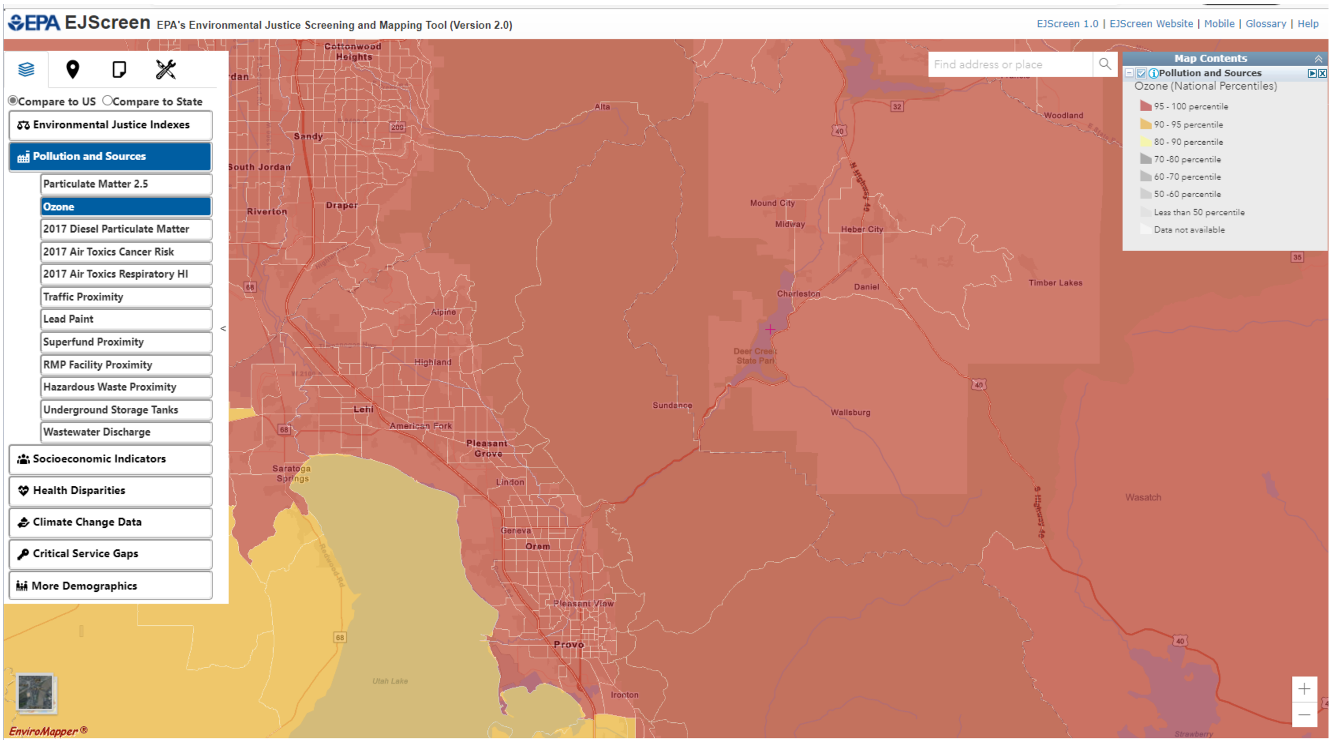

Figure 3-7 Ozone for area around Deer Creek Dam

The proposed project delivery provides an opportunity for those in the area and region to benefit from the water reliability regardless of race, minority, or poverty level and would meet the goal of the Executive Order 12898. The impacts would be temporary and generally located in an area where people do not live so the impacts from construction activity are not anticipated to burden any group of people disproportionately.

3.7 Climate Change

Climate change impacts are anticipated to impact geographies in unique ways as changes in precipitation and temperature are expected.

Figure 3-8 shows how temperatures across the United States have changed over the last one hundred years. In Wasatch County specifically where Deer Creek Reservoir is located, temperatures have risen by approximately 2 degrees Fahrenheit for the last decade (1996-2006), compared to the average for the last 100 years.

