Wastewater Facilities Planning Study

FISH HAVEN AREA RECREATIONAL SEWER DISTRICT

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DRAFT

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AUTHORIZATION

In September 2022, the Fish Haven Area Recreational Sewer District (District) contracted with Keller Associates (Keller) to prepare a Wastewater Facilities Planning Study in accordance with IDAPA 58.01.22 to evaluate the District's wastewater treatment and collection system and to develop a plan to meet forthcoming discharge requirements and future system demands. The study was funded in part by a grant from the Idaho Department of Environmental Quality (Idaho DEQ).

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EXECUTIVE SUMMARY

INTRODUCTION

The purpose of this Wastewater Facilities Planning Study (WWFPS) is to assess the condition of the wastewater collection system, evaluate the capacity of the sewage lagoons, and consider their ability to meet the requirements for lagoon facilities as outlined in the State of Idaho's Administrative Procedure Act (IDAPA). It begins with an assessment of environmental and socioeconomic conditions, forecasts the population for a 40-year period, and conducts a detailed analysis of the existing collection system and lagoons, while considering future wastewater flows and impacts. The study then presents and compares improvement alternatives before selecting recommended modifications, along with an implementation schedule, financing options, and an annual O&M and replacement budget.

SYSTEM SUMMARY

The Fish Haven Area Recreational Sewer District is located in Bear Lake County in the southeast corner of Idaho. The District was founded in 1981 with the attempt to preserve the quality of the soil, groundwater, and nearby Bear Lake. As homes continued being built in the area, a sewer collection system was constructed to reduce the number of septic tanks in the area.

The sewer line, maintained by the District, runs from the Utah border, through Fish Haven along US Highway 89 to the City of St. Charles, ending at the District's sewage lagoons north of St. Charles. The sewer line is comprised of both gravity and pressurized pipelines, with five lift stations along the way. More lift stations will be added to the District's system as the area develops. St. Charles operates and maintains a length of sewer, including one lift station, through the city and to the lagoons. The wastewater treatment facility consists of four treatment lagoons, and one winter storage lagoon used to store wastewater in the winter months. All stored wastewater is land applied during the irrigation season.

SYSTEM DEFICIENCIES AND NEED FOR ACTION

The District, has observed the following deficiencies in the collection system and in the lagoons caused by increased wastewater flows. The higher flows recently caused the lagoons to reach their full capacity during the peak seasons and the area for the land application site to be no longer sufficient. The higher flows have also caused two of the lift stations in the collection system to be at risk of overtopping.

ALTERNATIVES CONSIDERED

Various alternatives discussed in Chapter 4 of this study regarding the collection system and the lagoons were evaluated for the District's information to identify solutions to address the identified deficiencies.

PREFERRED ALTERNATIVE

The preferred alternatives are presented in Chapter 5 of this study. This includes an alternative to address the capacity issue of the lagoons by constructing an additional winter storage lagoon and to construct a new pipeline to a new larger land application site. It also includes alternatives which increase the capacity the collection system to enable more flow to pass through including upsizing pumps in selected lift stations, installing a parallel force main in selected locations, upsizing specific force main diameters, and addressing additional miscellaneous improvements to each lift station.

FINANCIAL ANALYSIS

The preferred alternative is to be funded by grants and/or loans from the Idaho Department of Environmental Quality (DEQ) and USDA-Rural Development. It is planned to submit a Letter of Interest (LOI) to the Idaho DEQ January of 2025 and a funding request to the USDA-Rural Development.

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CHAPTER 1 - INTRODUCTION

1.1. PROJECT PURPOSE AND NEED

This report presents the findings and recommendations for the District's wastewater collection system. Keller has worked closely with key District officials and staff to conduct this study, aiming to understand the system's current challenges. The goal was to develop practical and cost-effective solutions to assist the District in meeting their wastewater goals. Keller gratefully recognizes the District's administrative and support staff and all others involved for their valuable assistance in the completion of this study.

The criteria used in conducting this report followed the regulations outlined in the Idaho Wastewater Rules (IDAPA 58.01.16), the Ten States Standards, the Federal Clean Water Act, and the Idaho Pollutant Discharge Elimination System.

1.2. SCOPE

The Scope of this study includes the following:

- Evaluate the District's collection system:
  - Analyze the collection system's pipelines.
  - Communicate with the District about lengths of pipelines or lift stations in the system they have observed to have deficiencies.
  - Recommend improvements and prepare a Capital Improvement Plan (CIP).
- Evaluate the wastewater lagoons and land application site:
  - Perform a detailed evaluation of the District's lagoons for a 40-year planning period regarding facility capacity, operational challenges, and remaining useful life.
  - Recommend improvements and prepare a Capital Improvement Plan (CIP).
- Report Preparation:
  - Submit to FHARSD for their review and approval.
  - Submit to Idaho Department of Environmental Quality (DEQ) for review and approval.
- Facilitate Public Participation in the planning process through Open House Presentation and Meeting.
- Work with the District to identify potential methods of financing for any recommended improvements.

1.3. REPORT ORGANIZATION

This report is intended to provide a methodical description of the District's wastewater collection and treatment system. The report is organized to address system components regarding current and future conditions. The table of contents provides a complete directory of sections included in this report, and additional lists of tables and figures are included immediately following the table of contents. Chapters in the report are summarized below:

- Chapter 1 - - Introduction
- Chapter 2 - Project Planning
- Chapter 3 - Existing Facilities Condition & Evaluation
- 0- Evaluation of Improvement Alternatives
- Chapter 5 - Implementation & Funding Analysis

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CHAPTER 2 - PROJECT PLANNING

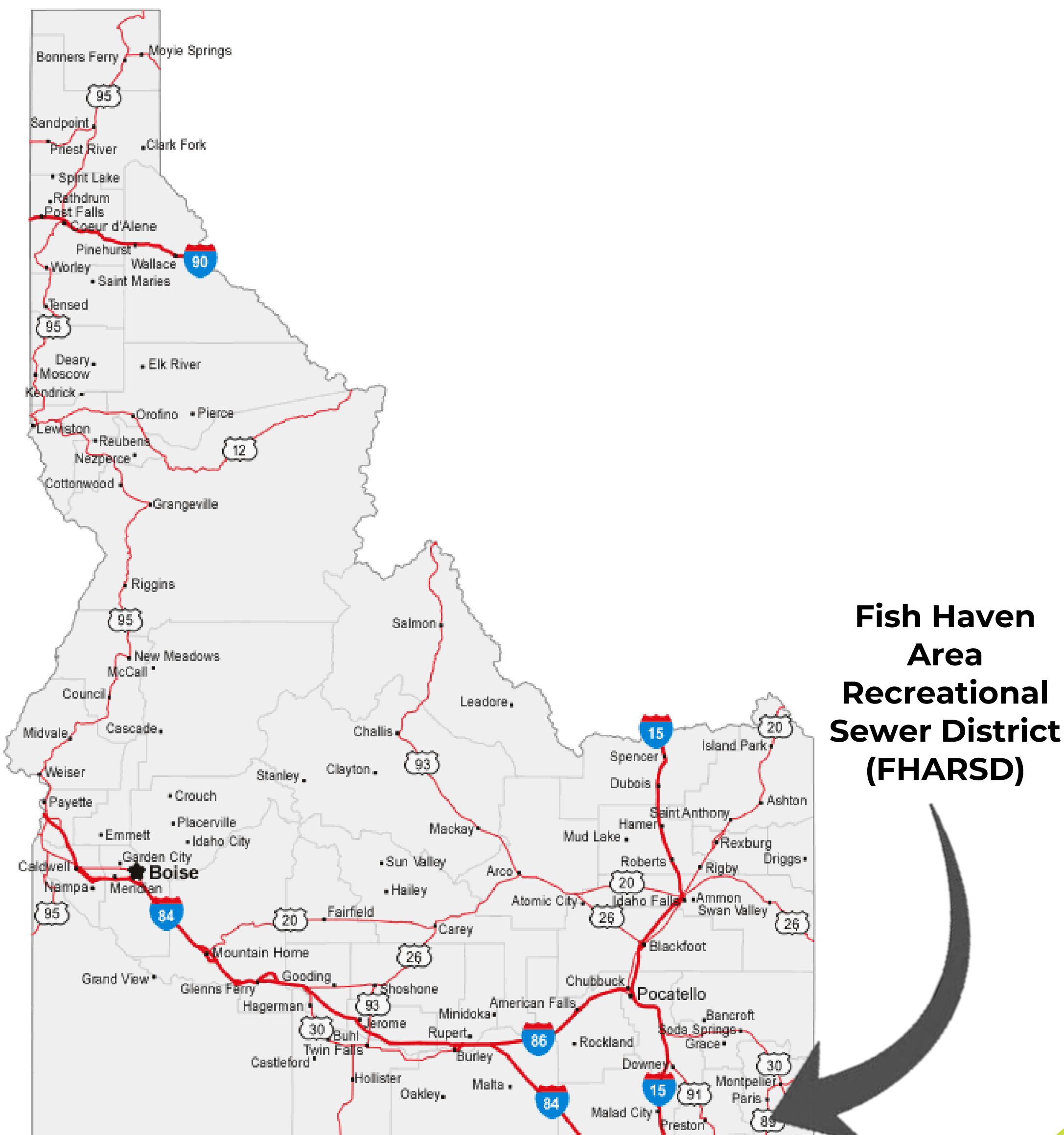
This portion of the report presents a general overview of existing conditions within the study area. An Environmental Information Document (EID) may be prepared subsequent to this study if the District elects to pursue State or Federal funding for the recommended projects. An EID, if prepared, will provide additional detail regarding environmental conditions within the planning area, potential environmental impacts which may result from the implementation of the proposed improvements, and means to mitigate these environmental impacts.

2.1. LOCATION AND PROPOSED PLANNING AREA

The District lies between the cities of Fish Haven and St. Charles along US Highway 89. Figure 2-1 shows the location of the District in relation to the State of Idaho.

This WWFPS is based on a specific proposed project planning area (PPPA) which incorporates the region and population which the wastewater system could reasonably be expected to serve for the 20-year planning period from 2023 to 2043. Figure 2-4 identifies the PPPA and is provided at the end of this chapter.

FIGURE 2-1: LOCATION OF FHARSD



2.2. ENVIRONMENTAL RESOURCES PRESENT

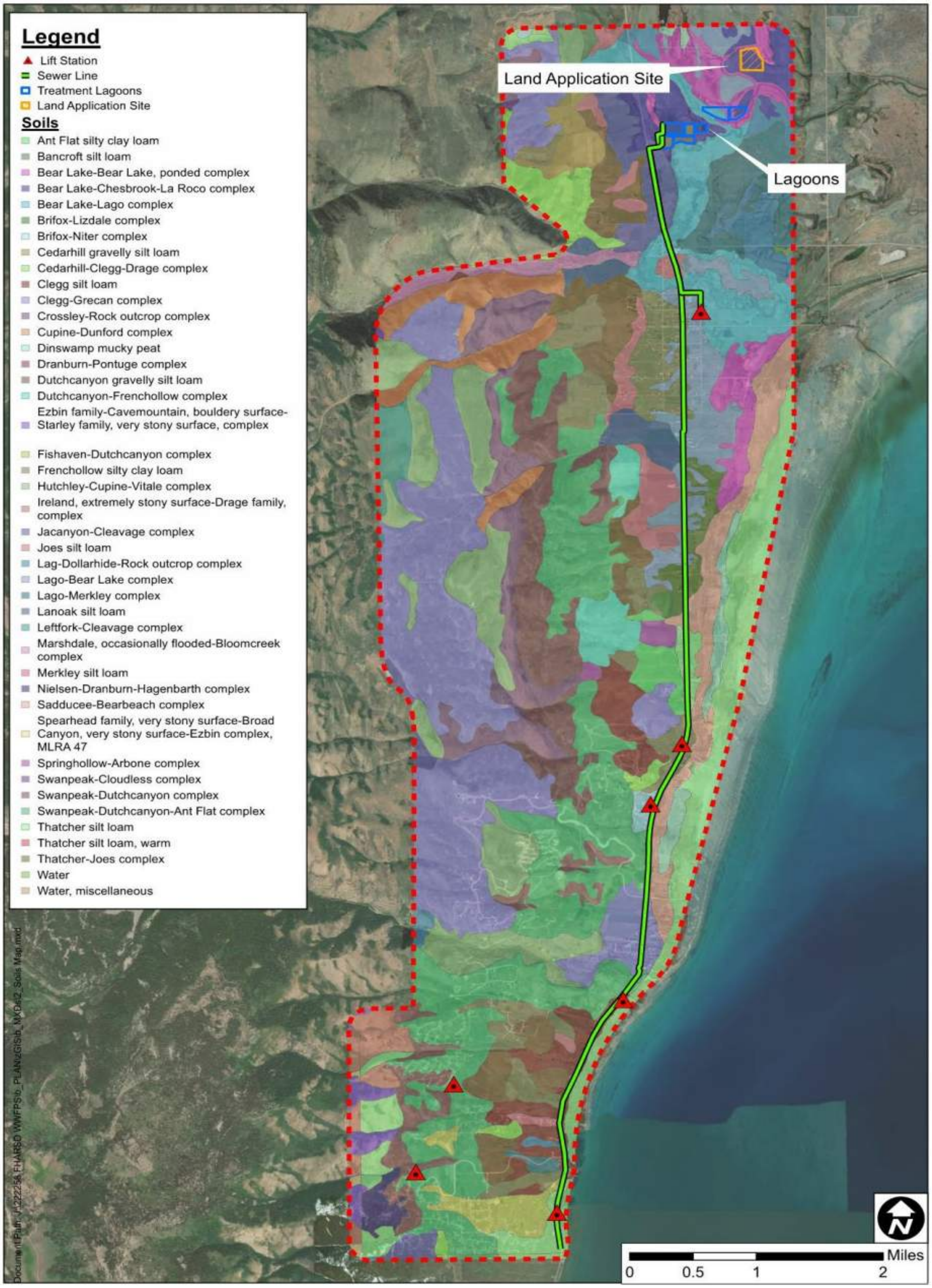
2.2.1. Physiography, Topography, Geology, and Soils

The District is located within Bear Lake County in southeast Idaho. The District runs along US Highway 89 and is surrounded by Bear Lake on the east and the Bear River Range on the west. The District's elevation is 5,955 ft above sea level and the immediate area is dominated by low marshes as the foothills begin to descend into the lake. The topography rises towards the west into the foothills and then to the mountains surrounding the lake. Fish Haven Creek and St. Charles Creek both originate in the Bear River Range and run toward the valley from the west to the east.

Classification of soils in and around the planning area was completed by the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS). The soils in the planning area primarily consist of Swan Peak and Dutch canyon complex and the Clegg and Grecan complex which consists of a cobbly/gravelly silt loam and silt/clay loam. This soil is typically found on 4 to 20 percent slopes. Close to 60% of the PPPA consists of some type of loamy soil. For more information, a detailed soil report of the PPPA from the NRCS is included in Appendix A. Figure 2-2 displays the different zones of soils in the PPPA.

Included in the NRCS's soil survey is an evaluation of wastewater lagoon and wastewater land application suitability. Evaluation of wastewater lagoon suitability is based on the soils hydraulic conductivity (saturated), depth to groundwater, ponding, depth to bedrock (or a cemented pan), flooding, large stones, and organic content. Evaluation of the land application suitability is based on the sodium adsorption ratio, depth to groundwater, ponding, soil water capacity, hydraulic conductivity (saturated), slope, flooding, depth to bedrock (or cemented pan), bulk density, salinity, and the cation exchange capacity of the area soils.

FIGURE 2-2: SOILS MAP



2.2.2. Surface and Ground Water Hydrology

There are several small creeks and springs that originate in the Bear Lake Range west of the PPPA. The St. Charles Creek is one of the larger creeks which branches off into Big Creek and Little Creek. Big Creek runs adjacent to the existing lagoons and the closest point on the river is about 25 ft away from the road surrounding Cell #2.

Groundwater and water from creeks in the area are the main source of domestic and agricultural water in the study area. Based on Idaho Department of Water Resources (IDWR) records, there are approximately 167 permitted groundwater wells in the planning area. St. Charles only has one municipal well with a diversion rate of 1.00 cubic foot per second (cfs). The St. Charles Irrigation Company also has 75.5 cfs of diversion water rights for irrigational use sourcing from Little Creek, Spring Creek, and St Charles Creek. The City of Fish Haven does not maintain any groundwater wells; however, the Fish Haven Water Users Company has water rights for irrigation, municipal, and mitigation use from Fish Haven Creek. Most of the water rights in the area come from groundwater, Fish Haven Creek, Fish Haven Spring, St. Charles Creek, Little Creek, Spring Creek, North Fork St. Charles Creek, and a few other creeks/springs. Reported static water depths range from 0 feet to 634 feet below ground surface. Production rates for the identified wells are reported to range from 3 to 850 gallons per minute (Idaho Department of Water Resources, n.d.). It should be noted that the IDWR well dataset does not contain comprehensive production and static water level depth data. Therefore, reported values outside of realistic conditions have been omitted from the data referenced previously.

2.2.3. Fauna, Flora, and Natural Communities

The PPPA and Bear Lake County support a wide variety of plant and animal life, several of which are listed species by the US Fish and Wildlife Service. Species listed as threatened or endangered include the Canada Lynx, North American Wolverine, Yellow-billed Cuckoo, and the Monarch Butterfly. The Ute Ladies'-tresses is listed as a threatened flower in the study area. A significant portion of the PPPA is located in Freshwater Emergent Wetlands and Freshwater Forested/Shrub Wetlands (U.S. Fish and Wildlife Service, n.d.). More information, including an Information for Planning and Consultation (IPaC) Resource List from the US Fish & Wildlife Service, can be found in Appendix A.

2.2.4. Zoning, Land Use, and Development

The District currently has no zoning classifications. The District mostly serves residential communities, except for the Club House in Bear Lake West, Gladys' Place, and Fish Haven General Store.

2.2.5. Cultural Resources (Historical and Archaeological)

The City of Fish Haven has one rural Folk Victorian dwelling registered to the National Register of Historic Places. The name of this historic site is Scofield, Anna Nielsen House and it is located along US Highway 89 in Fish Haven. This home was built in 1896 and was taken into the registry in 1999. It is a privately owned building which currently serves as a domestic home/hotel.

The City of St. Charles has a grouping of one old home, three cabins, and the surrounding out-buildings which were added to the National Register of Historic Places Inventory in 1976. This historic site is called the Wilhelmina Nelson House and Cabins, and it is located along US Highway 89 in St. Charles. This group of houses represents a typical homestead in southeast Idaho built in 1896. The entry information is shown in Table 2-1 and the data sheets for these historic places are attached in Appendix A.

TABLE 2-1: FHARSD CULTURAL RESOURCES

Title	Address	Date of Register
Scofield, Anna Nielsen, House	2788 US Highway 89, Fish Haven, ID	03/03/1999
Wilhelmina Nelson House and Cabins	Off US Highway 89, St. Charles, ID	05/03/1976

None of these registered historical structures or nearby historical resources will be significantly impacted as part of this study and the subsequent recommendations.

2.2.6. Utility Use and Energy Consumption

The wastewater collection system is partially gravity fed and partially pressurized. The District operates six lift stations that pump flows from lower elevation portions of the service area to the north where the treatment lagoons are located. The lift station located within St. Charles pumps directly to the lagoons. The lift station in St. Charles is owned, operated, and maintained by city personnel.

The pumps in the irrigation building pumps water from the lagoons to the land application site. The lift stations and the irrigation building are the only items that consume electricity in the system.

2.2.7. Floodplains/Wetlands

The Bear Lake area is in an unmapped Federal Emergency Management Agency (FEMA) area. There are many areas throughout the PPPA that are described as wetlands as provided by US Fish & Wildlife Service. According to their wetlands delineation map, the PPPA is partially in Freshwater Emergent Wetlands and partially in Freshwater Forested/Shrub Wetland. (U.S. Fish & Wildlife Service, n.d.). Figure 2-6 shows the extent of areas classified as wetlands in the planning area.

2.2.8. Wild and Scenic Rivers

The Wild & Scenic Rivers Act established by Congress on October 2, 1968 states that certain selected rivers of the Nation which, with their immediate environments, possess outstanding remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations (U.S. Fish and Wildlife Service, n.d.).

Neither St. Charles Creek, Fish Haven Creek, nor any of its tributaries are listed as Wild and Scenic Rivers (National Wild and Scenic Rivers System, n.d.).

2.2.9. Important Farmlands Protection

Prime farmland is defined by the U.S. Department of Agriculture as:

> "Land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban, built-up land, or water areas."[1]

Prime farmland will not be significantly impacted in the PPPA because the study and any subsequent recommendations will focus on previously developed infrastructure, such as the wastewater collection system. Approximately 10% of the study area is farmland of statewide importance, if irrigated. Another 5% of the PPPA is classified as prime farmland if irrigated, and about 20% of the PPPA is located on prime farmland if irrigated and drained. The remaining 65% is not considered to be prime farmland. More information on prime farmland, including a map showing prime farmland, can be found in the USDA NRSC Soils Report attached in Appendix A.

[1] *(USDA Natural Resource Conservation Service, 2021)*

2.2.10. Proximity to a Sole Source Aquifer

A sole source aquifer, is defined by the Idaho Department of Environmental Quality as:

> "…an aquifer that has been designated by EPA as the sole or principal source of drinking water for an area. As such, a designated sole source aquifer receives special protection. EPA designates an aquifer as a sole source based upon a petition from an individual, company, association, or government entity. Three of Idaho's aquifers—the Eastern Snake River Plain Aquifer, the Spokane Valley-Rathdrum Prairie Aquifer, and the Lewiston Basin Aquifer—are classified as sole source aquifers."[2]

The District does not lie in a sole source aquifer. It is approximately 35 miles south of the Eastern Snake River Plain Aquifer (EPA, n.d.).

2.2.11. Climate

Climatic data for the District is found in Table 2-2. Since there was no data provided in the Western Regional Climate Center for St. Charles or Fish Haven directly, the data has been taken from the Lifton Pumping Station in Lifton, Idaho, which is less than four miles east of the PPPA. Table 2-2 provides the averages taken between the years of 1919 and 2016. Precipitation averages 10.37 inches per year. Annual snowfall averages 40.3 inches (Western Regional Climate Center, 2021).

TABLE 2-2: CLIMATE DATA FOR LIFTON PUMPING STATION, IDAHO (PERIOD 1919-2016)[3]

Month	Average Max Temp (F)	Average Min Temp (F)	Precipitation (Inches)	Snowfall (Inches)
January	29	7	0.7	9.1
February	32	7	0.7	8.1
March	40	16	0.8	6.2
April	51	29	1.1	3.0
May	63	39	1.3	0.5
June	73	46	1.0	0.0
July	82	51	0.7	0.0
August	81	48	0.8	0.0
September	71	39	1.0	0.1
October	58	30	1.0	1.3
November	42	21	0.8	5.1
December	32	12	0.7	6.9
Annual	**54**	**29**	**10**	**40**

2.2.12. Air Quality & Noise

There will not be any direct air emissions from the project that will not meet federal and state emission standards contained in the air quality state implementation plan, nor will the project violate

[2] *(Idaho Dept. of Environmental Quality, 2021)*

[3] *(Western Regional Climate Center, 2021)*

national ambient air quality standards in an attainment area. The proposed improvements are not anticipated to cause odor or noise nuisance problems. Figure 2-7 shows the administrative boundaries for areas with sensitive air quality in Idaho (DEQ, n.d.).

2.2.13. Energy Production & Consumption

The District is served electricity by Rocky Mountain Power. There are no sources of energy production in the area aside from residential solar installations. The electricity consumption of the residents is assumed to be average for the area.

2.3. POPULATION TRENDS

2.3.1. Historic Population Trends

According to the 2020 Census[4], the population of the St. Charles and Bear Lake County was 161 and 6,372 respectively. The St. Charles Census Bureau Profile is in Appendix A. No data was available on the Census Bureau for the City of Fish Haven, or any other subdivisions served by the District.

The District provided the total number of service connections for each of the last 17 years. During this period, the District experienced an average annual growth rate of 2.13%. The history of the number of connections and annual growth rates are provided in Table 2-3.

TABLE 2-3: HISTORICAL NUMBER OF CONNECTIONS (EDU'S) OF DISTRICT

Year	Number of Connections[1]	Annual Growth Rate
2007	699	-
2008	709	1.42%
2009	715	0.84%
2010	718	0.42%
2011	732	1.93%
2012	743	1.49%
2013	750	0.94%
2014	766	2.11%
2015	774	1.04%
2016	787	1.67%
2017	802	1.89%
2018	826	2.95%
2019	841	1.80%
2020	862	2.47%
2021	901	4.42%

4 *(U.S. Census Bureau, 2022)*

2022	950	5.30%
2023	980	3.11%

1. *The count is as of November 30th of each year.*

2.3.2. Existing Lots served by FHARSD

Table 2-4 shows the individual subdivisions served by the District, along with the current number of homes connected to the system and the total number of parcels in each area. Figure 2-5 displays the locations of each of these subdivisions. This provides a better overview of how close a subdivision is to reaching buildout. The home counts for each subdivision were determined from a 2021 aerial image, which explains the slight variation from the number of connections provided by the District. A 20-year buildout scenario would be achieved with an average annual growth rate of approximately 3.1%.

TABLE 2-4: CURRENT CONNECTIONS AND TOTAL PARCELS IN EACH SUBDIVISION

Location	Current Number of Connections	Total Number of Parcels
Bear Lake West	276	503
Country Club Estates	15	28
Lakeside Estates	66	138
Bear Lake West B&C	179	435
Aspen Creek Meadows	9	68
Fish Haven West	47	52
Reserve 1-3	17	41
Reserve 4-5	55	110
Reserve 6	3	55
Kentucky Estates	0	17
7 Mile Ranch	0	60
Lakeshore Section 1	0	50
Lakeshore Section 2	0	103
Lakeshore Section 3	63	118
Lakeshore Section 4	33	102
Lakeshore Section 5	52	52
Lakeshore Section 6	20	22
Total	**835**	**1,894**

The District serves subdivisions with a high number of multifamily homes, many of which are rented out as Airbnb vacation properties accommodating over 25 guests. This creates challenges for planning as these homes are vacant periodically but can host substantial crowds when occupied. Despite being listed as single connections, some of these properties generate wastewater equivalent to that of multiple homes combined.

2.3.3. Population Patterns in Surrounding Communities

Since the 2000 census, the population of St. Charles has been growing steadily at an annual growth rate of 0.8%. Over the past decade (from 2010 to 2020), the city experienced an average annual growth rate of 2.1%. Similarly, Bear Lake County also saw a population increase in the last ten years, with a growth rate of 0.6%. The District is adjacent to Rich County, Utah, which has grown at an annual rate of 1.0%. Table 2-5 contains the population growth rates of various communities surrounding the study area. Between 2010 and 2020, most of these communities experienced a rise in population (U.S. Census Bureau, 2022).

TABLE 2-5: ANNUAL GROWTH RATES IN SURROUNDING COMMUNITIES

Community	2000-2010	2010-2020
Bear Lake County, ID	-0.7%	0.6%
Rich County, UT	1.4%	1.0%
Montpelier City, ID	-3.3%	0.2%
Paris City, ID	-0.9%	0.5%
Bloomington City, ID	-0.8%	-0.3%
Garden City Town, UT	4.5%	0.7%

2.3.4. Population Projections

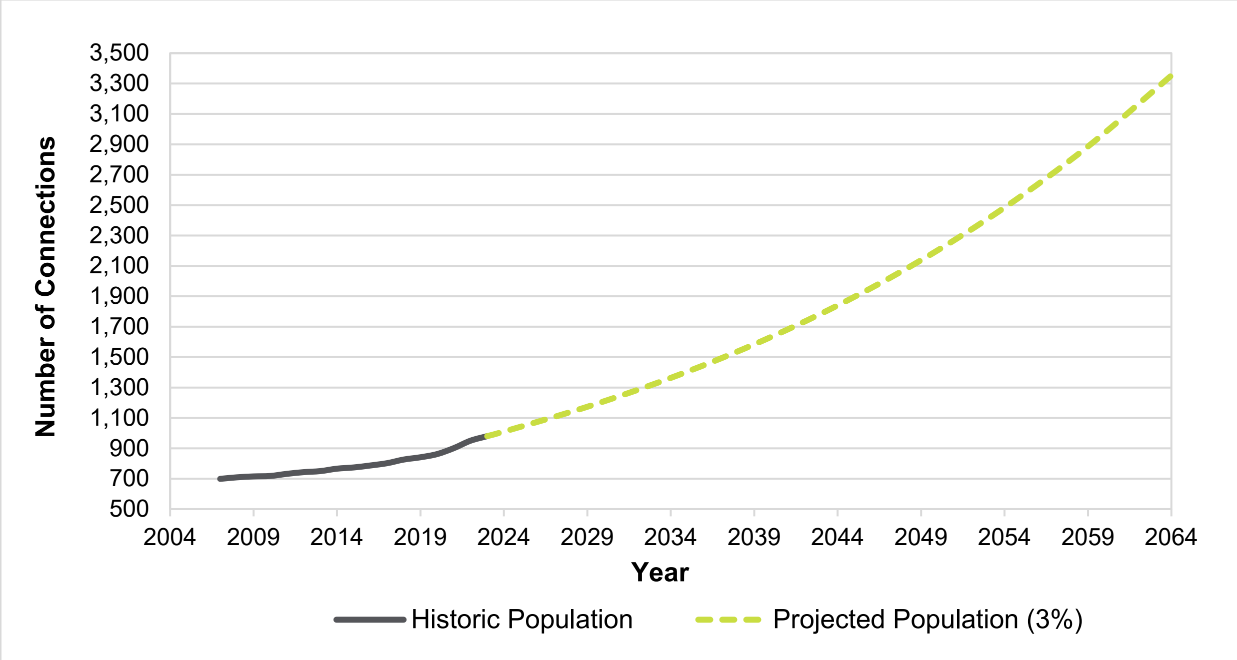
The District was presented with various growth projections to determine which growth rate best represents the study area. Over the last 5 years, the average growth rate has been about 3.5% and over the last 10 years, the average growth rate was 2.7%. The District chose to use an average annual growth rate of 3% going forward, which assumes that buildout of the existing lots would be reached within approximately 20 years. Based on an annual growth rate of 3% the projected number of connections are shown in Table 2-6 and shown graphically in Figure 2-3.

TABLE 2-6: PROJECTED NUMBER OF CONNECTIONS OF FHARSD

Year	Number of Connections[1]
2024	1,010
s2029	1,175
2034	1,365
2039	1,585
2044	1,840
2049	2,140
2054	2,485
2059	2,885
2064	3,355

Population projections based on average annual growth rate of 3%

FIGURE 2-3: POPULATION PROJECTION



Based on the 3% average annual growth rate, it is anticipated that the District wastewater system could be serving as many as 1,840 connections by 2044 and 3,355 by 2064. The population served by the District fluctuates seasonally due to as the use of vacation rentals. Typically, dividing the total population by the number of households provides an average household size. However, Census Data from surrounding communities, including Bear Lake County (ID), Rich County (UT), St. Charles (ID), Montpelier (ID), Paris (ID), Bloomington (ID), and Garden City (UT) did not accurately reflect the average household size in the study area, most likely due to the high number of vacation homes. The calculated household sizes for these communities are listed in Table 2-7. As a result, an estimated average of 3.5 people per household was used for the project area.

TABLE 2-7: AVERAGE HOUSEHOLD SIZE IN SURROUNDING COMMUNITIES

Community	Average Number of People per Household
Bear Lake County, ID	1.66
Rich County, UT	0.81
St. Charles City, ID	1.21
Montpelier City, ID	2.20
Paris City, ID	1.91
Bloomington City, ID	1.75
Garden City Town, UT	0.53

Based on the estimate of 3.5 people per household, the current population served by the District (as of 2024) is around 3,535. In 20 years (in 2044), the population is projected to reach about 6,440 and in 40 years (in 2064), it is anticipated to grow to approximately 11,735 people. These population estimates are presented in Table 2-8. These numbers might vary because some of the vacation homes can house up to 25 people.

TABLE 2-8: POPULATION PROJECTIONS

Year	Population
2024	3,535
2029	4,115
2034	4,780
2039	5,550
2044	6,440
2049	7,490
2054	8,700
2059	10,100
2064	11,745

FIGURE 2-4: PROPOSED PROJECT PLANNING AREA

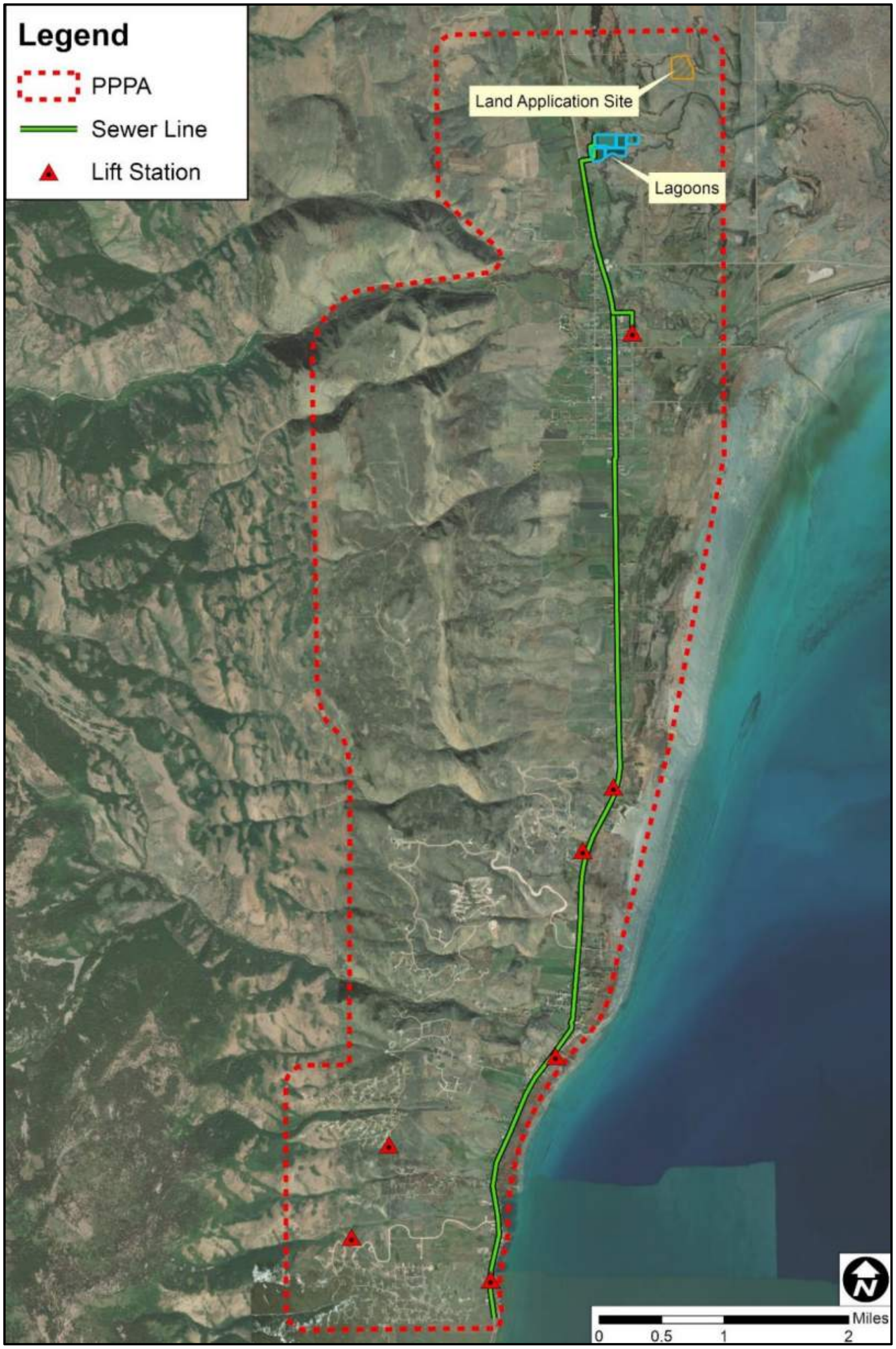


FIGURE 2-5: DISTRICT ZONING MAP

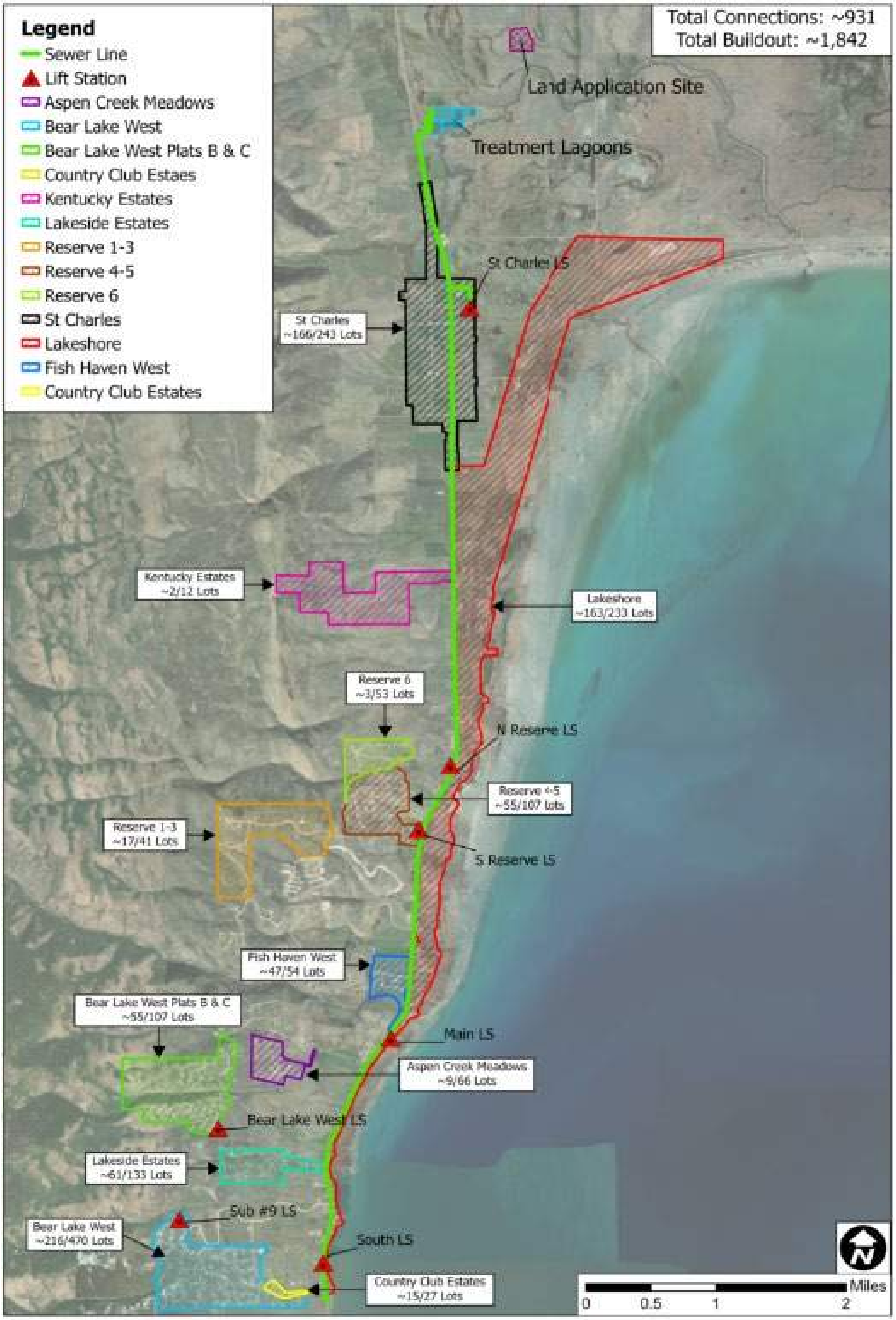


FIGURE 2-6: DISTRICT AREA WETLANDS

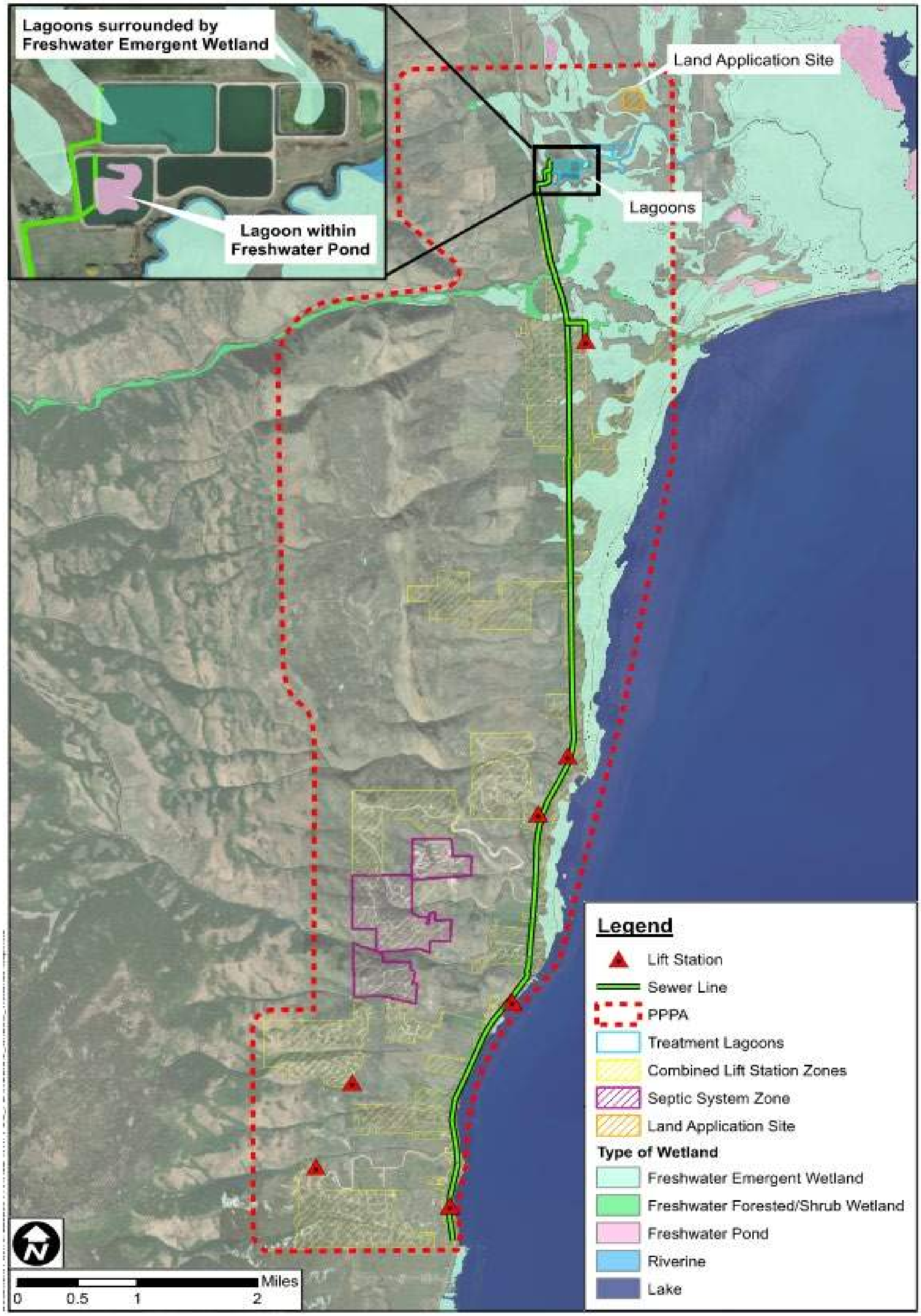
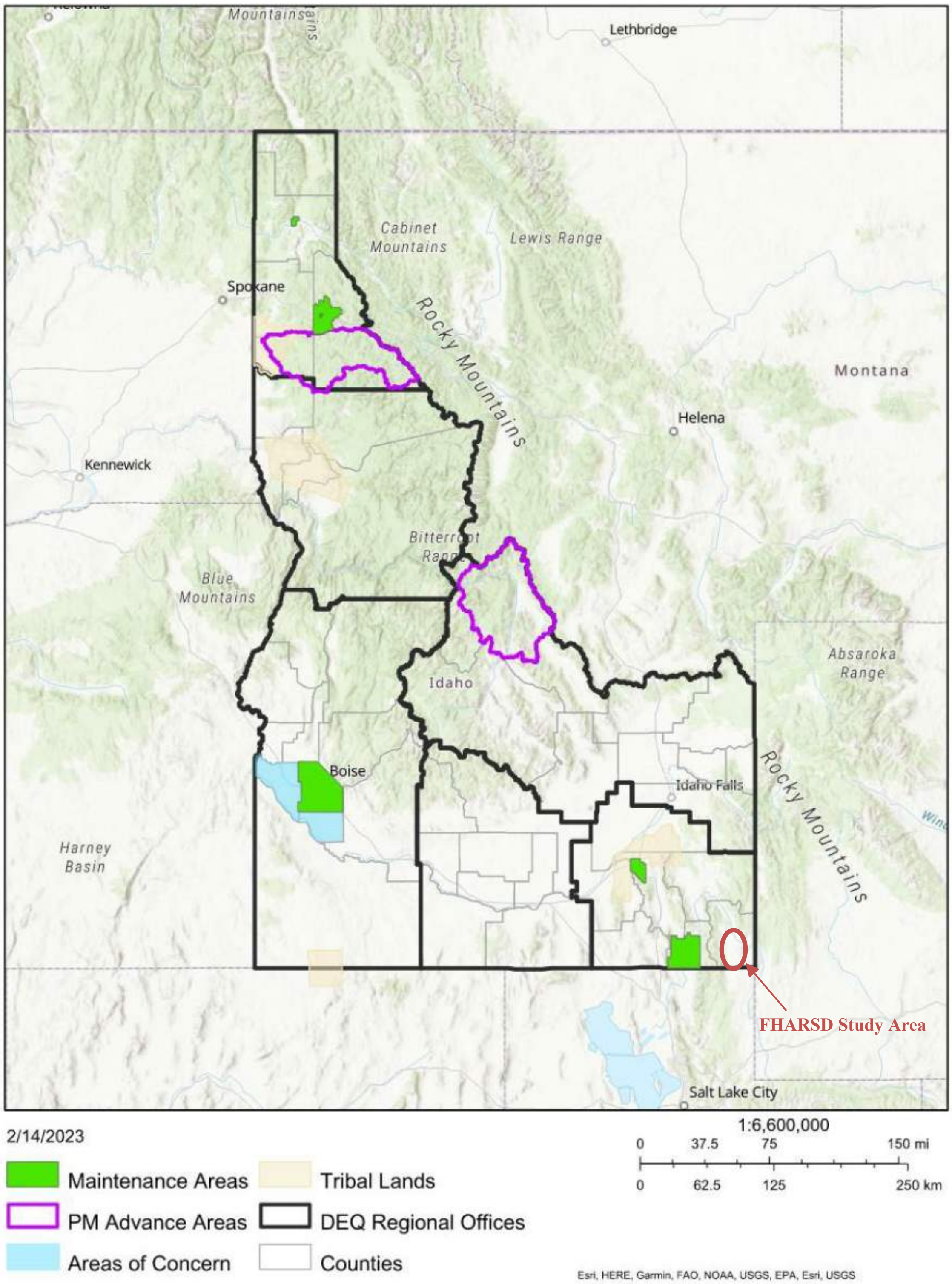


FIGURE 2-7: ADMINISTRATIVE BOUNDARIES FOR AREAS WITH SENSITIVE AIR QUALITY



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CHAPTER 3 - EXISTING FACILITIES CONDITION & EVALUATION

This chapter evaluates the District's existing wastewater treatment and collection infrastructure. The collection system, treatment practices, and current flows through the system are evaluated.

3.1. EXISTING SYSTEM LAYOUT

The layout of the wastewater treatment and collection system for the FHARSD is presented in Figure 3-1. Additionally, specific system components and process schematics are discussed in detail within their respective sections.

3.2. HISTORY

The St. Charles Lift Station, Cells #1, #2, & #3, and the piping leading to the lagoons were constructed in 1979. The lagoons originally had bentonite clay liners which were all relined with HDPE in 2003. The District's wastewater collection system, which fed into the St. Charles system, was constructed in 1985 and primarily consists of 4- to 8-inch pressure sewer lines, concrete manholes, and 8-inch gravity sewer lines, most of which are PVC pipe. In 1985, two lift stations were built at the south end of the sewer line. As the area continued to develop, two additional lift stations were built in 2006 and 2007.

In 2006, a new primary cell and winter storage cell were built to the east and west of the existing Cell 3. Prior to the winter storage pond being built, the section of land served as a land application site. The new 18-acre land application site is located northeast of the lagoons.

All lagoons are divided by earthen embankments and connected with a pipe and valve configuration. The operating depth and available freeboard of the five lagoon cells are shown in Table 3-1.

TABLE 3-1: LAGOON OPERATING DEPTHS AND FREEBOARD

	Cell #1	Cell #2	Cell #3	Primary Cell	Winter Storage Cell
Operating Depth (ft)	7	8	9	6	10.25
Freeboard (ft)	2	2	2	3	3

There are another two lift stations operated and maintained by the District located up on the hillside, one in Bear Lake West (Sub #9 Lift Station), and another in Bear Lake West Plats B & C (Bear Lake West Lift Station). The Sub #9 Lift Station was constructed in 2005 and the Bear Lake West Lift Station was rehabilitated in 2021. These two lift stations pump the wastewater from a few homes up to the nearest gravity line. There are six air vacuum valves located along the sewer line that were replaced in 2021. A new section of pressurized pipeline between the St. Charles Lift Station and the lagoons was added in 2019.

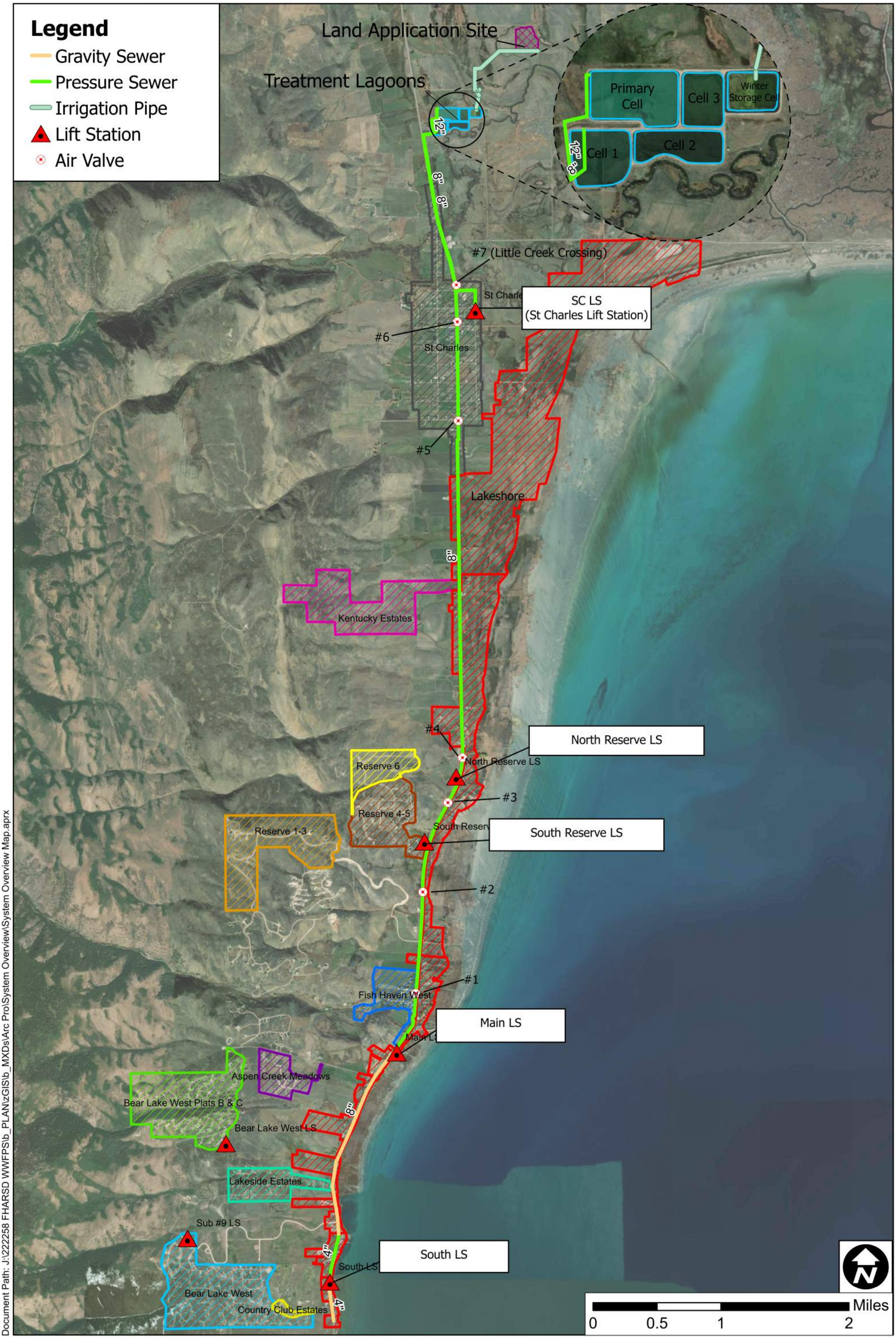

Figure 3-1

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FHARSD
Fish Haven Area Recreational Sewer District

System Overview Map

FHARSD Wastewater Facilities Planning Study

KELLER ASSOCIATES

3.3. WASTEWATER INFLOWS & PROJECTIONS

System flows were evaluated based on lift station run times and their pumping rates. The St. Charles Lift Station, which is under the jurisdiction of the City of St. Charles, had its flow rates calculated independently. The City of St. Charles provided existing flow rates and calculated populations and flow projections.

The FHARSD and the City of St. Charles' flows were combined in the planning criteria to determine the overall capacity for the lagoons and land application site. Lift station run times for the lift stations owned and operated by FHARSD were available for 2018, 2022, and 2023. The flows from FHARSD and St. Charles were projected separately and then added together for a total, because both entities have their own individual pipes to the lagoons. The expected annual growth rate for FHARSD is also much higher than that of St. Charles, which is why the flow rates had to be projected separately and added together. The peaking factors used were also different for each entity, as these were determined based on the existing flows which were used to establish the planning criteria. The various design flows that were calculated and will be used to plan for the future are presented in the following sections.

3.3.1. Design Flows

IDAPA 58.01.16 requires design flows to be calculated and used in the design and evaluation of wastewater facilities. Specifically, Average Day Flow (ADF), Maximum Day Flow (MDF), Maximum Month Flow (MMF), Peak Instantaneous Flow (PIF), and Peak Hour Flow (PHF) are to be identified if required for a specific design. These terms are defined within their respective sections herein.

Average Annual Day Flow (AADF)

The average annual daily flow (AADF) is defined by IDAPA Standards as:

> "The average day flow is the average of daily volumes to be received for a continuous twelve (12) month period expressed as a volume per unit time. However, the average day flow for design purposes for facilities having critical seasonal high hydraulic loading periods, such as recreational areas or industrial facilities, shall be based on the average day flow during the seasonal period. See also the definition of Wastewater Flows."[5]

Maximum Month Average Day Flow (MMADF)

The maximum month average daily flow (MMADF) is the average day flow of the largest volume of flow received during any calendar month.

Maximum Day Flow (MDF)

According to IDAPA 58.01.16.010, the maximum day flow (MDF) is the largest volume of flow received during a continuous 24-hour period.

Peak Hour Flow (PHF)

The peak hour flow (PHF) is the largest volume of flow to be received during a one-hour period (Idaho Dept. of Environmental Quality, 2022). The PHF for FHARSD was calculated by multiplying the AADF by a factor of 5.6. This higher factor was selected due to the considerable number of large vacation rentals in the project area, resulting in peaking factors above those anticipated in a city. For cities with populations under 5,000, the typical peaking factor is around 4.0 (Metcalf & Eddy, Inc., 2003).

[5] (Idaho Dept. of Environmental Quality, 2022)

The peaking factor of 5.6 was derived by applying a peaking factor of 1.66, which reflects the relationship between the MDF and PHF. This specific factor of 1.66 corresponds to the peaking factor of a diurnal curve for Labor Day, as shown in the article “Sewer Sociology – The Days of our (Sewer) Lives” (Patrick L. Stevens & Kevin L. Enfinger, 2006). The diurnal curve, illustrating the flow rate throughout a 24-hour period on Labor Day, was chosen because the project area is characterized by a high number of vacation rentals, making its daily flow patterns like those on a holiday. The curve typically shows people starting their day later than usual, with significant flow peaks observed in the late morning and again in the evening. This curve and its details are further elaborated in the Model section of this report, in Section 3.10.4. From this analysis, a peaking factor of 1.66 for the maximum day was established, leading to the calculation of a PHF peaking factor of 5.6 for the entire system.

Peak Instantaneous Flow

The peak instantaneous flow (PIF) is the largest instantaneous maximum flow rate to be received (IDAPA 58.01.16.010). Peak instantaneous flow is not able to be recorded with the flow data available as pumping from the lift station is not constant. This criterion is summarized in Table 3-2.

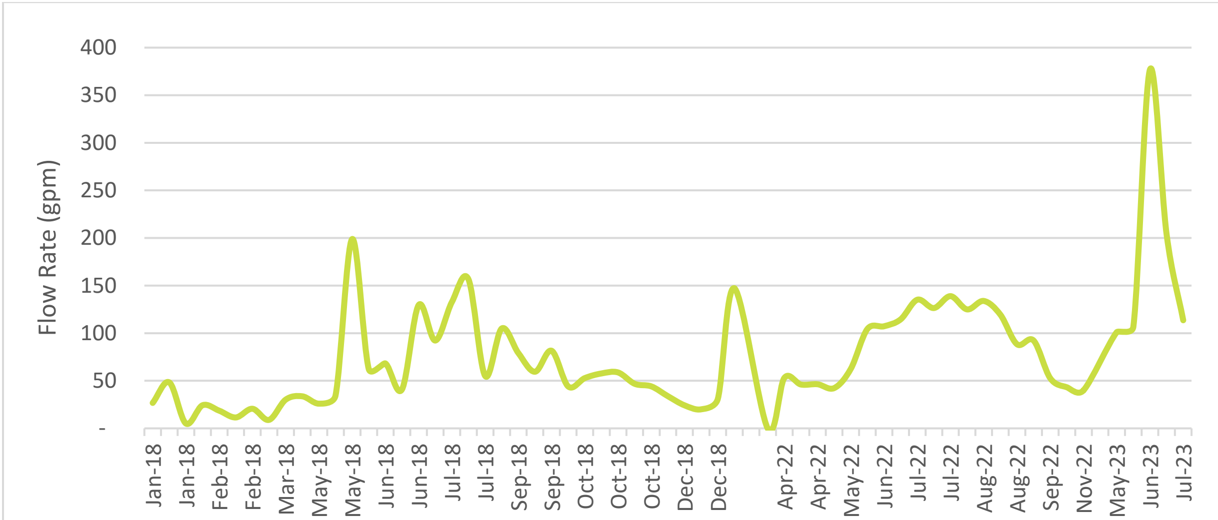
TABLE 3-2: PLANNING CRITERIA (2024) FOR FHARSD & ST. CHARLES

	FHARSD			City of St. Charles[1]		
	gpd/EDU	gpm	Peaking Factor	gpd/EDU	gpm	Peaking Factor
# of Connections	1,010			158		
AADF	164	115	1.0	321	35	1.0
MMADF	233	163	1.4	549	60	1.7
MDF	555	389	3.4	1,159	127	3.6
PHF	919	644	5.6	1,854	203	5.8

1. *Number of connections and flowrates provided by Sunrise Engineering. Per capita use and peaking factor calculated by Keller.*

Flows to the lagoons were determined by adding flows from FHARSD and the City of St. Charles together. The FHARSD flows were calculated by adding flow from the Main Lift Station, South Reserve Lift Station, and the North Reserve Lift Station together. Since the South Lift Station pumps the wastewater directly into the Main Lift Station, the flows were not added to the total. Average daily flows from January 2018 to July 2023 are shown in Figure 3-2. The peak flow in the year 2023 occurred in June, reaching a flow rate of 375 gpm. Peak flows typically occur in the summer months, which align with the busiest season due to many vacationers visiting the area.

FIGURE 3-2: INFLUENT FLOWS FOR MAIN LS + SOUTH RESERVE LS + NORTH RESERVE LS



Note: The monthly average inflow volume into the lagoons was 0.22 MG. Maximum monthly flow volume occurred in July with an approximate volume of 0.32 MG.

3.3.2. Projected Flows

The planning criteria shown in Table 3-1 along with the population projections presented in Section 2.3.4. were used to estimate flows in the future. Table 3-3 shows the total estimated system flows, including those from FHARSD and the City of St. Charles.

TABLE 3-3: PROJECTED FLOWS FOR FHARSD AND ST. CHARLES COMBINED

Description	Peaking Factor	Current Flows (gpm)	Projected Flows (gpm)							
Year	--	2024	2029	2034	2039	2044	2049	2054	2059	2064
Connections	--	1,170	1,335	1,530	1,755	2,015	2,320	2,670	3,075	3,550
AADF	1.0	150	170	193	219	249	284	324	371	425
MMADF	1.5	224	252	284	321	364	415	472	539	616
MDF	3.4	516	583	660	748	849	969	1,105	1,263	1,448
PHF	5.6	848	958	1,085	1,230	1,399	1,596	1,822	2,083	2,389
Total Flow (MG/Year)	**--**	**64**	**89**	**101**	**115**	**131**	**149**	**170**	**195**	**224**

The design flows projected for the 40-year planning period will be used for sizing long-term facilities including lagoon capacity, land application sites, and piping systems at the lagoons. It does not include lift stations and their respective pumps. These components will have a 20-year planning period.

While St. Charles is included into the projected flows when studies are done with the lagoons, winter storage and the land application site, flows from St. Charles will not included into the calculations done with the collection system as shown in Section 3.5. Only flows from the District will be included in that analysis.

3.4. WASTEWATER COLLECTION SYSTEM

3.4.1. Design Considerations

Collection system design is based on the estimated ultimate tributary population and the estimated maximum wastewater flows from the tributary population. The design of wastewater collection systems must adhere to requirements established in Idaho Wastewater Rules [IDAPA 58.01.16.430 (Idaho Dept. of Environmental Quality, 2022)], including the following:

- Gravity sewer mains must be a minimum of 8 inches in diameter. Gravity sewer service lines must be a minimum of 4 inches in diameter.
- Gravity wastewater lines must have sufficient slope and velocity to “self-clean” or transport solids to the treatment facility.
- Manholes should be installed at the end of each line, at changes in grade, size, or alignment, and at all intersections.
- Sewer lines cannot be in the same trench as potable water lines and must be a minimum of 10 feet away from potable water lines. If the design of sewer lines within 6 to 10 feet of potable water lines is unavoidable, both lines must be constructed of potable water class pipe and be in separate trenches with the potable main above the elevation of the non-potable main. Any non-potable main designed within 6 feet of a potable water line must be reviewed and approved by Idaho DEQ on a case-by-case basis.
- Sewer lines must have at least 18 inches of vertical separation when crossing under potable water lines. When the vertical separation is less than 18 inches, the gravity sewer line must be sleeved with potable water class pipe for 10 feet on each side of the crossing.
- Pressure sewage mains cannot cross closer than 18 vertical inches from a potable water main.

Additional design considerations must be given to wastewater pumping stations. The design of wastewater pumping stations must adhere to requirements established in the Idaho Wastewater Rules [IDAPA 58.01.16.440 (Idaho Dept. of Environmental Quality, 2018)], including the following:

- Construction materials must be selected that are appropriate for exposure to corrosive gases, greases, oils, and other constituents present in wastewater.
- Pumps and controls must be selected based upon peak hourly flow.
- Each pumping station should include a method of measuring flow.
- Emergency pumping capabilities are required for all new pumping stations and all existing stations undergoing modification or expansion.
- Force mains must maintain a minimum cleansing velocity of 2 ft/s.

3.4.2. Existing System Piping

The District wastewater collection system spans from the Utah border to the lagoons north of St. Charles. The District services Fish Haven, Bear Lake West, Country Club Estates, Lakeside Estates, Bear Lake West Plats B & C, Aspen Creek Meadows, Lakeshore, and the Reserves, which have a gravity sewer system that feeds into the main sewer line that runs along US Highway 89.

The main sewer line consists of a small section of 4-inch gravity line which feeds into the South Lift Station, located about 1,800-feet north of the Utah border. This lift station collects the flows from Bear Lake West, Country Club Estates, and a section of Lakeshore. The next section of sewer line is a 4-inch pressurized line. Then it transitions into about a 1.5 mile long section of 8-inch gravity line which spans to the Main Lift Station. The gravity line collects flows from Lakeside Estates, Bear Lake West Plats B & C, Aspen Creek Meadows, and a section of Lakeshore. Flows from the City of Fish Haven and Lakeshore go directly into the Main Lift Station. An 8-inch pressurized sewer line follows all the way from the Main Lift Station to the lagoons north of St. Charles.

There are two additional lift stations along the way: the South Reserve Lift Station and the North Reserve Lift Station, which must pump into the pressurized line. These lift stations collect flows from Reserves 1 through 6. The pressurized line goes through the City of St. Charles, and all flows from FHARSD are pumped into the Primary Cell.

Another lift station is located on the north end of St Charles, which is operated and maintained by the City of St. Charles. Flows from St. Charles get directed to this lift station and pumped directly into Cell #1 through a separate pressure line.

In total, the main collection system along the highway consists of approximately 11.6 miles of collection lines and approximately 40 manholes. The individual collection systems in each subdivision were not covered as part of this study which would greatly increase the amount of piping and manholes. A summary of sewer pipe sizes and their associated length is shown in Table 3-4. There are 965 connections in total, primarily residential. Three of the connections are for the Fish Haven General Store, the Bear Lake West Clubhouse, and Gladys' Place.

TABLE 3-4: COLLECTION SYSTEM PIPE SUMMARY

Type of Pipe	Diameter (in)	Length (ft)	Length (miles)
Gravity	4	1,630	0.3
	8	8,330	1.6
	Total	**9,960**	**1.9**
Pressure	4	1,930	0.4
	8	40,640	7.7
	12	8,550	1.6
	Total	**51,120**	**9.7**

Additionally, the District operates and maintains an irrigation pipeline and pump house that transfers water from the Winter Storage Lagoon to the land application site. This entails approximately 960 feet of 12-inch gravity irrigation pipeline and 3,820 feet of 6-inch pressurized irrigation line.

Assessing the condition of the collection system allows the District to avoid emergencies, prioritize projects, and plan for the future. This condition assessment is an ongoing process and should be completed at regular intervals. To assess the condition of a sewer system, data and information are gathered through observation, direct inspection, investigation, and indirect monitoring and reporting. An analysis of the information collected helps identify the structural and operational issues impacting the performance of the system. Condition assessment also includes failure analysis to determine the cause of infrastructure failures and to develop ways to prevent future breakdowns (EPA, 2021).

3.4.3. Existing Lift Stations

There are seven lift stations throughout the collection system, six of which are operated and maintained by the District. Each lift station has automatic controls and manual override controls that manage the operation of the individual lift station. Each lift station has a SCADA (Supervisory Control and Data Acquisition) system connected to it, allowing the operator to monitor the wet well's current water level, active pumps, pump operation duration, and cycle count. The operator also has the flexibility to check the pump stations using a smartphone. There are no flow meters installed in the system that measure flow currently. There is no overall control system that orchestrates the operation of the lift stations as they operate in unison, though a proposed system is being worked on to accomplish this.

Keller visited each station and reviewed available drawings to complete a general inventory of facilities. Table 3-5 contains a summary of information gathered for each lift station. Note that the St. Charles Lift Station is not part of this table, as it is maintained and operated by the City of St. Charles and not the District. A description of the service area of each lift station is summarized in Table 3-6 and additional discussion is provided in subsequent sections.

TABLE 3-5: LIFT STATION INVENTORY

Description	South LS[1]	Main LS	South Reserve LS	North Reserve LS	Sub #9 LS	Bear Lake West LS
Lift Station Location	Blue Bird Inn	2331 Highway 89	Reserve Drive (Main Entrance)	Reserve Drive (North Entrance)	Hickock Drive	Cottonwood Circle
Year Constructed	1985	1985	2008	2008	2005	Rehabilitated in 2021
Current Connections Served	~365	~400 + 365 (from South LS)	~75	~3	~4	~8
Shape	Round	Square	Round	Round	Round	Round
Wet Well Dimensions	8 ft	10 ft	8 ft	10 ft	unknown	4 ft
Total Depth of Wet Well	12.7 ft	14.5 ft	15.5 ft	18.84 ft	Unknown	11.0 ft
Pump Capacity	100 gpm	375 gpm	100 gpm 215 gpm	225 gpm	70 gpm	30 gpm
Total Dynamic Head	45 ft	120 ft	85 ft 75 ft	120 ft	30 ft	100 ft
Pump Type	Solids Handling	Solids Handling	Solids Handling	Solids Handling	Solids Handling	Grinder Pump
Pump Make and Model	Hydromatic S4NX500FC	Hydromatic S4LXP300FC	ABS AFP 1049	ABS AFP (K) 1034	ABS AFP 0831	Hydromatic HPGHHX500 CD
Pump HP (each)	5 Hp	30 Hp	12 Hp	30 Hp	3.7 Hp	5 Hp
Rated Speed	1750 rpm	1750 rpm	1660 rpm	3400 rpm	1750 rpm	unknown
Impeller Size	7.38 in	10.87 in	9.33 in	8 in	7.48 in	unknown
Level Control Type	Submersible Level Transducer	Submersible Level Transducer	Submersible Level Transducer	Submersible Level Transducer	Submersible Level Transducer	Submersible Level Transducer
Alarm Telemetry Type	Cellular Alarm	Cellular Alarm	Cellular Alarm	Cellular Alarm	Cellular Alarm	Cellular Alarm
Auxiliary Power Capabilities	Yes	Yes	Yes	Yes	No	No
Force Main Length	1,900 ft	40,300 ft	Pumps into Main LS Force Main	Pumps into Main LS Force Main	1,550 ft	600 ft

TABLE 3-6: LIFT STATION SERVICE AREAS

Lift Station	Service Area		Approx. % of Total AADF[1]
	Size (acres)	Description	
South LS[2]	450	Accepts all wastewater generated by Bear Lake West, Country Club Estates, and a small section of Lakeshore. This lift station pumps directly into the Main Lift Station.	9%
Main LS	750	Accepts all wastewater from Lakeside Estates, Bear Lake West Plats B & C, Aspen Creek Meadows, the City of Fish Haven, and a portion of Lakeshore. This lift station pumps directly to the Primary Cell of the lagoons.	44%
South Reserve LS	410	Accepts all wastewater from Reserve 1-3, and Reserve 4-5 subdivisions. This lift station has to pump directly into the pressurized sewer line that leads to the lagoons.	25%
North Reserve LS	80	Accepts all wastewater generated at Reserve 6. This lift station also has to pump directly into the pressurized sewer line.	0.6%
Sub #9 LS	10	Accepts wastewater from about 4 houses in the Bear Lake West subdivision and pumps it up to the nearest gravity sewer. All flows from this lift station eventually end up at the South Lift Station.	0.06%
Bear Lake West LS	20	Accepts wastewater generated by about 8 houses in the Bear Lake West Plats B & C subdivision. This lift station pumps these flows to the nearest gravity sewer line. These flows eventually end up at the Main Lift Station.	0.16%
St. Charles LS	460	Accepts water from the City of St. Charles. This lift station pumps flows directly to the lagoons through a separate pressure line than the rest of the flows. Note that this lift station is owned and operated by the City of St. Charles, not the District.	22%

[1] AADF = Average Annual Daily Flow

[2] Note that all flows from the South LS go directly into the Main LS.

South Lift Station

South Lift Station is located alongside US Highway 89 south of the Lakeside Estates subdivision, on the border of Bear Lake West. It collects wastewater from Bear Lake West, Country Club Estates, and a small section of Lakeshore. It then pumps it via force main for part of the way and then gravity flows directly into the Main Lift Station. The design flowrate of this lift station is 100 gpm at a total dynamic head of 45 feet. Figure 3-3 to Figure 3-6 show pictures of this lift station.

FIGURE 3-3: SOUTH LS SITE

FIGURE 3-4: SOUTH LS CONTROL PANEL

FIGURE 3-5: SOUTH LS WET WELL

FIGURE 3-6: SOUTH LS LID

Deficiencies:

- Guide rail system is very old and outdated
- Surrounding terrain is marshy likely from ditch on the hillside above, with standing water near the wet well lid
- Wet well lid is too low allows water to run into the wet well at times
- No flow meter

Recommendations:

- Raise the wet well lid, leveling the surrounding grade, guide rail replacement and the power disconnect
- Add a flow meter

Main Lift Station

The Main Lift Station is located alongside US Highway 89 just south of Fish Haven. This lift station directly serves Fish Haven, and receives all the flow from the South Lift Station, Lakeside Estates, Bear Lake West Plats B & C, