WaterSMART Drought Resiliency Projects

Fiscal Year 2023
NOFO No. R23AS00005

WBWCE AV Watkins Dam & Siphon Replacement and South Delovery Conduit Project

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Date: June 15, 2022
Applicant Name: Weber Basin Water Conservancy District
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Applicant Category: Category A; Funding Level III; Funding Request $4,000,000; Total Project Cost $8,624,694

Project Summary:
Weber Basin Water Conservancy District (WBWCD) AV Watkins Dam & Siphon Replacement and South Delivery Conduit Project is located in eastern Box Elder County, Utah. The project will replace aging infrastructure to improve operations and facilitate better water delivery to the end-users. Over the past ten years, extreme drought has impacted WBWCD's ability to deliver water out of Willard Bay through a 45-year-old siphon system to industrial and environmental users. This project is documented as a high priority within their Drought Contingency Plan and will provide access to an additional 50,000 acre-feet of water not previously available with the current siphon system, and generate 64,000 kWh of power annually to offset WBWCD energy needs. The project includes four phases:

1) Replace the aging corroded coated steel siphons that jeopardize the stability of the A.V. Watkins Dam with 350 feet of concrete-encased welded steel 48-inch diameter outlet delivery conduit through the earthen dam.
2) Install a new delivery conduit within a new location approximately 1,200 feet to the north.
3) Remove the existing siphon system.
4) Implement a 33.3 kW solar array on their Weber South Water Treatment Plant.

State the length of time and estimated completion date.
Due to the nature and importance of this project, WBWCD has made strides to get Phase 1 of the project going to reduce the possibility of failure of the A.V. Watkins Dam, where the existing siphons are located. They have the design for Phase 1 and have an approved environmental for all the phases. They have advertised to prequalified contractors, selected the three contractors, and are now waiting on the bid to construct Phase 1 of the project.

The environmental investigation and clearance with an approved Categorical Exclusion (CE) were approved and completed in February 2022. The design for the delivery conduit was conducted as part of the CE approval from Reclamation. Material purchases will be pre-award expenses due to expected long lead times in March/April 2022. Prequalification of contractors and bidding in June 2022. Construction of the delivery conduit through the dam embankment will be a pre-award expense from August 2022 to March 2023. Design of the pipe between the delivery conduit and the existing canal in September 2022. Bid and construct the pipe between the delivery conduit and the existing canal from March 2023 through September 2023. Remove the old siphons after the new siphon is up and working in October 2023, or if water is too high, WBWCD will need to wait for a lower water level to avoid or reduce impacts and coffer dam needs.

Whether or not the proposed project is located on a Federal facility.
Yes, the project is located at Willard Bay Reservoir, a Reclamation facility.

Project Location

The project is located at Willard Bay, a freshwater reservoir located in eastern Box Elder County, Utah, northwest of the city of Ogden, on the northeastern floodplains of the Great Salt Lake. The Weber Basin Water Conservancy District operates the reservoir, and Utah State Parks administers recreation activities. Reclamation constructed Willard Bay Reservoir, and surrounding the reservoir is the A.V. Watkins Dam, a 36-foot-high earthen dam approximately 14.5 miles in length. With a surface area of 10,000 acres, the A.V. Watkins Dam impounded approximately 227,200 acre-feet of water within the Willard Bay Reservoir when it was completed in 1964. When the dam was raised in 2015-2016, it increased the total storage capacity within the reservoir to approximately 250,000 acre-feet. The project latitude is {41°20’34”N} and longitude is {112°7’51”W}. See Attachment A Project Location Map and Attachment B Detailed Project Map.

Technical Project Description

A portion of water from the Willard Bay Reservoir is delivered to a canal through a siphon located on the southwestern corner of the A.V. Watkins Dam. Water supplied from the siphon is used by Great Salt Lake Minerals Corporation, now called Compass Minerals, and the Harold Crane Waterfowl Management Area (Harold Crane WMA). The canal to Compass Minerals has a capacity of approximately 25 cubic feet per second (cfs); it consists of two adjacent siphons, a 16-inch diameter siphon, and a 24-inch diameter siphon installed early in the 1970s by WBWCD.

The proposed project will replace aging infrastructure to improve operations and facilitate better water delivery to the end-users before failure of the siphons occurs due to corrosion. The project includes four Phases. Phase 1 will replace the aging, corroded coated steel siphon with 350 feet of concrete-encased welded steel 48-inch diameter outlet delivery conduit through the earthen dam approximately 1,200 feet to the north. Phase 2 will construct a new delivery conduit pipe from the end of the new concrete encased steel pipe back to the existing outlet canal and will include a new concrete outlet structure. Phase 3 will remove the existing siphon system, and Phase 4 will construct a 33.3 kW solar array on the Weber South Water Treatment Plant.

Phase 1 – Delivery Conduit (outlet):

This project phase consists of replacing a 50-year-old, aging corroded coated steel siphon system, which delivers approximately 20 cfs of water. The existing siphon was built within the earthen embankment of the A.V. Watkins Dam and now presents a risk to the dam embankment itself. When the reservoir is full, failure of one or both of the siphons will result in washing away and failure of a section of the earthen dam, posing a risk to the dam and WBWCD's ability to deliver water to Compass Minerals and the Harold Crane WMA. Such a failure would empty the reservoir and flood neighboring lands. The elevation of the new delivery conduit will be such that lower reservoir levels can be accessed, and water withdrawn and delivered. The existing siphon system is limited in accessing water at a lower level.

Soils in the area are corrosive to very corrosive given the project's proximity to the shores of the Great Salt Lake. Though the existing siphon system has been in operation for 50 years, the fact that it was installed in corrosive soils has contributed to the need for replacement before it fails. This project incorporates mitigation measures to prevent corrosion of the new system. A series of cables and sacrificial anode banks will be installed to promote degradation and corrosion of the anodes rather than the new steel. The anode banks can be checked over the years and easily replaced if necessary.

The siphon will be replaced by constructing a new 350-foot-long, concrete encased welded steel 48-inch diameter outlet delivery conduit through the earthen dam. The new 48-inch conduit will be installed below the existing dam, requiring the removal of approximately 50 vertical feet of the earthen dam. This allows the new conduit to provide access to water in the lowest levels of the reservoir. The excavation (trench) will be approximately 20 feet wide at the bottom and taper to around 350 feet at the top of the earthen dam.

Construction will take place with water in the reservoir. For this to occur, an earthen cofferdam, approximately 800 feet long and 30 feet tall, will be built out into the reservoir. The area between the cofferdam and the existing dam will be dewatered for construction activities. Vinyl sheet piling will also be incorporated to better seal the interface between the cofferdam and bottom of the reservoir and existing embankment. Due to the nature of the native soils, the sheet piling will be cut off near the reservoir floor and remain in place along the upstream side of the A.V. Watkins Dam and also serve as a cutoff wall to seepage. The project will also incorporate a large section of impervious sheeting material approximately 150 feet wide and 100 feet up the inner slope of the dam, around the new conduit.

The site for the new outlet delivery conduit was selected by analyzing and ranking several locations along the dam. The final five locations were then subject to further analysis with respect to several factors, including proximity to deep section(s) of the reservoir, proximity to the existing outlet canal, geotechnical considerations and risk, environmental concerns and permitting, access to (or ability to incorporate) other water sources, distance to power, dam geometry and constructability.

Several months of meetings, discussions, and workshops with the Bureau of Reclamation were undertaken to discuss several factors, such as seismic concerns, risk, risk mitigation, design, permitting, environmental considerations, and materials. Those efforts produced a project that mitigates risk and is on the positive side of risk-neutral.

Phase 2 – Delivery Pipe:

The new delivery pipe will begin at the new delivery conduit (Phase 1) location, approximately 1,200 feet north of the current site and existing outlet canal. A pipe will be constructed from the new delivery conduit outlet to the existing canal, which runs to Compass Minerals and feeds the Harold Crane WMA. Either twin 36-inch HDPE pipes or one 48-inch HDPE pipe will be buried under an existing dirt access roadway. A new concrete outlet structure will then be built at the head of the canal. The new outlet structure will also be designed such that WBWCD can trap and remove any sediment or debris that makes its way from the reservoir into the canal, reducing or preventing accumulation; thus, reducing overall maintenance requirements. The pipe will incorporate valving that will be used to regulate the flow to the canal. It will also have connections for a trailer-mounted pump that can be brought on-site during very low reservoir levels.

Phase 3 – Removal of Existing Siphon System:

Once the new Delivery Conduit and Delivery Pipe have been installed and are in operation, the existing siphon system will be removed. The existing siphon system consists of two tar-coated welded steel pipes that are 24-inches and 16-inches in diameter installed within the earthen dam and two HDPE pipes, 24-inches, and 16-inches, that run out into the reservoir. The two tar-coated welded steel pipes that go through the dam are each approximately 250 feet long. Near the inside toe of the dam (reservoir side), the two steel pipes transition to HDPE pipes and run out into the reservoir along its floor for approximately 200 feet. Large concrete blocks hold down the HDPE lines. The HDPE and anchor blocks will be removed from the reservoir. A cofferdam will then be constructed, the earthen dam excavated, and the steel sections of the siphon removed. The excavation will then be filled, and the dam repaired like the construction of the delivery conduit.

Phase 4 – Solar Array

A solar array will be constructed at the Weber South Water Treatment Plant. The array capacity would be 33.3 kWh with an annual power generation of 64,000 kWh.

Performance Measures

WBWCD proposes three performance measures to quantify the project's benefits:

1) Monitor and document how much additional water is available at specific elevations by documenting the quantity of water delivered per foot of elevation drop. This will be of particular interest and great value from elevation 4,212 to elevation 4,200 (empty). Water delivery is monitored and quantified as it passes through a Parshall flume at the head of the canal that feeds Compass minerals and the Harold Crane WMA. WBWCD prepared a bathymetric survey of the reservoir bottom, with a corresponding table of estimated volumes per foot of elevation; this project will allow refinement of those volumes for better long-range planning and forecasting. WBWCD knows, with a fair amount of certainty, what the water volume per foot of elevation is above 4,211 or 4,212; however, below these elevations, the estimates come from the bathymetry.

2) Documented total water served to Compass Minerals and Harold Crane WMA will be measured by a Parshall flume at the head of the canal that delivers their water through gravity flow. At lower water levels, when a temporary pump is utilized to move water along or lift it to the canal, an inline flow meter will be used, along with the readings from the flume. If WBWCD elects to construct a permanent pump station in the future, an inline flow meter would also be installed to measure flows.

3) Measure the power generation savings from the Solar Array by comparing past power bills to current power bills. The solar arrays will also have the ability to monitor electrical production in real-time. This will allow WBWCD to self-monitor savings by comparing the time of day to their power utility rate table and estimate savings.

Evaluation Criteria

E.1.1. Evaluation Criterion A – Project Benefits

How will the project build long-term resilience to drought? How many years will the project continue to provide benefits?

WBWCD is a regional water supplier within the Ogden and Weber River drainages and provides a wide variety of water supplies within its service area of 2,500 square miles. They are continually developing new strategies to conserve our water and extend existing supplies. They deliver annually approximately 230,000 acre-feet of treated wholesale municipal water, wholesale and retail agricultural irrigation water, wholesale and retail secondary irrigation water, treated and untreated industrial water, and replacement water. Over 700,000 residents within Davis, Weber, Morgan, Summit, and Box Elder counties receive water from District sources. They operate seven large storage reservoirs, three hydropower generation plants, 21 wells, four water treatment plants, and hundreds of miles of canals, tunnels, aqueducts, and pipelines.

Over the past twenty years, drought has significantly impacted water availability, and Utah has seen mega and extreme drought situations in recent years. Over the past two years, most of the state's reservoirs have been half full. Last fall WBWCD only had storage water to meet drinking water needs. For example, two of its reservoirs, Pineview Reservoir was only 27 percent full, and Echo Reservoir was only 37 percent full going into the winter season. With low snowpack and little rain, all WBWCD service areas are still in an extreme drought.

This project will build long-term resilience by installing a new delivery conduit allowing WBWCD to access stored water at the bottom of the Willard Bay reservoir. This will provide access to an additional 50,000 acre-feet of water not previously available with the current siphon system. Allowing WBWCD to store more water up in the higher reservoirs – Pineview, Echo, causey, Lost Creek, Smith & Morehouse, East Canyon, and Rockport – for longer periods of time that can be used for drinking water.

During drought years, as the water level drops in Willard Bay Reservoir, it reduces the ability to pull water from the reservoir through the existing siphon. Flows begin to drop at an elevation of 4,214. As water levels drop, maintenance, such as air entrainment and air pocket removal, become more problematic and hinder deliveries. Eventually, the water level drops so far that the required water delivery cannot be withdrawn from the reservoir without adding temporary pumps and/or augmentation by pumping from the nearby slough (South Drain) when the flow stops at approximately 4,210 feet.

During the planning process, WBWCD had a goal of accessing and withdrawing water down to an elevation of 4,206 or 4,207. At those elevations, the reservoir has a volume of approximately 10,000 acre-feet per foot. This meant that they would be able to access an additional 20,000 acre-feet or more. However, it was found that if they allow for the construction of the new delivery conduit at around an elevation of 4,201 feet, it will now enable WBWCD to access an additional volume, likely in excess of 50,000 acre-feet. Much of the newly accessible water can also be delivered by gravity, reducing the need for pumping.

This Delivery Conduit Project has a design life of over 75 years and is designed to last as long as the dam itself and will likely exceed that timeframe.

Will the project make additional water supplies available?

- *If so, what is the estimated quantity of additional supply the project will provide and how was this estimate calculated? Provide this quantity in acre-feet per year as the average annual benefit over ten years (e.g., if the project captures flood flows in wet years, provide the average benefit over ten years including dry years).*
  The Delivery Conduit will provide access to an additional 50,000 acre-feet. This estimate is based on a bathymetric reservoir survey used to determine volumes. The bottom of the reservoir is sloped at the lowest levels, which means that the upper 1/2 to 2/3 is relatively consistent in acre-feet per foot. But the bottom 1/3 varies in volume per foot of depth. As mentioned earlier, along with replacing the old siphon system, a goal was to access an

additional two vertical feet of water. Each of those feet represented approximately 10,000 acre-feet, for a total of 20,000 acre-feet. Our investigations found that we can access more water at lower levels; however, we encounter the sloped bottom, altering the quantity per vertical foot. For this reason, from an elevation of approximately 4,206 down to 4,201, only an additional 30,000 acre-feet of water is accessible, giving us access to a total of 50,000 acre-feet. The average annual benefit over ten years would be 300,000 acre-feet. The average annual amount is 30,000 acre-feet per year which is easily accessible by gravity. *(30,000 Af x 10 yr = 300,000 Af)*

- *What percentage of the total water supply does the additional water supply represent? How was this estimate calculated?*
  This project will give WBWCD access to an additional 50,000 acre-feet that was not accessible in the past due to the siphon location. This represents 20 percent of the total water supply within Willard Bay: 50,000/250,000 = 20 percent, calculated by dividing the newly available water by the total volume of Willard Bay.

- *Provide a qualitative description of the degree/significance of the benefits associated with the additional water supplies.*
  Willard Bay is the District's largest reservoir and is situated at the bottom of the watershed, where it can capture excess flows that are not captured in upstream reservoirs. During times of drought, the District relies heavily on Willard Bay to provide water to downstream users, allowing WBWCD to keep water in upstream reservoirs where it can be treated for potable uses. Willard Bay can be a great hedge against drought and climate change because it can store runoff from significant rain events that have historically fallen as snow. The proposed project will open up access to 50,000 acre-feet of additional usable storage capacity in Willard Bay when it is needed most – during drought years.

Will the project improve the management of water supplies? For example, will the project increase efficiency, increase operational flexibility, or facilitate water marketing (e.g., improve the ability to deliver water during drought or access other sources of supply)? If so:

- *How will the project increase efficiency or operational flexibility?*
  The project will provide flexibility by allowing water deliveries via gravity down to lower water levels. It will also provide for a significantly more efficient operation. Currently, the reservoir will drop to a level wherein flows through the siphon drop off and become problematic. A significant problem that results from the lower levels is that a vortex forms near the intake (end of the pipe) in the reservoir, sucks in air, slows the flow, and stops the flow in the siphon. Because of this, the operator(s) must haul equipment out on the dam daily or multiple times per day to vacuum out the trapped air and get the siphon running again. Since this occurs when reservoir levels are low, it also provides a significant safety risk. Reservoir levels are lowest during the winter, so the operators must drive and pull equipment behind them along the top of the dam embankment in the snow, ice, and wind. The new delivery conduit eliminates air entrainment and all the issues that it brings with it. Additionally, not babysitting the siphon at low levels allows the operators to tend to their other duties and maintenance needs. The new Delivery Conduit will also provide access to an additional, previously inaccessible or hard-to-access 50,000 acre-feet for use during droughts.

- *What is the estimated quantity of water that will be better managed as a result of this project? How was this estimate calculated? Provide this quantity in acre-feet per year as the average annual benefit over ten years (e.g., if the project captures flood flows in wet years, provide the average benefit over ten years including dry years).*

  This project will give WBWCD access to an additional 50,000 acre-feet that was not accessible in the past due to the siphon location. This represents 20 percent of the total water supply of Willard Bay: 50,000/247,302 = 20 percent, calculated by dividing the newly available water by the total volume of Willard Bay.

  The potential 10-year average additional supply is 20,000 to 30,000 acre-feet via gravity flow through the new Delivery Conduit. Replacing the existing siphon system with the Conduit allows a near maintenance free delivery. A total of 50,000 acre-feet can be supplied on a dry year if the lower 20,000 acre-feet is lifted to the canal using a pump. The 50,000 acre-feet is the sum of the upper 20,000 to 30,000 acre-feet that can be delivered by gravity, plus an additional 20,000 acre-feet that lie below the canal's elevation but can now be pumped to the canal.

  Willard Bay can be a great hedge against drought and climate change because it can store runoff from significant rain events that may have historically fallen as snow. It can also capture stormwater runoff from areas below the elevation of the upper reservoirs and many cities and towns that the supply canal (Willard Canal) runs through. Capturing low elevation rain and runoff allows WBWCD to hold water in its storage reservoirs that are higher in elevation throughout the watershed.

  Additionally, having access to an additional 50,000 acre-feet within the reservoir allows upstream water to be put to use within the culinary system, as well as for cropland irrigation; rather than simply run through the system to meet contract demands of Compass Minerals and Harold Crane WMA.

- *What percentage of the total water supply does the water better managed represent? How was this estimate calculated?*

  50,000/247,302 = 20 percent, calculated by dividing the newly available water by the total volume of Willard Bay. Implementing this project and lowering the delivery conduit at around an elevation of 4,201 feet will enable WBWCD to access an additional volume of water that was previously not accessible.

- *Provide a qualitative description of the degree/significance of anticipated water management benefits.*

  The benefits include flexibility regarding how and when water is delivered to users in the Box Elder and West Weber County areas, and maintenance timing. The project will save WBWCD significant man-hours and wear-and-tear on equipment that currently have to be utilized when the reservoir level gets near and below 4,212 feet. When the elevation gets near that level, our operators have to go to the existing siphon to reprime them at least once a day. There is also a point at which WBWCD has to utilize a diesel pump to deliver the water, which again requires an operator's time to monitor and refuel. This project will free up all of that time and equipment and give them access to the otherwise inaccessible water. Water delivery maintenance and pumping are typically done in the winter when the reservoir has dropped to lower levels, and WBWCD has year-round delivery contracts with Compass Minerals. Unlike agricultural deliveries from April to October, trying to keep the water flowing can be very dangerous in the winter months, because operators are working on top of the dam embankment, which is only one vehicle wide.

Access to an additional 50,000 acre-feet within the reservoir is significant for agricultural users and their crops. Keeping water higher in the system later into the year will allow farmers to use the water to finish off a crop. Notably, in dry years, a crop can grow to near maturity, and then if there isn't that last little bit of water to finish off the ripening, the entire crop can fail or be significantly affected and diminish.

- *Will the project make new information available to water managers? If so, what is that information and how will it improve water management?*
  The project will give us a better understanding of how much water is actually available for use in the reservoir. It will also allow the District to predict volumes of water to hold back in the upper elevation reservoirs.

E.1.2. Evaluation Criterion B – Drought Planning and Preparedness

Provide a link to the applicable drought plan, and only attach relevant sections of the plan that are referenced in the application, as an appendix to your application. These pages will be included in the total page count for the application.

WBWCD prepared a Drought Contingency Plan in 2018 (DCP). This planning process brought together numerous stakeholders – agricultural users, municipalities, irrigation companies, and industrial users to determine the most appropriate measures and demand reductions to implement based on our area's drought conditions. The 2018 Drought Plan is over 500 pages. WBWCD has housed a shortened condensed version on their website, and this can be found at the following link – District's 2018 Drought Contingency Plan - https://weberbasin.com/Docs/DCP%20Executive%20Summary.pdf

Explain how the applicable plan addresses drought. Proposals that reference plans clearly intended to prepare for and address drought will receive more points under this criterion.

The DCP addresses drought-related vulnerabilities by considering drought response actions and mitigation measures. The DCP is not a water supply master plan to accommodate growth; however, the strategies considered in this plan provide ancillary benefits for emergency response, replacement, or alternative supplies. The DCP provides a practical and systematic means for WBWCD to manage emergency supply conditions within its service area. This plan is intended to augment and support WBWCD's Water Conservation Plan and other District policies for managing water supply and delivery in the event of severe or prolonged drought. See Attachment C 2018 Drought Contingency Plan, page 8

Within the DCP, WBWCD included a vulnerability assessment evaluating the potential for drought based on historical data and future projections and an evaluation of potential risks and impacts of drought on three major sectors – municipal, agricultural, and environmental. This vulnerability assessment drives the development of mitigation and response actions. The process included six major components:

1. Identification of Key Drought Vulnerabilities
2. Paleohydrology Study
3. Hydrologic Model
4. Establishment of Drought Levels and Triggers
5. Future Climate Change Scenarios
6. Drought Risks

- *Does the drought plan contain drought focused elements including a system for drought monitoring, sector vulnerability assessments related to drought, prioritized mitigation actions, and response actions that correlate to different stages of drought?*
  Yes, the plan addresses vulnerabilities, risk, drought monitoring, drought triggers, mitigation measures, and response actions, including demand reduction and effectiveness of demand reductions. A collaborative process with input from the Technical Team and the Advisory Group was used to develop a response plan that includes the establishment of target demand reductions (in terms of percentages) for each drought level. Figures 1 and 2 indicate the response actions:

Figure 2 Demand Reduction Targets

Demand Reduction Targets

Drought Levels		Demand Reduction Targets				
RESPONSE LEVEL	WATER SHORTAGE DESCRIPTION	SECONDARY WATER[4]	AGRICULTURAL IRRIGATION[5]	M&I CULINARY OUTDOOR WATER[4]	M&I CULINARY INDOOR WATER[4]	TOTAL YEAR 2020 DEMAND REDUCTION (ACRE-FEET)[5]
1	Normal	0%	0%	0%	0%	0
2	Advisory	Reduce demands through messaging and general water conservation				0 to 43,000
3	Moderate	20%	20%	20%	0%	43,000
4	Severe	60%	40%	60%	10%	123,000
5	Extreme	95%	70%	95%	25%	206,000

[4]Assumed that water use reductions will be met across the entire WBWCD service area
[5]Assumed that only WBWCD agricultural supplies will be reduced. Does not include agricultural demands in the basin that are not managed by the District

WBWCD Drought Response Actions

Drought Levels		Response Actions
RESPONSE LEVEL	WATER SHORTAGE DESCRIPTION	
1	Normal	Continue current conservation efforts to meet statewide goal to reduce usage by 25% between year 2000 and 2025.
2	Advisory	Begin messaging to inform the public that water shortages are possible if drought conditions continue and that additional conservation efforts are needed.
3	Moderate	Increased messaging, implement yellow drought rates and shortened irrigation season, and increased advisory group meetings.
4	Severe	Increased messaging, implement orange drought rates, exercise fallowing agreements, cut watering of lawns in half, reduce agricultural water use, start indoor water reduction strategies, and increased advisory group meetings.
5	Extreme	Increased messaging, implement red drought rates, exercise fallowing agreements, no residential lawn watering (trees and gardens yes), and increased advisory group meetings.

- *Explain whether the drought plan was developed with input from multiple stakeholders. Was the drought plan developed through a collaborative process?*
  The planning process included two levels of stakeholder involvement. Level one had a small group of stakeholders invited to be part of the "Task Force." Level two formed a larger group called an "Advisory Group." These groups included agriculture users, decision-makers, community residents, local businesses, environmental advocates, and other stakeholders. This extensive stakeholder involvement helped to provide an excellent foundation for the more in-depth work required to formulate an all-inclusive drought plan.

  Members of the Task Force and Advisory Groups were interviewed. Key themes and insights from these interviews are listed in Figure 3. Key person interviews provided an understanding of the critical drought concerns and potential strategies to mitigate the effects of drought and ways to respond to drought.

THEMES	INSIGHTS
INFRASTRUCTURE & OPERATIONS	Maximizing the efficiency and capacity of the existing system through strategies such as improved metering, canal lining, aquifer storage and recovery and wastewater reuse will improve drought resiliency.
ENVIRONMENT	Water operations strategies such as pulsing water through the system during wet years or improving the connectivity of fish habitats should be evaluated and coordinated to minimize negative environmental impacts during droughts.
DATA, COMMUNICATION & COLLABORATION	Improved communication and collaboration through strategies such as: public notification of current drought level status, delivery of water consumption reports to users, creation of water sharing agreements between water entities, interconnection agreements between cities and cooperation between all water users will improve drought resiliency and ability to respond to drought conditions.
DROUGHT WATER PRIORITIES & RESTRICTIONS	A detailed drought plan is needed to prioritize water restrictions for future drought periods, set expectations with water users for drought responses and develop drought messaging.

- *Does the drought plan include consideration of climate change impacts to water resources or drought?*
  The DCP has five future climate scenarios evaluated based on potential future temperature and precipitation changes. The climate change projections completed for this plan are based on Phase 5 of the World Climate Research Program Coupled Model Intercomparison Project (CMIP5). These scenarios include 30 years from 1980 to 2010, and project future water conditions from 2034 to 2064. Wester Water Assessment evaluated these future climate change scenarios, which can be found in Attachment C 2018 Drought Contingency Plan, page 32.
- *Describe how your proposed drought resiliency project is supported by an existing drought plan.*
  The project was listed as a high priority within the DCP based on preparing a risk analysis of the siphon. The implementation of the project became one of the highest priorities after the analysis and extreme drought situation of 2020 and 2021. See Attachment C 2018 Drought Contingency Plan, page 59.
- *Does the drought plan identify the proposed project as a potential mitigation or response action?*
  The project is listed as a mitigation measure. See Attachment C 2018 Drought Contingency Plan, page 60.
- *Does the proposed project implement a goal or need identified in the drought plan?*
  This project meets the mitigation objectives of the DCP in improving the mobility of water supplies and minimizing drought impacts on industry and aquatic ecosystems. See Attachment C 2018 Drought Contingency Plan, page 57.
- *Describe how the proposed project is prioritized in the referenced drought plan?*
  The project is ranked as a priority planning and implementation project in the drought plan. It was ranked lower when the DCP was developed in 2016-2018, but with the extreme drought situations, it was moved to a high priority because we could no longer provide water to the users without costly and continuous pumping.

E.1.3. Evaluation Criterion C – Sustainability and Supplemental Benefits

1. Climate Change: *EO 14008 emphasizes the need to prioritize and take robust actions to reduce climate pollution, increase resilience to the impacts of climate change, protect public health, and conserve our lands, waters, oceans, and biodiversity. Examples in which proposed projects may contribute to climate change adaptation and resiliency, may include but are not limited to the following:*

- *In addition to drought resiliency measures, does the proposed project include other natural hazard risk reductions for hazards such as wildfires or floods?*
  Yes. The development of this project will reduce the risk of siphon and possibly dam failure of the A.V. Watkins Dam. The steel siphons installed through the dam embankment of the reservoir approximately 50 years ago are experiencing significant effects from corrosion and are at risk of failure. They do not satisfy seismic design standards, and failure of the siphons at full pool would likely result in failure of the dam embankment. If there were a failure, it would be a disastrous flood that would be catastrophic to the environment and economy in the area. The proposed action would address the corrosion issues, allow access to water at lower reservoir levels, correct seismic deficiencies, and significantly lessen the risk of embankment failure.

- *Does the proposed project include green or sustainable infrastructure to improve community climate resilience such as, but not limited to, reducing the urban heat island effect, lowering building energy demands, or reducing the energy needed to manage water? Does this infrastructure complement other green solutions being implemented throughout the region or watershed?*
  The old saying "every little bit helps" is true in this case because of the previous solar array and hydro turbines added over the past ten years. The energy produced from WBWCD's solar arrays and hydro turbines adds up to over 8,300 kWh of renewable energy each year. It is estimated that the proposed 33.3 kWh solar panel array project will produce an annual power generation of 64,000 kWh, which will offset approximately 99,992 pounds of CO_2 per year. Although this 33.3 kWh is a small amount of power in the overall scheme of things, the power generated will allow WBWCD to be more self-reliant and put less demand on the Rocky Mountain Power system. This project will enable WBWCD to implement its second solar array.
- *Will the proposed project establish and use a renewable energy source?*
  The project will install a 33.3 kWh solar panel array at WBWCD Weber South Water Treatment Plant. The proposed solar array will provide approximately 64,000 kWh annually that will be used to offset energy demands at the Treatment Plant. As previously stated, WBWCD has implemented other solar arrays on other treatment facilities and hydropower as a source of renewable energy to run other facilities within their delivery system. With the solar array development in this project, WBWCD will now be able to utilize the solar power on-site at their water treatment plant, reducing reliance on outside power sources and offsetting approximately 99,992 pounds of CO_2 per year, reducing its carbon footprint.
- *Does the proposed project seek to reduce or mitigate climate pollutions such as air or water pollution?*

Air quality conditions in Utah are bad, to the point where the poor air quality in Utah is a topic of discussion and debate amongst the state government, tourists, residents, climate experts, and other researchers. One of the main reasons that Utah faces poor air quality is due to its geographical conditions. The mountainous regions in Utah cause pollutants to build up on the Wasatch Valley's surface and prevent winds from dispersing these pollutants to areas beyond the mountain ranges. Winter months cause temperature inversions in the area that make air quality much worse. The temperature inversions, coupled with large-scale emissions from vehicles and other activities, can be a red flag to the health of Utah residents. Utah has set up several frameworks to improve its air quality, including setting a ban on wood fires, subsidies to reduce vehicular emissions, and Red Flag Days to reduce driving.

WBWCD contributes over 21.1 Metric Tons of CO_2 pollutants as they are required to drive 60 miles round trip twice a day to Willard Bay to monitor and recharge the siphon, and if needed, refuel the pump. Many, if not all, trips are required during the winter months due to low water levels at Willard Bay in order to keep the siphons flowing. WBWCD provides water to Compass Minerals 360 days a year, 24 hours a day. In the past, wintertime required so much more operator time, especially during the drought years.

This project will reduce the need to continually recharge the siphon and utilize a diesel pump to deliver water, and it will free up personal time and miles driven as well as the need to pump. The completion of this project will reduce the time, energy, and money spent to pump water and monitor pumps daily.

Pumping savings: The diesel pumping fuel cost is $4,000 per month for approximately two months, equaling $8,000, and CO2 pollutants released are 11.59 metric tons in the winter months. By having the siphon lower in Willard Bay, WBWCD can eliminate pumping except in extreme circumstances; thus, saving $8,000 in fuel costs and reducing their Co2 pollutants by 11.59 Metric Tons.

Monitoring Savings: At 60 miles per round trip, monitoring the siphon, and if there is the need to pump, refilling the pump twice a day, the operator would travel 840 miles per week for six months – September through February – equating to 21,600 miles in the winter when the inversion is at its highest. This adds 9.51 Metric Tons of CO2 and $7,236 in fuel cost.

Suppose WBWCD can cut the trips to once a day for only three days a week (4,320 miles) for the six months in winter. In this case, WBWCD would realize savings of 6.88 Metric Tons of CO2 and $5,788 in fuel costs for six months during the winter season.

CO2 Calculation and information: Calculation and information for the CO2 metric tons saved come from the "Carbon Foot Print" website located at www.carbonfootprint.com/calculator.aspx.
The following are the assumptions made:

» Assume 14 mpg for a 2019 Ford F150 four-wheel drive
» Assume the fuel cost for the vehicle at 4.69 per gallon and the pump cost (Diesel fuel) at $6.97 per gallon
» Assume a Social Cost of Carbon discounted at 3 percent per ton

Gasoline cost savings: Savings of $13,788.00
(Truck – 17,280/14 mpg = 1,234gallons of gas x 4.69 cost per gallon = $5,788 in savings)

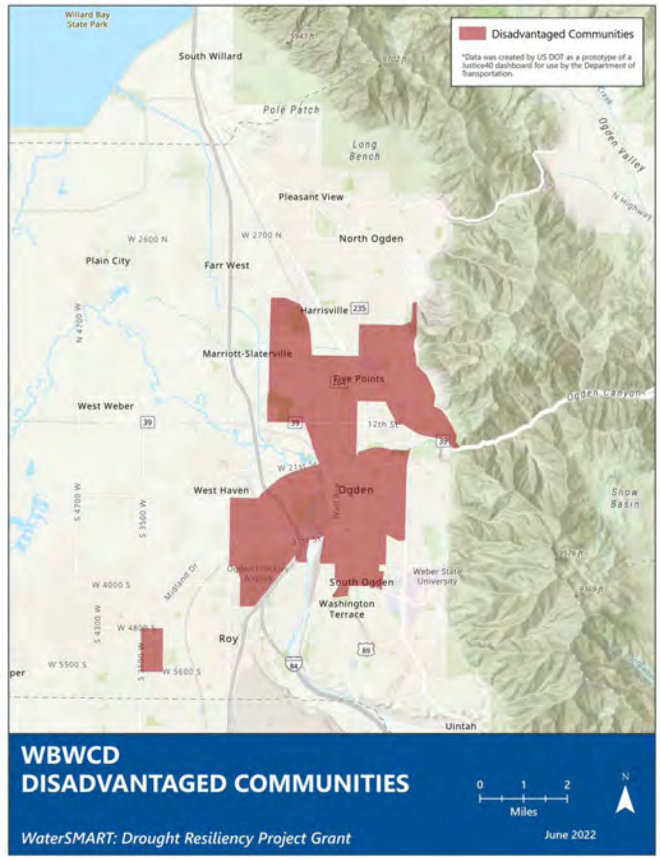
(Pump – 2 months of pumping – 1,147gallons of diesel fuel x 6.97 costs per gallon =$8,000 in savings)

- *Will the proposed project reduce greenhouse gas emissions by sequestering carbon in soils, grasses, trees, and other vegetation?*
  N/A.
- *Does the proposed project have a conservation or management component that will promote healthy lands and soils or serve to protect water supplies and its associated uses?*
  N/A.
- *Does the proposed project contribute to climate change resiliency in other ways not described above?*
  N/A.

2. Disadvantaged or Underserved Communities:

Please describe in detail how the community is disadvantaged or underserved based on a combination of variables that may include the following:

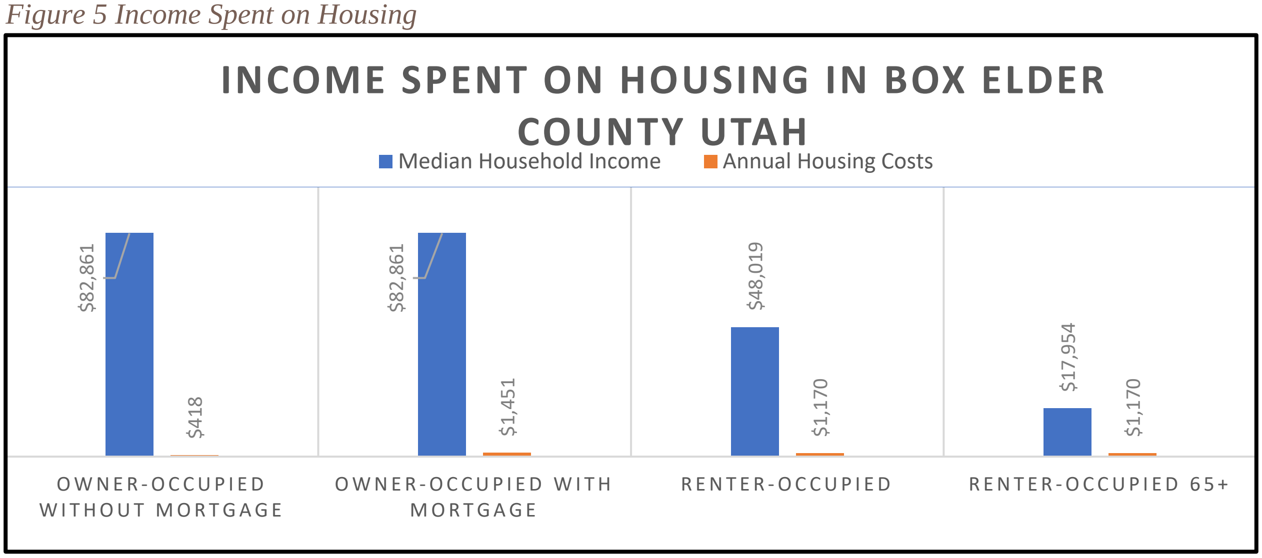
WBWCD's service area is large and covers five counties. In each of these counties, there are disadvantaged populations. However, WBWCD has a disadvantaged population in its Weber County service area, a substantial housing cost burden, and substandard housing in the Box Elder County service area.



Weber County has many disadvantaged population census tracts to which WBWCD delivers culinary and secondary water. This information has come from USDOT data created to document disadvantaged indicators in Census tracks across the nation as a prototype of Justice40 to be used by the Department of transportation. Attachment D WBWCD Disadvantage Communities Map shows the disadvantaged indicators for this area. These indicators include the disadvantage indicators for each census tract that have historical transportation, health, economy, equity, resilience, and environmental disadvantages.

Box Elder County's 2020 statistics from the US Census Bureau show that the disparity between the annual incomes of owner-occupied housing and renter-occupied housing is significant. Box Elder County shows that owner-occupied households have a median annual income of $82,861, while renter-occupied households have a median annual income of $48,019. That means those that rent make 42 percent less than those that own their homes. The Box Elder County Moderate-Income

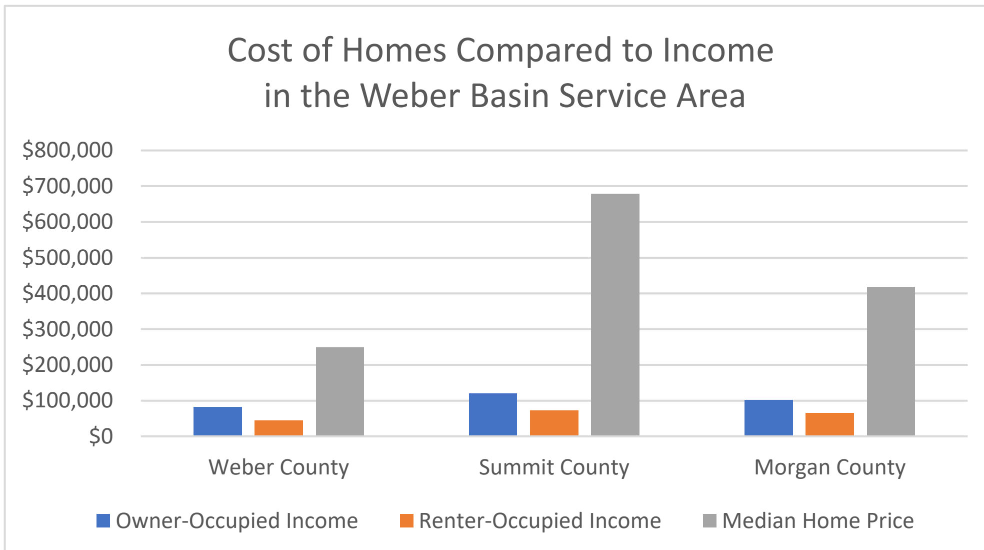
Figure 5 Income Spent on Housing



Housing Report projects that percentage to widen. The report states there is a disparity between wages and housing costs. Median gross rent increased 41.5 percent from 2007-2016 while median home values only rose by 21 percent during the same period. Box Elder County has a large percentage of residents aged 65 and older, and that percentage has been increasing since 1990 by 17 percent. With many seniors on fixed incomes, the increased housing costs put a heavier burden on this vulnerable population.

There are many new single-family residential homes being built in Box Elder and Weber Counties. This reduces the number of affordable housing options for residents with lower annual incomes and pushes them further into poverty as they are forced to pay higher rental rates. The possibility of investing in home ownership pulls further away for these residents. Without funding assistance, the costs for utilities or to improve West Corrine Water Company's infrastructure are passed on to the property owners. Those who own their homes are more likely to adjust to higher bills, but higher bills are more difficult to accommodate for those with lower incomes in rental units. Ogden City in Weber County is among the top 10 "most overvalued" housing markets in the US, according to the latest research released by Florida Atlantic University and Florida International University. Ogden has remained high on the list of the top 100 US housing markets, all of which have rising prices that " force buyers to pay higher premiums — the amount of money above what they should be spending based on past pricing trends.

Figure 6 Cost of Homes Compared to Income



3. Tribal Benefits:

- *Does the proposed project support tribal resilience to climate change and drought impacts or provide other tribal benefits such as improved public health and safety through water quality improvements, new water supplies, or economic growth opportunities?*
  N/A.
- *Does the proposed project support Reclamation's tribal trust responsibilities or a Reclamation activity with a Tribe?*
  N/A.

4. Environmental Benefits:

- *Does the project seek to improve ecological climate change resiliency of a wetland, river, or stream to benefit to wildlife, fisheries, or habitats? Do these benefits support an endangered or threatened species?*

  WBWCD provides water to the Harold Crane Waterfowl Management Area (Harold Crane WMA) along the shores of the Great Salt Lake. With the drought over the past few years, water delivery has been reduced, contributing to the shrinking Great Salt Lake. Today the Great Salt Lake's volume has dropped nearly 50 percent. According to the United States Geological Survey, the Great Salt Lake's size has always fluctuated. It goes on to say:

  "*Its surface area has varied from about 3,300 square miles at its highest levels in 1986-1987 to about 950 square miles at its lowest level in 1963. But over the course of more than a century of documentation, researchers have been able to account for an 11-foot drop in lake levels due to human development, which has occurred mostly over the past 10 years." Within the survey, it said "that might not sound like a lot when you think of most lakes, but the Great Salt Lake is not like others. Its lakebed is shallow — averaging a depth of just 15 feet and recording a maximum depth of about 33 feet. When water levels drop, more shoreline is exposed than what would be exposed in deeper bodies of water. What's left behind is a dusty playa full of toxic chemicals and hazardous pollutants. According to research from Utah State University, nearly 50% of the lakebed is now exposed. Approved water developments that are currently underway could take the water level down another 10 feet.*"

  If WBWCD were not able to continue to provide water to the Harold Crane WMA, it would have detrimental effects on the Management Area and a continued impact on the levels of the Great Salt Lake. This project will allow WBWCD to secure its ability to provide water to the Management Area.

- *What are the types and quantities of environmental benefits provided, such as the types of species and the numbers benefited, acreage of habitat improved, restored, or protected, or the amount of additional stream flow added? How were these benefits calculated?*

  The development of this project will allow for more water to be saved and held in the Pineview, Echo, Causey, Lost Creek, Smith & Morehouse, Rockport, and East Canyon Reservoirs and within the Ogden and Weber River systems. This saved water can be used later in the year to benefit the Bonneville Cutthroat Trout and Bluehead sucker, native fish species found in these rivers. Both species are covered by conservation agreements Utah has entered into with the US Fish and Wildlife Service and other parties. The population status of these two sensitive species warrants additional conservation efforts to diminish the likelihood of future listings under the Endangered Species Act.

  Stable and connecting flows between Bonneville Cutthroat Trout and Bluehead Sucker habitats are fundamental requirements for successful conservation actions. Therefore, most any project that enhances the continuity and maintenance of flows within the Ogden and Weber River is a step in the right direction.

- *Will the proposed project reduce the likelihood of a species listing or otherwise improve the species status?*

  Yes

5. Other Benefits: *Will the project address water sustainability in other ways not described above?*
This past 2021 irrigation season was difficult for all water delivery systems. WBWCD worked with the Davis and Weber Counties Canal Company (DWCCC) to exchange water out of Willard Bay, allowing DWCCC water to remain in Echo and other reservoirs for the following year's culinary water. WBWCD felt it was necessary to spend money pumping extra water out of Willard Bay to exchange that water with DWCCC. By doing so, WBWCD was able to preserve storage in the upstream reservoirs such as Echo and East Canyon; therefore, helping maintain a drinking water supply for the next year in case of another bad winter and spring runoff. WBWCD had to pump the water into DWCCC's system to exchange the water. The power cost to pump the water from Roy's WBWCD drought relief pump station was $343,000. The last time WBWCD operated this pump station, other than for testing/maintenance purposes, was in 2006. In addition to running the drought relief pump station in Roy, WBWCD also had to do some supplemental pumping at its Willard Bay pump station.

This project will not reduce the need to implement the drought relief pumps if needed again, but it will reduce the need to pump at the current siphon due to continual drought. WBWCD will now be able to access water lower in the reservoir, allowing for gravity-fed water for their users, and will not have to pump to provide this water.

- *Will the project benefit multiple sectors and/or users (e.g., agriculture, municipal and industrial, environmental, recreation, or others)?*
  All sectors that WBWCD services will benefit from this project based on the ability to reduce pumping. This will allow WBWCD to have more flexibility in moving water around the system and provide the opportunity for deliveries that were not easy before the project. Water can now be held in storage higher in the system. It can then be released and used by multiple users, including culinary, agricultural, and industrial customers within the service area. Holding water in higher elevation storage later in the season will extend the recreation use of the reservoirs, help with flows and recreational uses such as kayaking and fishing in the rivers, and help with the riparian health of the rivers, streams, and canals.

- *Will the project benefit a larger initiative to address sustainability of water supplies?*
  WBWCD has a Drought Contingency Plan (DCP). They have been actively working toward water conservation by installing meters on secondary services, and through public outreach and education, lining canals, repairing infrastructure, etc. They have also been working with agriculture to implement conservation measures. This project is identified in the DCP and is part of the District’s larger initiative.

E.1.4. Evaluation Criterion D – Severity of Actual or Potential Drought Impacts to be Addressed by the project

What are the ongoing or potential drought impacts to specific sectors in the project area if no action is taken., and how severe are those impacts? Impacts should be quantified and documented to the extent possible. For example, impacts could include, but are not limited to:

- *Whether there are public health concerns or social concerns associated with current or potential drought conditions (e.g., water quality concerns including past or potential violations of drinking water standards, increased risk of wildfire, or past or potential shortages of drinking water supplies? Does the community have another water source available to them if their water service is interrupted?).*
  The Utah State Department of Agriculture and Food officials estimated that crop yields were down by 30 percent for farmers in Box Elder County in 2021 and are fast to do the same in

2022. Agriculture in Utah is a $1.8 billion industry and is responsible for 2.3 percent of the state's gross domestic product. In 2021 and 2022, all five counties that WBWCD services have been listed on the Secretarial Disaster Designations for crops that have been impacted by drought.

This designation comes because of natural disaster occurrences, including drought conditions, and the county must have a 30 percent production loss of at least one crop. This past year, many farmers had to fallow their land because their water share was cut by 40 to 70 percent and was completely shut down in August. If it were not for late rains in August and early September, fruit growers in Box Elder and Utah counties would not have been able to have their entire crop of apples and peaches.

The drought in 2021 put many farmers out of business due to the lack of natural feed in mountain pastures where ranchers graze cattle during the summer, and because many high-country wells they rely on to water ran dry. Many ranchers were forced to bring their livestock home weeks or months earlier than expected. They did not have the alfalfa to feed their livestock and had to buy hay on the open market paying $100 to $120 more per ton, putting them in significant debt. "They just sold their farms for residential development. It was just too hard after so many years of drought. Others suffered, but it has taken its toll on them financially and emotionally."

On May 5, 2022, the Utah Department of Natural Resources Drought Update indicated that several years of drought and ongoing extreme drought conditions statewide are having a significant impact on the survival rates of deer. The Utah Division of Wildlife Resources recommended decreasing hunting permits for the 2022 hunting seasons.

According to the Great Basin Coordination Center, fire potential may increase to above normal from mid to late May and by June over higher elevations in Utah due to drought concerns. By July, the higher terrain in northern Utah will likely see above-normal fire potential due to the drought once the snow melts and fuels cure.

- *Whether there are local or economic losses associated with current drought conditions that are ongoing, occurred in the past, or could occur in the future (e.g., business, agriculture, reduced real estate values).*
  The new direct conduit will allow WBWCD to access up to an additional 50,000 acre-feet of water from the reservoir. This not only has economic benefits to Compass Minerals, who directly benefit from the additional water, but it also has economic benefits to customers higher in the watershed. By holding water back in the upper watershed, it can be used by municipal, industrial, recreation, and agricultural users.

  For example, WBWCD serves a significant amount of farmland. The crops are used for both human and livestock consumption. During drought years, if farmers cannot grow enough feed for their livestock, they will be forced to purchase feed at inflated values or sell off their livestock, potentially at a loss. This was the case last year in some Utah areas and the Weber Basin's service area. Alfalfa hay currently sells in excess of $300.00 per ton. Whereas three years ago, it sold for $150.00 to 200.00 per ton. Last year, it was $200.00 and higher per ton.

  Other areas in the western US experiencing drought have driven prices up as they also need to import feed. In WBWCD's service area, the average water consumption for alfalfa hay is three acre-feet per acre of crop. If WBWCD were to hold back 30,000 acre-feet (keep it in upper elevation storage for late season use), that would potentially produce 10,000 acres of alfalfa (30,000 acre-feet / 3 acre-feet per acre). At an average of 4 tons per acre, this equates to an economic value of $12,000,000.00 (10,000 acres x 4 tons per acre x $300.00 per ton) (not deducting for production costs of equipment, labor, and fuel). If they held back 50,000 acre-feet, the economic value or positive economic impact would potentially be $20,000,000.00.

Agriculture is only one sector that would benefit from the additional water or would be severely impacted by reduced water if this resiliency project is not constructed. Commercial, industrial, and municipal users would also benefit or be harmed similarly.

- *Whether there are other drought-related impacts not identified above (e.g., tensions over water that could result in a water-related crisis or conflict).*
  There is tension over water in the WBWCD service area. These tensions manifest themselves in several ways. Typically, it is agriculture vs. everyone else. But now, the Great Salt Lake has risen as a contender for tensions over water. The Utah legislation this past legislative session had several bills to help provide water for the Great Salt Lake, most of which were to help irrigators and others conserve water. With each drought year, the Great Salt Lake gets smaller and smaller. The shrinking of the Great Salt Lake has become contentious, not only for the aesthetics but for the impact drought is having on migratory birds and in the dust from the dry lakebed, causing health effects from air-born heavy metals and contaminants.

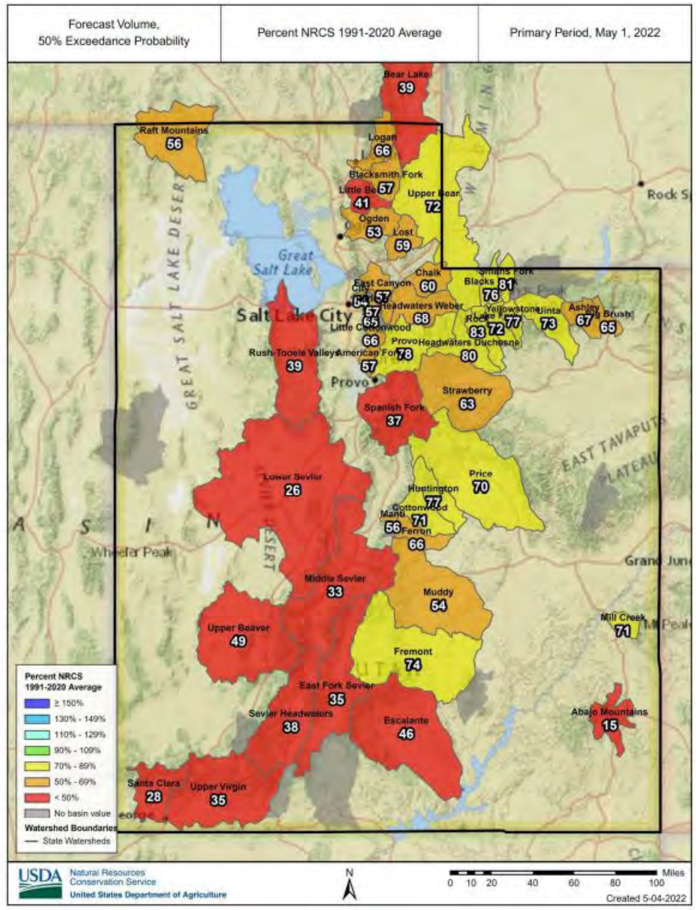
  The massive economic impacts on industries like brine shrimp and others concern Utah's governor and the State Legislature. This past legislative secession, they gave over 40 Million dollars to a committee to study and develop projects to help secure the Great Salt Lake. It has become a battle between the push for reusing water and sustaining the Great Salt Lake.

Describe existing or potential drought conditions in the project area.

- *Is the project in an area that is currently suffering from drought or which has recently suffered from drought? Please describe existing or recent drought conditions, including when and the period of time that the area has experienced drought conditions (please provide supporting documentation, [e.g., Drought Monitor, droughtmonitor.unl.edu]).*
  The State Engineer and her deputies met with representatives of WBWCD, the Division of Water Resources, and the Department of Natural Resources to discuss challenges that the Weber Basin area is experiencing with existing water supplies. Due to the ongoing drought, WBWCD has received very little new storage during the last two years and is expected to receive very little again this year. To mitigate the effects of the drought on their storage reservoirs, they have reduced the amount of water they intend to deliver to contract holders this year. In addition to those measures, they are also purchasing 5,000 acre-feet of Echo shares from users on the Provo River and about 14,000 acre-feet from Deer Creek water users. The delivery of this water into Weber Basin's reservoirs will be accomplished by modifying the operation of the Weber-Provo Canal. WBWCD has also implemented its "Severe" drought response level designation found within the DCP.

  The DCP proposed demand reductions for this drought designation include a 60 percent reduction in waters available for outdoor irrigation of lawns and gardens (both culinary and secondary), a 40 percent reduction for agricultural use, and a 10 percent reduction for culinary indoor use. Figure 7 indicates the streamflow forecasts based on basins. The percentage is the percentage of volume compared to a 30-year average volume of water for the basin.

Figure 7 Utah Streamflow Forecast for Basins



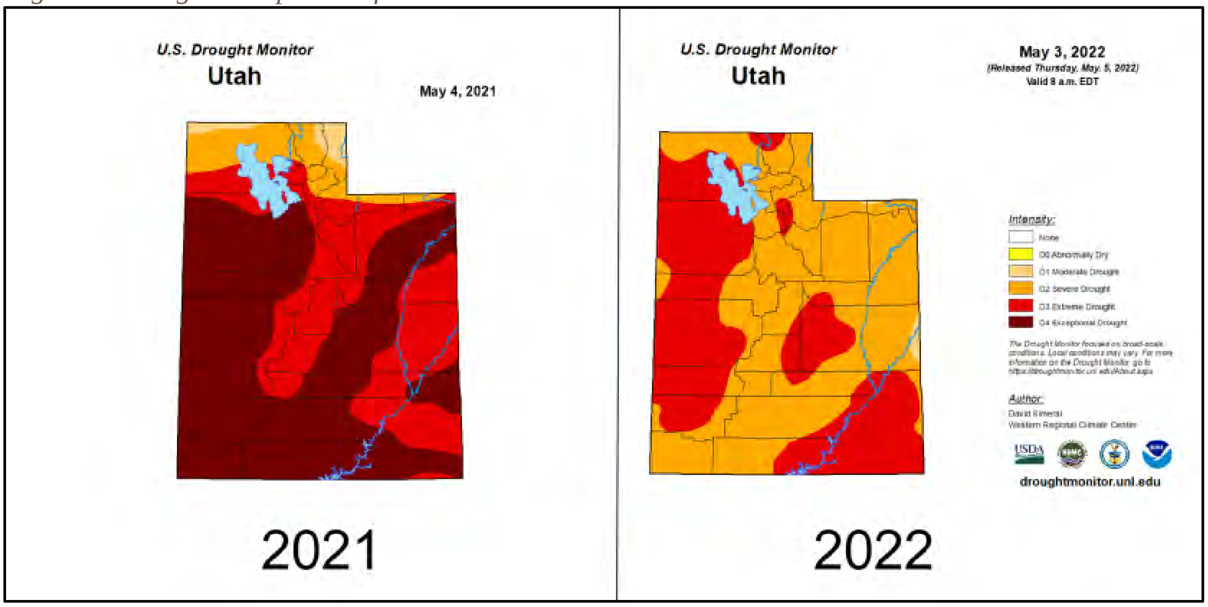
On May 5, 2022, the Utah Department of Natural Resources Drought Update indicated the following:

- Soil moisture content was the driest on record in Utah in 2020, stealing an already abysmally low spring runoff, which led to depleted reservoirs, with some now at 30-year lows.
- The Great Salt Lake hit its lowest recorded level in decades in October 2021.
- According to the latest information released by the U.S. Drought Monitor, drought conditions continue to plague the state, with 99.45 percent of the state experiencing "severe" or "extreme" drought conditions. The Drought Monitor's second and third most serious categories are severe and extreme drought conditions. Spring runoff is underway, with the snowpack levels declining as temperatures warm and snow melts. The snowpack was 25 percent below average and did not refill our reservoirs.
- Statewide snow water equivalent (SWE), or how much water would be in the snowpack if it melted, peaked at 12 inches. This is 75 percent of our water year's typical median peak of 16 inches.
- Twenty-two of Utah's largest 45 reservoirs are below 55 percent available capacity, and overall statewide storage is 60 percent of capacity. This time last year, reservoirs were about 67 percent of capacity.
- Of the 96 measured streams, 56 are flowing below normal despite spring runoff, and five streams are flowing at record low conditions. Due to low snowpack, stream flows are expected to be lower than normal, which means our reservoirs won't fill as they normally would.
- Current drought conditions have created drier fuels, increasing the chance of a wildfire starting. There have been 97 wildfires in Utah as of May 5, 2022 that have burned approximately 256 acres. Out of the 97 wildfires this year, 88 have been caused by humans.

- *Describe any projected increases to the severity or duration of drought in the project area resulting from changes to water supply availability and climate change. Provide support for your response (e.g., reference a recent climate informed analysis, if available).*

  Figure 8 compares Utah's current drought situation to 2021. Last year at this time, 57.21 percent was in exceptional drought. Currently, no part of the state is in exceptional drought (the worst category), but reservoir storage has dropped significantly due to the extended drought. Currently, 99.45 percent of the state is in severe drought.

Figure 8 Drought Comparison for 2021& 2022



E.1.5. Evaluation Criterion E – Project Implementation

Describe the implementation plan of the proposed project. Please include an estimated project schedule that shows the stages and duration of the proposed work, including major tasks, milestones, and dates. Milestones may include, but are not limited to, the following: design, environmental and cultural resources compliance, permitting, construction/installation.

In 2019, WBWCD conducted a study of the existing siphons that were observed to be in failing condition. Based on their findings, WBWCD decided to remove the existing siphons from the dam embankment and install a low-level outlet or new, larger siphon capable of delivering 35 cubic feet per second (cfs). An analysis of five locations for the new siphon was developed, and WBWCD decided on the proposed project location. Cost estimates were developed, and WBWCD took their project to Reclamation to prepare a NEPA evaluation. Reclamation determined that a Categorical Exclusion (CE) would be appropriate for this project. The CE was prepared and approved, allowing WBWCD to move forward with its project. WBWCD has prepared a 100 percent design for the delivery conduit and obtained all required permits. They have a 30 percent design on the piping and siphon removal of the project.

Project Schedule and Milestones

- **Study Analysis:** Prepared the Project Study and Alternatives analysis – *Completed Aug 2021*
- **Permitting and Planning:** Planned with the Bureau of Reclamation and obtained required permits – *Completed Feb 2022*

- **Design:** Designed for the new delivery conduit through the dam embankment – *Completed Jan 2022*
- **Environmental:** Environmental Investigation and Clearance – *Completed Feb 2022*
- **Material Purchase:** Pre-purchase long-lead materials (steel pipe, gate, sheet piles) and fill materials – *March/April 2022*
- **Bidding:** Prequalification of Contractors and Bidding – *Prequalification advertised on April 19 and chose three bidders on May 17, 2022; bids due June 22, 2022*
- **Construction:** Construction of the delivery conduit through the dam embankment – *July 2022 to March/April 2023*
- **Design:** Design of the pipe between the delivery conduit and the existing canal – *September 2022*
- **Bidding and Construction:** Bid and construct the pipe between the delivery conduit and the existing canal – *March to July 2023*
- **Charge System:** Deliver water through new pipe system – *Summer/Fall 2023*
- **Old Siphon Removal:** Remove old siphons after the new siphon is up and working – *August 2023, or if water is too high, wait for a low water level to avoid or reduce impacts and coffer dam needs.*

Describe any permits that will be required, along with the process for obtaining such permits.

Reclamation communicated with the Army Corp of Engineers, Utah Dam Safety, Utah DEQ, State Parks, and State Fish and Wildlife during the CE process, and based on information from Reclamation; this project complies with section 404 of the Clean Water Act. It qualifies under conditions (a) and (c) of nationwide permits 3, and all activities must comply with that permit's general and regional requirements. It is anticipated that this project will comply with these requirements.

There would be no significant impact on water quality from this project. However, WBWCD (or its contractor) will obtain a dewatering permit per Reclamation's correspondence with Utah DEQ staff.

Identify and describe any engineering or design work performed specifically in support of the proposed project.

WBWCD has prepared a 100 percent design for the delivery conduit and obtained all required permits, and they have a 30 percent design on the piping and siphon removal of the project.

Describe any new policies or administrative actions required to implement the project.

None are required.

E.1.6. Evaluation Criterion F – Nexus to Reclamation

Describe the nexus between the proposed project and a Reclamation project or Reclamation activity. Please consider the following:

- *Does the applicant have a water service, repayment, or O&M contract with Reclamation?*
  The project is located at Willard Bay Reservoir and the A.V. Watkins Dam; both are Reclamation projects and operated by WBWCD.
- *If the applicant is not a Reclamation contractor, does the applicant receive Reclamation water through a Reclamation contractor or by any other contractual means?*
  N/A.

- *Will the proposed work benefit a Reclamation project area or activity?*
  Yes. The proposed action would address the corrosion issues, allow access to water at lower reservoir levels, correct seismic deficiencies, and significantly lessen the risk of embankment failure.
- *Is the applicant a Tribe?*
  No.

[redacted]

[redacted]

- [redacted]
- [redacted]
- [redacted]
- [redacted]
- [redacted]

[redacted]

- [redacted]
- [redacted]

- *How the expenditure benefits the project.*
  All of the items listed required long lead times, and WBWCD needed to have these items coming and ready at the job for when construction starts. Sheet piles are required in order to construct the coffer dam. The coffer dam is step one in construction; without the piles, construction cannot begin. The Delivery Conduit is a concrete encased 48-inch diameter steel pipe, which the manufacturer estimates a five month timeframe for delivery. The guard gate is estimated to take up to six months to build by the supplier. The import fill materials needed to be processed and delivered to the site, and the supplier estimates several months to make those deliveries. Each of the four items is critical to the timeliness and success of the project. If one is missing, mainly the piles, pipe, or gate, then the project cannot proceed. The earth-fill dam needs to be excavated, pipe installed, and dam reconstructed before freezing temperatures are encountered. In order to accomplish this requirement, materials were pre-purchased as soon as Reclamation approved construction plans but before the construction bidding process could happen. The construction bidding process is a two to three month process, and the project could not absorb those delays. Time is of the essence for this to be successful.

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Budget Proposal

Table 1 – Total Project Cost Summary

Source	Amount
Costs to be reimbursed with the requested Federal Drought Resiliency funding	$3,800,643
Costs to be paid by the applicant (operation funds, bonds, or other nonfederal funding)	$3,800,643
Costs to be paid by XM Loan	$1,115,908
Value of third-party contributions	$0.00
Total Project Cost	$8,717,194

Table 2 – Non-Federal and Federal Funding Sources Summary

Funding Sources	Amount
Non-Federal Entities	
1. WBWCD (operation funds bonds, or other nonfederal funding)	$3,800,643
Non-Federal Subtotal	$3,800,643
Federal Entities	
1. Reclamation Funding	$3,800,643
2. XM Loan	$1,115,908
Federal Subtotal	$4,916,551
Requested Reclamation Funding	$3,800,643

Table 3 – Drought Resiliency Project Budget Proposal

Drought Resiliency Project Pre Purchase of Supplies and Materials				
Budget Item Description	Computation		Unit	Costs
	$/Unit	Quantity		
Sheet Piles	$668,919.00	1	Each	$668,919.00
Zone 2A Materials hauled to site	$23.17	10,500	Each	$243,285.00
			Supplies and Materials Total:	**$912,204.00**

Drought Resiliency Project Phase 1 Delivery Conduit (outlet)				
Budget Item Description	Computation		Unit	Costs
		Quantity		
Seeding	$2,750.00	1.3	Acre	$3,575.00
Construction Surveys	$27,500.00	1	LS	$27,500.00
Unwatering	$110,000.00	1	LS	$110,000.00
Cofferdam Water	$27,500.00	1	LS	$27,500.00
Blanket Drain	$11.00	5,000	SF	$55,000.00
Trench Drain	$110.00	100	LF	$11,000.00
Sheet Pile Installation	$4.40	29,080	SF	$127,952.00
Sheet Pile Removal	$11.00	6,020	SF	$66,220.00
Unclassified Excavation	$11.00	86,430	CY	$950,730.00
Earthfill, Zone 1, Zone 1A, and Zone 1B	$11.00	27,890	CY	$306,790.00
Earthfill, Zone 2	$11.00	22,910	CY	$252,010.00
Earthfill, Zone 2A (Import)	$27.50	9,410	CY	$258,775.00
Earthfill, Zone 2B	$8.80	17,420	CY	$153,296.00
Riprap Bedding	$55.00	370	CY	$20,350.00
Filter Sand	$110.00	7,040	CY	$774,400.00
Gravel Drain	$110.00	2,230	CY	$245,300.00
Reinforced Concrete - Intake Structure	$27,500.00	1	Each	$27,500.00
Reinforced Concrete - Outlet Encasement	$770,000.00	1	Each	$770,000.00
Reinforced Concrete - Keyways	$8,800.00	1	Each	$8,800.00
Reinforced Concrete - Control Building	$22.00	1	Each	$22.00
Reinforced Concrete - Drain Headwall	$2,750.00	1	Each	$2,750.00
Reinforced Concrete - Pile Cap	$27,500.00	1	Each	$27,500.00
12-inch HDPE Pipe (Slotted)	$110.00	1	Each	$87,450.00
12-inch HDPE Pipe (Solid)	$88.00	795	LF	$29,216.00
48-inch HDPE Pipe Installation	$11,000.00	332	LF	$220,000.00
48-inch Delivery Pipe Installation	$275.00	20	LF	$92,400.00
Rock Riprap (Imported)	$55.00	3,370	CY	$24,200.00
48-inch by 48-inch Slide Gate Install	$55,000.00	440	CY	$55,000.00
Instrumentation	$55,000.00	1	Each	$55,000.00

Field Office and Laboratory	$55,000.00	1	Each	$55,000.00
Upstream Liner	$3.30	1	Each	$28,446.00
Geogrid	$2.20	8,620	SF	$136,400.00
Phase 1 Delivery Conduit (outlet) Total:				**$5,010,082.00**

Drought Resiliency Project Phase 2 Delivery Pipe				
Budget Item Description	Computation		Unit	Costs
	$/Unit	Quantity		
Mobilization/Demobilization	$92,500.00	1	Each	$92,500.00
48" DR-17 HDPE Pipe (outlet to canal)	$475.00	1500	LF	$712,500.00
Piping for Flow Control Manifold	$37,500.00	1	Each	$37,500.00
48" Tee	$22,500.00	4	Each	$90,000.00
48"x36" Tee (manifold)	$22,500.00	2	Each	$45,000.00
36"x24" Tee (manifold)	$18,750.00	2	Each	$37,500.00
48" 90° Bend	$22,500.00	2	Each	$45,000.00
16" 90° Bend (manifold)	$15,000.00	2	Each	$30,000.00
48" Double Offset Butterfly Valve	$112,500.00	4	Each	$450,000.00
Phase 2 Delivery Pipe Total:				**$1,540,000.00**

Drought Resiliency Project Phase 4 Solar Array				
Budget Item Description	Computation		Unit	Costs
	$/Unit	Quantity		
Solar Array - 33.3 kW (includes panels, controls, and installation)	$139,000.00	1	Each	$139,000.00
Phase 4 Solar Array Total:				**$139,000.00**

Drought Resiliency Project Grand Total	
Budget Item Description	Cost
Supplies and Materials Total	$912,204.00
Phase 1 Delivery Conduit (outlet) Total	$5,010,082.00
Phase 2 Delivery Pipe Total	$1,540,000.00
Phase 4 Solar Array Total	$139,000.00
Drought Resiliency Project Grand Total Estimated Project Costs:	**$7,601,286.00**

Table 4 – Maintenance and Aging Infrastructure (XM) Project Budget Proposal

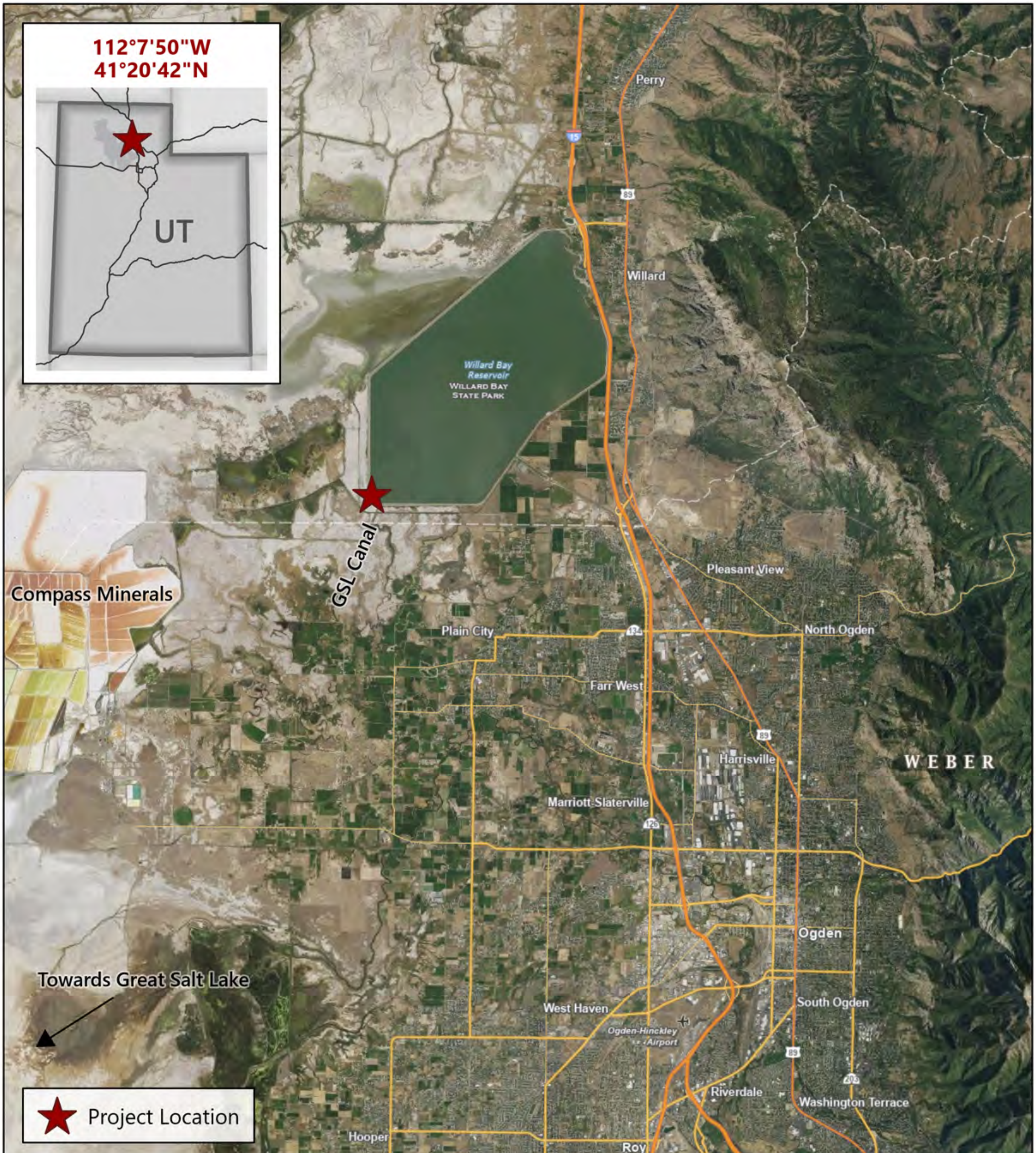
XM Project Pre Purchase of Supplies and Materials				
Budget Item Description	Computation		Unit	Costs
	$/Unit	Quantity		
48-inch Steel Pipe	$1,323.00	336	Each	$444,528.00
Guard Gate	$94,710.00	1	Each	$94,710.00
Supplies and Materials Total:				**$539,238.00**

XM Project Phase 1 Delivery Conduit (outlet)				
Budget Item Description	Computation		Unit	Costs
	$/Unit	Quantity		
Clearing, Grubbing and Stripping	$2,750.00	2.8	Acre	$7,700.00
Pollution Control	$27,500.00	1	Each	$27,500.00
Mobilization & Demobilization	$275,000.00	1	LS	$275,000.00
Roadbase	$55.00	250	CY	$13,750.00
Vent Ring Fitting	$11,000.00	336	LF	$11,000.00
Precast Manhole	$5,500.00	1	Each	$11,000.00
Rock Riprap (Onsite)	$11.00	2	Each	$37,070.00
Waterway Buoys	$27,500.00	1	Each	$27,500.00
Cathodic Protection	$33,000.00	62,000	SF	$33,000.00
Phase 1 Delivery Conduit (outlet) Total:				**$443,520.00**

XM Project “Phase 2 Delivery Pipe”				
Budget Item Description	Computation		Unit	Costs
	$/Unit	Quantity		
24" Double Offset Butterfly Valve	$50,000.00	1	Each	$50,000.00
16" Double Offset Butterfly Valve	$37,500.00	1	Each	$37,500.00
Phase 2 Delivery Pipe Total:				**$87,500.00**

XM Project “Phase 3 Removal of Existing Siphon System”				
Budget Item Description	Computation		Unit	Costs
	$/Unit	Quantity		
Excavation:	$11.00	1,050	Yard	$11,550.00
Zone 1:	$11.00	800	Yard	$8,800.00
Zone 2:	$13.20	250	Yard	$3,300.00
Dispose of Existing Pipes	$22,000.00	1	Each	$22,000.00
Phase 3 Removal of Existing Siphon System Total:				**$45,650.00**

XM Project Grand Total	
Budget Item Description	Cost
Supplies and Materials Total	$539,238.00
Phase 1 Delivery Conduit (outlet) Total	$443,520.00
Phase 2 Delivery Pipe Total	$87,500.00
Phase 3 Removal of Existing Siphon System Total	$45,650.00



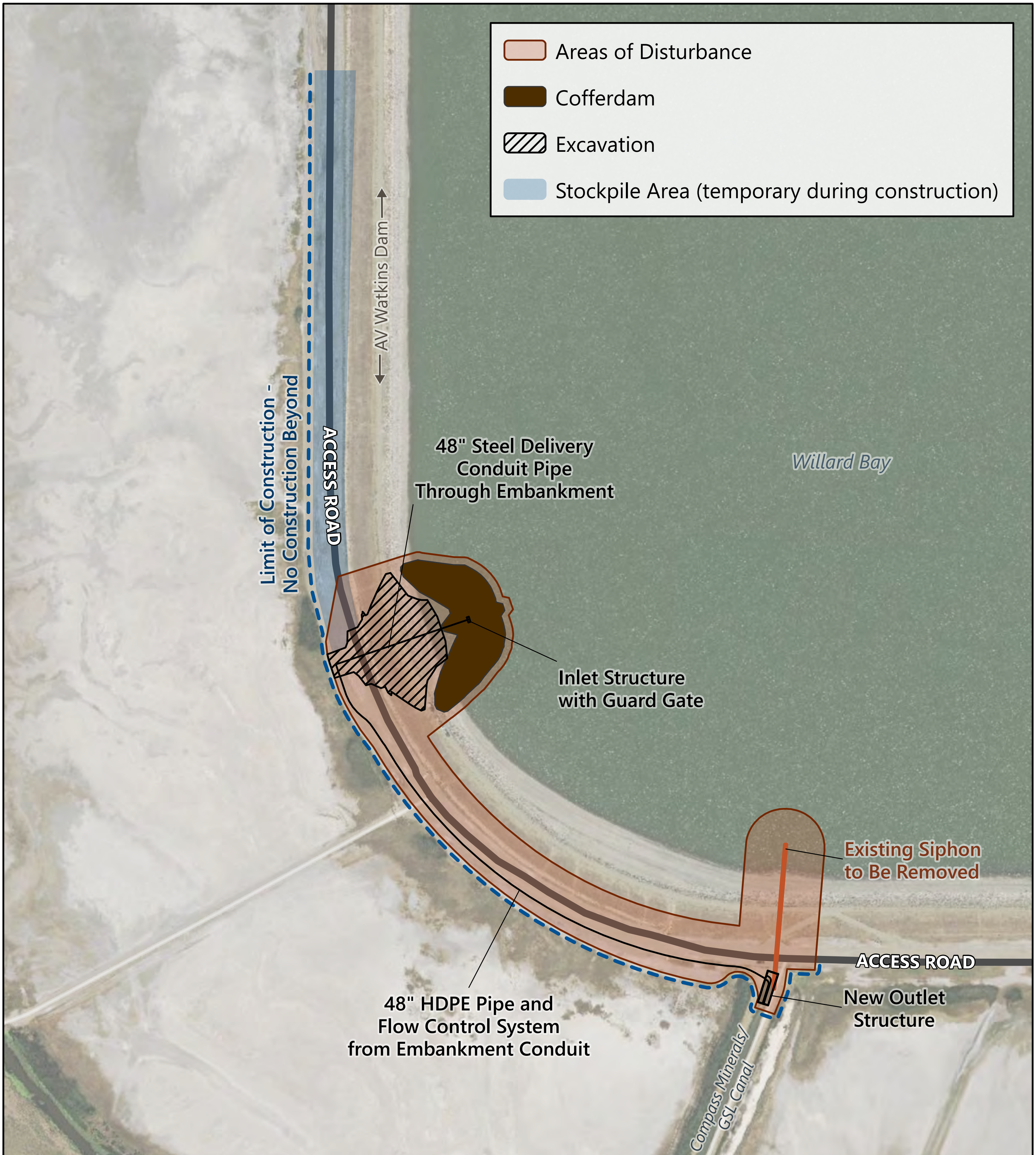
AV WATKINS SIPHON REPLACEMENT PROJECT DELIVERY CONDUIT PROJECT LOCATION

WaterSMART: Drought Resiliency Project Grant

0 1 2
Miles

N

June 2022



AV WATKINS SIPHON REPLACEMENT PROJECT DELIVERY CONDUIT PROJECT DETAIL

WaterSMART: Drought Resiliency Project Grant

0 250 500
US Feet

N

May 2022

Areas of Disturbance

AV Watkins Phase 2 Siphon Replacement

Weber Basin Water Conservancy District

RB&G ENGINEERING, INC.

1435 WEST 820 NORTH
PROVO, UTAH 84601-1343
801 374-5771 PROVO
801 521-5771 SALT LAKE CITY

PRELIMINARY PLANS
DEC. 2021

NOT FOR CONSTRUCTION

NO.	DESCRIPTION	BY	APR	DATE

REVISION

AV WATKINS PHASE 2 SIPHON REPLACEMENT
WEBER BASIN WATER CONSERVANCY DISTRICT

PROJECT SITE PLAN

FILE:
JOB PROJ. #: 57.20.018
DRAWN BY: JBR
DESIGN BY: BCH
CHECKED BY: RFP

ONE INCH
AT FULL SIZE. IF NOT ONE INCH, SCALE ACCORDINGLY

LAST UPDATED: 9 FEB 2022

SHEET NUMBER:
G101

9-FEB-2022
DGN File: H:\DAMS\AV Watkins Siphon Replacement 202004-002\Cad\Sheet_Files\202004_002_G101.dgn

WASATCH WIGEONS
ASSOCIATION

CONSERVATION | COMMUNITY | LEGACY

Date: 6/8/2022

Scott Paxman, General Manger
Weber Basin Water Conservancy District
2837East Highway 193
Layton, Utah, 84041

Dear Scott,

Wasatch Wigeons Association (WWA) is pleased to write in support of the Weber Basin Water Conservancy District's grant application submitted to The Bureau of Reclamation for a Water SMART: Drought Resiliency Projects Grant. We appreciate your efforts to increase your system's resilience to the impacts of the ongoing drought by replacing aging infrastructure to improve operations, facilitate better delivery of water to end users, and reduce the possible failure of the siphons due to corrosion. This project will have a significant impact on our operations and the sustainability of our access to water. This project will also support water use for a key wetland "Harold Crane Waterfowl Management Area" as a refueling station for millions of migratory birds, for both their spring and fall migrations.

WWA recognizes the importance of drought resiliency within our often water-short basin. The water provided through these improvements will benefit water users and the regional environment and create a more drought-resilient water delivery system that helps provide security to essential water needs within the area.

We strongly support your grant application and appreciate the advancements it will make in improving water efficiencies in the area.

Thank You

Troy Burgess, President
Wasatch Wigeons Association
475 West 2125 North
Harrisville, Utah 84414