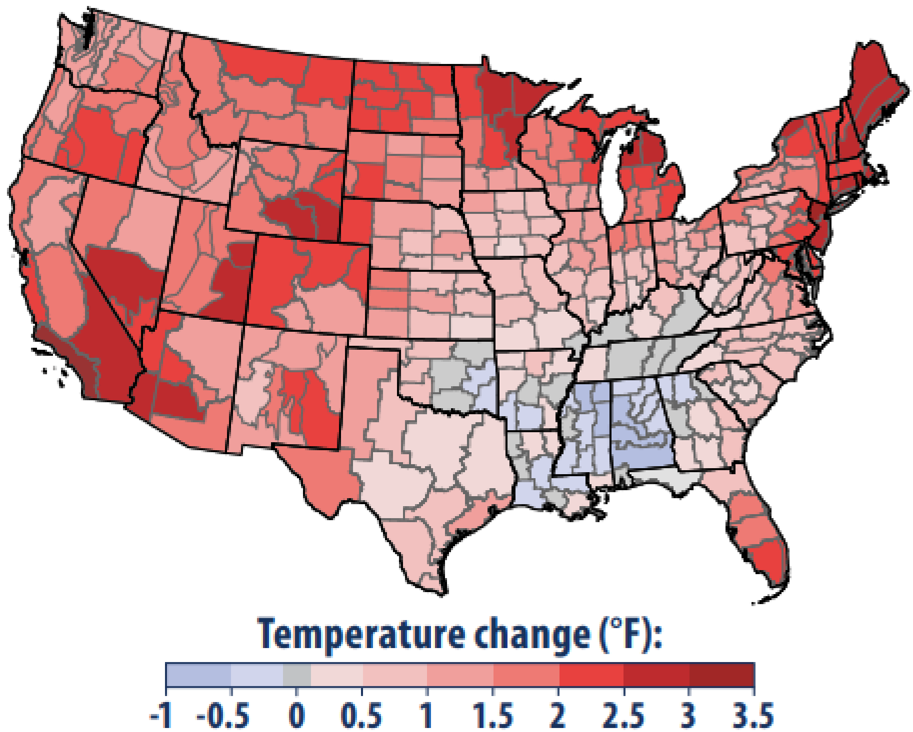

Figure 3-8 Change in temperatures across the United States

Average April snowpack has declined since 1955 and could be caused by elevated air temperatures inducing premature snowmelt. Figure 3-9 shows the change in snowpack since 1955. Climate models suggest that overall precipitation in Northern Utah may increase as temperatures increase, but that precipitation would come as rain not snow. Premature snowmelt creates an inefficient, slow runoff that is subject to evaporation and absorption over a longer period of time. Even though precipitation levels may rise, inflows to Deer Creek Reservoir could potentially be reduced. This could be a potential impact of climate change on the Deer Creek Reservoir and the users who are supplied water.

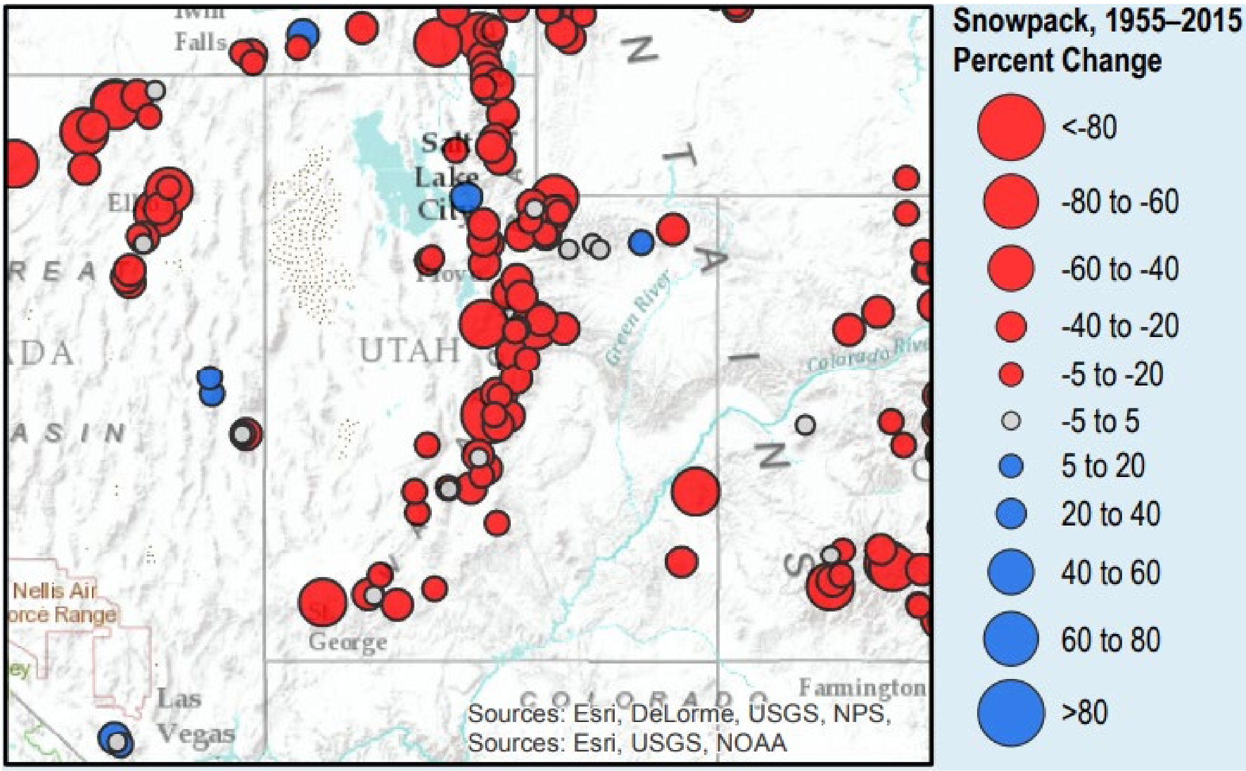

Figure 3-9 Percent change in snowpack for Utah since 1955

Climate models are also projecting stronger precipitation events. Intense rain events create larger amounts of sediment runoff into the reservoir, which in turn increases the amount of nutrient loading, and eutrophication may occur. This condition has already been addressed in terms of intake design. Elevated air temperatures and reduced inflows are the main potential effects of climate change considered.

Table 3-9 includes research conducted at Brigham Young University in 2011 that modeled the effects of increased air temperature and decreased inflow on water temperature, stratification, and algae concentration, specifically for Deer Creek Reservoir. The effects of decreased inflow describe potential drought conditions, which is perhaps the most undesirable outcome of climate change for the reservoir. In addition to this study, increased temperature could also increase the likelihood of Quagga mussel settlement.

Table 3-9 Potential Effects of Climate Change on Deer Creek Reservoir

Parameter	Increase Air Temperature	Decrease Inflow
Water temperature	Water temperature increases 1°C for every 3°C of air. This leads to an increase in algal blooms and consequently larger anoxic zone in the hypolimnion layer.	Water temperature increases with decreased flow. This leads to an increase in algal blooms and consequently larger anoxic zone in the hypolimnion layer.
Stratification	More intense stratification and starts earlier and ends later in the year. Length of Ice-over period on reservoir decreases.	Lower inflows with consistent outflows would cause reservoir level to decrease. Sunlight is then able to penetrate farther and create a weaker stratification.
Algae concentration	Summer months too hot for algae and content decreases (further research needed). No significant changes in the fall and winter.	Decreased inflows increase algal content.

3.7.1 Impacts on Climate Change

To estimate the emissions of the Proposed Action, the USEPA Greenhouse Gas Equivalencies Calculator was used with fuel estimates provided by the contractor. Estimates are based on the following equations that convert diesel and gasoline usage to carbon dioxide emissions.

Equation 1 shows the diesel equivalent used to calculate emissions from diesel fuel.

Equation 1: Diesel Emissions Equivalency

$$10{,}180\ g\ of\ \frac{CO_2}{gal}\ of\, diesel = 10.180 * 10^{-3}\ metric\ tons\ \frac{CO_2}{gal}\ of\ diesel$$

Equation 2 shows the gasoline equivalent used to calculate emissions from gallons of gasoline.

Equation 2: Gasoline Emissions Equivalency Equation

$$8{,}887\ g\ of\ \frac{CO_2}{gal}\ of\, gasoline = 8.887 * 10^{-3}\ metric\ tons\ \frac{CO_2}{gal}\ of\ gasoline$$

Table 3-10 below uses these diesel and gasoline equivalency equations to calculate the CO_2 equivalent emissions from the amount of fuel being used for each piece of equipment used to construct the proposed project.

Table 3-10 Fuel Consumption and CO2e Emissions

Contractor and Vehicle Type	**Fuel Type**	**Fuel (gallons)**	**CO_2e Emission (Metric Tons)**
Granite	-	-	-
Total Gasoline	Gasoline	24775	219.75
Total Diesel	Diesel	30305	308.51
Total Offroad Fuel	Diesel	21877	222.71
Total Boat Fuel	Gasoline	21554	191.18
Mountain Crane	-	-	-
110 TN Crawler Crane (diesel)	Diesel	7260	73.91
2250 (300 TN) Crawler Crane	Diesel	3520	35.83
80 TN RT Crane	Diesel	4125	41.99
Malcolm	-	-	-
3/4 TN Pick-Up	Diesel	4800	48.86
Clemm 805	Diesel	1665	16.95
IR/Sullair 9000 CFM Compressor	Diesel	5000	50.90
OLIN 5	Diesel	835	8.50
Skytrack Forklift	Diesel	1553	15.81
Generator	Diesel	1765	17.97
Miller Welder	Diesel	886	9.02
Komatsu PC128 Excavator	Diesel	2000	20.36
Reed B20 Concrete Pump	Diesel	384	3.91
IR/Sullair 375 CFM Compressor	Diesel	384	3.91
CORE	-	-	-
Work Vans	Gasoline	1470	13.04
3/4 TN Pick-Up	Diesel	4400	53.75
Welding Machines	Diesel	5280	53.75
Forklifts	Diesel	3520	35.83
Compressor	Diesel	1320	13.44
Generator	Diesel	2640	26.88
JW Fowler	-	-	-
Air Compressor 185 CFM	Diesel	206	2.10
Backhoe – Rubber Tired	Diesel	590	6.01
Forklifts	Diesel	502	5.11
125 KW Gen Set	Diesel	9623	97.96
Loader CAT 938	Diesel	4290	43.67
¾ TN Pickup Trucks	Diesel	10080	102.61
Welder Lincoln 250 Amp	Diesel	977	9.95
Crawler Crane 100 Ton	Diesel	4620	47.03
1000 KW Gen Set	Diesel	39600	403.13
Brennan	-	-	-
Hot Water Unit	Diesel	28746	292.63
Hot Water Unit	Propane	28746	254.98
LP Dive Compressor (5120)	Diesel	15111	153.83

Contractor and Vehicle Type	Fuel Type	Fuel (gallons)	CO_2e Emission (Metric Tons)
100 KW Generators	Diesel	12137	123.55
50 KW Generators	Diesel	7321	74.53
Welder/Generator	Gasoline	1516	13.45
HPU - Sized for LARS	Diesel	8702	88.59
HPU - Sized for Tooling	Diesel	2176	22.15
185 Tool Air Compressor	Diesel	5867	59.73
5k Pressure Washer	Gasoline	990	8.78
CVE	-	-	-
3/4 TN Pickup	Diesel	500	5.09
1/2 TN Pickup	Gasoline	3500	31.05
Total	-	-	**3332.68**

The carbon footprint, the total emissions in a carbon dioxide equivalent (CO_2e), of the proposed Deer Creek Intake Project is about 3,333 metric tons CO_2. This level of emissions is roughly equivalent to building approximately 42 houses, with an estimated 80 metric tons of CO_2e. There is a large component of this project that will offset greenhouse gas emissions in the future, by continuing to flow water through the hydropower plant at the base of Deer Creek Dam when the intake tunnel is closed.

In Utah, the total carbon dioxide emissions from all energy sectors (transportation, buildings, etc.) totaled 60.4 million metric tons of carbon dioxide in 2018. Years 2013 to 2018 all had carbon dioxide emissions between 58.9 million metric tons to 67.2 million metric tons. Using 2018 numbers, the total percentage of carbon emissions that would come from the Proposed Action is 0.005%, minimal compared to the total carbon dioxide emissions released in Utah.

Many states have policies in place to reduce greenhouse gas emissions. Utah is not one of them, at this time.

3.8 Cumulative Effects

In addition to Project-specific impacts, Reclamation analyzed the potential for significant cumulative effects to resources affected by the Project and by other past, present, and reasonably foreseeable activities within the watershed. The Council on Environmental Quality's regulations for implementing NEPA (40 CFR 1508.1(g)(3)) state that cumulative effects "are effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time." A cumulative effects analysis 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.

3.8.1 Methodology

The majority of the lands surrounding the Project area are managed by Reclamation, the U.S. Forest Service (USFS), with some private and State-managed lands also in the area. Therefore, Reclamation searched agency websites and contacted agency/organization staff to identify past, present, or reasonably foreseeable projects with potential for cumulative effects.

- USFS—Reclamation USFS's project website for the Uintah-Wasatch-Cache National Forest (https://www.fs.usda.gov/projects/uwcnf/landmanagement/projects) to determine if there were any projects in the area that may contribute to cumulative effects.
- Reclamation—Reclamation internally reviewed projects and activities that Reclamation was planning, implementing, or cooperating on.
- State—Reclamation reviewed known State of Utah projects and activities in the area.
- Private—Reclamation searched the Wasatch County development office's website (https://www.wasatch.utah.gov) to determine if there were any projects in the area that may contribute to cumulative effects.

3.8.1.1 USFS

No USFS projects were identified that would contribute to cumulative effects.

3.8.1.2 Reclamation

No Reclamation projects were identified that would contribute to cumulative effects.

3.8.1.3 State – Utah Division of Parks and Recreation

Reclamation identified two projects by Utah Division of Parks and Recreation (UDPR) with potential for cumulative effects, both of which are recreation improvement/maintenance projects at the main park area of Deer Creek State Park. The impacts of one of these projects are described in PRO-EA-21-003 (https://www.horrocksengineers.com/utah-state-parks). The other project did not need NEPA compliance because it was an O&M activity that maintained the status quo (see section 4.9 of Reclamation's NEPA handbook [https://www.usbr.gov/nepa/docs/NEPA_Handbook2012.pdf]). It did comply with all other environmental laws such as NHPA, ESA, and CWA.

Potential improvements at Deer Creek Island State Park are being identified by UDPR, Reclamation, and the Utah Department of Transportation (UDOT). The project benefits would create safer ingress/egress and improve access and parking. These improvements would coincide with UDOT's US-189 widening project, described in Section 3.8.1.4.

3.8.1.4 State – Utah Department of Transportation

Two improvement projects were completed by UDOT in 2016. The US-189 corridor was widened near Deer Creek Reservoir between mileposts 19.4 and 22.5, and the intersection at Rainbow Bay Day Use Area was expanded to a High-Tee design.

An Environmental Impact Statement for the Heber Valley Corridor Project in Wasatch County, Utah is being conducted by UDOT. This project will improve regional and local mobility on US-40 from SR-32 to US-189 in the Heber Valley. UDOT is developing transportation alternatives that will also provide opportunities for non-motorized transportation and allow Heber City to improve the historic town center.

Project link: https://hebervalleyeis.udot.utah.gov/

UDOT has initiated a State Environmental Study (SES) to evaluate impacts associated with widening US-189 from the Rainbow Bay Area near Wallsburg, Utah to the SR-113 junction near Charleston, Utah. This project will widen the existing two lanes to four lanes over this 2.3-mile stretch of highway, update the highway to current standards to enhance safety, and mitigate the risk of crashes due to wildlife collisions. UDOT is also working with UDPR and Reclamation to make improvements at Deer Creek Island State Park.

Project link: https://storymaps.arcgis.com/stories/812755644eeb4d5dac4e3e9626598a23

3.8.1.5 Private

Canyon Meadows Subdivision and Wastewater Treatment Facility

Canyon Meadows subdivision is an existing, approved subdivision on private land west of Deer Creek Dam. The Canyon Meadows Mutual Water Company (CMMWC) is proposing to build a wastewater treatment facility that would replace septic tanks in the subdivision. CMMWC approached the Owl's Nest Special Service District (ONSSD) in January 2022 (ONSSD 2022a) via letter about ONSSD operating and maintaining the sewer system after it is built. The ONSSD board voted to look into the matter further in the April 2022 board meeting (ONSSD 2022b).

3.8.2 Cumulative Effects Analysis

Reclamation reviewed the potential for there to be additive or interactive effects from the Proposed Action in combination with the projects listed above. Effects on transportation, recreation, and (potentially) migratory bird nesting and/or foraging habitat are anticipated from the UDOT and UDPR projects; however, none of these resources would be measurably affected by the Proposed Action. Therefore, there could be no cumulative effects on those resources.

Similarly, the Proposed Action would not result in an adverse effect on eligible historic properties. Therefore, even if the projects listed above adversely affect eligible historic properties, there could be no cumulative effect with the Proposed Action.

3.8.2.1 Water Quality

There would be no combined or interactive effect on water quality from the Proposed Action and cumulative effects projects. This is true even for the CMMWC wastewater treatment facility because discharges from the facility would not be expected to affect temperature or dissolved oxygen, the only two water quality factors that have potential to be affected by the Proposed Action.

3.8.3 Conclusion

The Proposed Action would not have significant cumulative effects when combined with other past, present, and reasonably foreseeable projects, as described in the sections above.

4 Environmental Commitments

Environmental Commitments, along with Minimization Measures in Section 2.5 have been developed to further lessen the potentially minimal effects of the Proposed Action. The following environmental commitments will be implemented as an integral part of the Proposed Action.

4.1 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 area, additional environmental analyses will be completed as determined necessary.

4.2 Standard Reclamation Best Management Practices

Standard Reclamation BMPs will be applied during Project activities to minimize environmental effects and will be implemented by Project work forces or included in Project activity specifications. Such practices or specifications include erosion control, public safety, dust abatement, air pollution, noise abatement, water pollution abatement, waste material disposal, archaeological and historical resources, vegetation, wildlife, and flood control. Excavated material and debris may not be wasted in any stream or river channel in flowing waters. This includes material such as grease, oil, joint coating, or any other possible pollutant. Excess materials must be wasted at a Reclamation approved upland site well away from any channel. All materials, including bedding material, excavation material, etc. may not be stockpiled in riparian or water channel areas. If necessary, silt fencing will be appropriately installed and left in place until after revegetation becomes established, at which time the silt fence can then be carefully removed. Machinery must be fueled and properly cleaned of dirt, weeds, organisms, or any other possibly contaminating substances offsite prior to commencing the Project.

4.3 Utah Stormwater Permit

A Utah Pollution Discharge Elimination System (UPDES) Permit will be required from the State of Utah before any discharges of water, if such water is to be discharged at a point source into a regulated water body. Appropriate measures will be taken to ensure that Project activity related sediments will not enter the stream either during or after Project activity. A Storm Water Pollution Prevention Plan (SWPPP) is required in order to obtain a UPDES Permit. A Spill Prevention Control and Countermeasures (SPCC) plan will also be prepared as part of the Permit application process.

4.4 Site Restoration

Sailboat Beach and the construction office area (near the dam) will be restored to pre-construction status upon completing all work.

The microtunnel launch portal and area adjacent to the proposed vault will be designed such that finished grading will allow for a future access road and parking. This area currently has loose rock/talus with some vegetation, and seeding/sage restoration will be included in the restoration of this area.

4.5 Fugitive Dust Control Permit

The Division of Air Quality regulates fugitive dust from Project activity sites, requiring compliance with rules for sites disturbing greater than one-quarter of an acre. Sensitive receptors include those individuals working at the site or motorists that could be affected by changes in air quality due to emissions from Project activity. The BMP's will be followed to mitigate for temporary impacts on air quality caused by Project related activities. These may include the application of dust suppressants and watering to control fugitive dust; minimizing the extent of disturbed surface; during times of high wind, restricting earthwork activities; and limiting the use of, and speeds on, unimproved road surfaces.

4.6 Cultural Resources

If any cultural resources, either on the surface or subsurface, are discovered during Project activities, Reclamation's Provo Area Office archaeologist shall be notified and all activity 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.

a. If 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 the police and 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. The Utah SHPO and interested Native American Tribal representatives will also be promptly notified. Consultation with SHPO and Native American Tribal representatives 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).
b. The terms of the historic resources Memorandum of Agreement will be implemented by Reclamation (or contractor) in a timely fashion and concluded prior to its expiration date.

4.7 Paleontological Resources

Should vertebrate fossils be encountered during ground disturbing actions, Project activity must be suspended until a qualified paleontologist can be contacted to assess the find.

4.8 Wildlife Resources

4.8.1 Bald and Golden Eagles

If new bald and/or golden eagles are observed within the Project area other than the known nesting golden eagles, Reclamation's Provo Area Office wildlife biologist shall be notified and Project activities in the area shall cease until an assessment of eagle presence can be made by a professional wildlife biologist. The Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d) prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" eagles, including their parts, nests, or eggs. "Take" means "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." "Disturb" means "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death, or nest abandonment.

4.8.2 Other Raptors

If raptors are identified in the project area during construction, the Association and/or its contractor(s) shall follow the "Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances" (Romin and Muck 2002). No non-eagle raptors were identified in the project area during the 2021 and 2022 survey seasons.

4.8.3 Migratory Birds

The Proposed Action shall follow the "Project Recommendations for Migratory Bird Conservation" from the Utah Field Office of the USFWS (May 2020), which are outlined below.

a. Wherever possible we recommend that projects be completed outside the migratory bird nesting season to avoid and minimize impacts to migratory birds.

b. If the project includes the loss or degradation of migratory bird habitat then complete all portions of the project that could impact migratory birds outside the maximum migratory bird nesting season. This includes ground-disturbing activities, habitat removal, clearing or cutting of vegetation, grubbing, burning, etc. If that is not feasible, we recommend that you complete the project outside the minimum migratory bird nesting season.

   The time period associated with the maximum migratory bird nesting season is approximately December to August. The time period associated with the minimum migratory bird nesting season is April 1 to July 15 (timeframe when the majority of annual bird nesting occurs).

c. If the project needs to occur during the migratory bird nesting season, impacts to birds can be avoided or minimized by completing vegetation treatments and vegetation clearing and removal actions during the fall and winter (outside the migratory bird nesting season per above) prior to the nesting season when the project will begin.

d. If a project may impact migratory birds and/or cause the loss or degradation of migratory bird habitat, and such work cannot occur outside the migratory bird nesting season, we recommend surveying impacted portions of the project area to determine if migratory birds are present and nesting. Surveys should emphasize detecting presence of USFWS Birds of Conservation Concern, take place during the nesting season the year before the nesting season in which project is scheduled to occur, and should document presence of migratory birds at least throughout the entire minimum migratory bird nesting season (April 1 to July 15). Nest surveys should be conducted by qualified biologists using accepted survey protocols.

e. If your project must occur during the maximum migratory bird nesting season, implement measures to prevent migratory birds from establishing nests in the potential impact area. These steps could include covering equipment and structures and hazing birds away from the project footprint. Migratory birds can be hazed to prevent them from nesting until egg(s) are present in the nest. However, we acknowledge that hazing migratory birds away from a project site is likely only practical for projects with a relatively small footprint (i.e., projects about 5 to 10 acres in size or smaller). Do not haze or exclude access to nests for bald or golden eagles or any migratory bird species federally listed under the Endangered Species Act (ESA), as these actions are prohibited without a permit for these species.

f. If your project must be scheduled during the maximum migratory bird nest season, and vegetation clearing and removal work cannot be completed prior to the nesting season, then we recommend performing a site-specific survey for nesting birds no more than 7 days prior to all ground-disturbing activities or vegetation treatments.

   If you document active migratory bird nests during project nest surveys, we recommend that a spatial buffer be applied to these nests for the remainder of the nesting season. Vegetation treatments or ground-disturbing activities within the buffer areas should be postponed until after the birds have fledged from the nest. A qualified biologist should confirm that all young have fledged.

4.9 Wetland Resources

Any and all wetlands will be avoided where practical. In the event that impacts to wetlands are unavoidable, a USACE 404 Permit will be obtained prior to any dredged or fill material being discharged into jurisdictional wetlands. Surveys will be conducted to evaluate temporary and permanent impacts to wetlands.

4.10 Public Access

Project activity sites will be closed to public access. Temporary fencing, along with signs, will be installed to prevent public access.

4.11 Previously Disturbed Areas

Project activities will be confined to previously disturbed areas where possible.

4.12 Newly Disturbed Areas

All disturbed areas resulting from the Project will be smoothed, shaped, contoured, and rehabilitated to as near the pre-Project condition as practicable. After completion of the Project 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.

4.13 Recreation Areas

Contractors will be working near Sailboat Beach which has some existing recreation features (shelters, picnic tables, restroom, etc.) and these areas will be closed to the public during construction. However, the only existing recreation feature that may be impacted by construction would be the existing asphalt road and parking lot. The contractor is planning to protect these areas and restore any asphalt surfaces that are damaged (such as roads or parking lot).

4.14 Traffic Control Plan

A Traffic Control Plan would be developed by the contractor in coordination with UDOT and State Park officials to protect public health and safety.

4.15 Health, Safety, Noise and Dust

The Contractor would be responsible during Project activities for safety measures, noise control, dust control, and air and water pollution.

5 Scoping, Coordination, and Public Involvement

Scoping, as defined in 40 CFR 1501.9, is "an early and open process to determine the scope of issues for analysis…, including identifying the significant issues and eliminating from further study non-significant issues." Scoping includes all types of information-gathering activities and can occur throughout the NEPA process. The Proposed Action was presented to the public and interested agencies as outlined below.

5.1 Comment Period

Reclamation held a 30-day public comment period from August 15, 2022 through September 14, 2022. The Central Utah Project Completion Act Office submitted comments which were addressed prior to issuing this final EA and are held in the administrative record.

5.2 U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE) was contacted by Reclamation to discuss potential CWA permitting requirements for impacts to WOTUS. The project and Section 404 of the Clean Water Act requirements were discussed with Samuel Bohannon, regulatory project manager for Wasatch County, Utah. On January 19th, 2021, Reclamation and USACE determined that the project would qualify under Nationwide Permit 7, Outfall Structures and Associated Intake Structures.

5.3 U.S. Fish and Wildlife Service

Reclamation coordinated with USFWS in 2021 via email regarding the nesting pair of golden eagles. No consultation pursuant to Section 7(a)(2) of the Endangered Species Act was necessary because Reclamation appropriately made a "no effect" determination for June sucker.

5.4 Utah State Historic Preservation Officer

The Utah State Historic Preservation Officer (SHPO) was sent a copy of the report and site forms. They reviewed the documentation and concurred with Reclamation's determination that the project would have no effect on historic properties on June 15, 2021 (Case No. 21-1295).

5.5 Native American Consultation

Reclamation sent letters to the Shoshone-Bannock Tribes of the Fort Hall Reservation, Idaho and Ute Tribe of the Uintah and Ouray Reservation on 18 March 2022. Reclamation requested that the tribes return comments by May 2, 2022. No comments were received by that date.

6 Preparers

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

Table 6-1 Engineering and Environmental Preparers

Name	Title	Affiliation
Deon Stockert, PE	Project Manager	AE2S
Jeannie Schultz Mock	Permitting Specialist	AE2S
Brad Jorgensen	Operations and Engineering Assistant Manager	Provo River Water Users Association
Jeff Budge	Operations and Engineering Manager	Provo River Water Users Association
G. Keith Denos	General Manager	Provo River Water Users Association

Table 6-2 Reclamation Team, Environmental Preparers

Name	Title	Contribution
Brittany White	Fish and Wildlife Biologist	Waters of the U.S.
Jared Baxter	Environmental Protection Specialist	NEPA Compliance, Cumulative Effects
Maggie Erlick	Provo Area Office Archeologist	Native American Consultation
Wyatt Carter	Airport Wildlife Biologist	MBTA/BGEPA
Zachary Nelson	UCB Regional Archeologist	Cultural Resources

7 Acronyms and Abbreviations

Table 7-1 Acronyms and abbreviations

Acronyms	Meaning/Description
AE2S	Advanced Engineering and Environmental Services
Association	Provo River Water Users Association
AIS	Aquatic Invasive Species
BMP	Best Management Practice
BGA	Blue Green Algae
CFR	Code of Federal Regulations
CFS	Cubic Feet Per Second
CMMWC	Canyon Meadows Mutual Water Company
CY	Cubic Yard
DEQ	Department of Environmental Quality
EA	Environmental Assessment
EO	Executive Order
EIS	Environmental Impact Statement
FRC	Foul Resistant Coatings
Feasibility Study	Deer Creek Intake Project Feasibility Study
FONSI	Finding of No Significant Impact
HAB	Harmful Algal Bloom
kW	Kilowatt
kWh	Kilowatt Hours
MTBM	Microtunnel Boring Machine
NEPA	National Environmental Policy Act
NRCS	Natural Resource Conservation Service
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
NTU	Nephelometric Turbidity Units
ONSSD	Owl's Nest Special Service District
PRWUA	Provo River Water Users Association
Reclamation	U.S. Bureau of Reclamation
ROV	Remote Operated Vehicle
SHPO	State Historic Preservation Office
SPCC	Spill Prevention Control and Countermeasures
SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USACE	U.S. Army Corps of Engineers

Acronyms	Meaning/Description
WOTUS	Waters of the United States
WHO	World Health Organization
UPDES	Utah Pollutant Discharge Elimination System

8 References

AE2S. 2021. Deer Creek Intake Project Feasibility Study, AE2S, Advanced Engineering & Environmental Services, Inc., February 2021.

Owl's Nest Special Service District. 2022a. Notice and agenda of the Wasatch County Council acting as the governing board of the Owl's Nest Special Service District in the 25 N Main Street Heber City, UT 84032, Heber City, Utah, commencing at 4:30 PM, Tuesday, February 8, 2022. Accessed July 11, 2022, at https://docs.wasatch.utah.gov/OnBaseAgendaOnline/Documents/ViewDocument/Owl's_Nest_Special_Service_District_1664_Agenda_Packet_2_8_2022_4_30_00_PM.pdf?meetingId=1664&documentType=AgendaPacket&itemId=0&publishId=0&isSection=false.

Owl's Nest Special Service District. 2022b. Notice and agenda of the Wasatch County Council acting as the governing board of the Owl's Nest Special Service District in the 25 N Main Street Heber City, UT 84032, Heber City, Utah, commencing at 4:30 PM, Tuesday, April 12, 2022. Accessed July 11, 2022, at https://docs.wasatch.utah.gov/OnBaseAgendaOnline/Documents/ViewDocument/Owl's_Nest_Special_Service_District_1664_Agenda_Packet_2_8_2022_4_30_00_PM.pdf?meetingId=1664&documentType=AgendaPacket&itemId=0&publishId=0&isSection=false.

Romin and Muck. 2002. Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances. U.S. Fish and Wildlife Service, Utah Field Office.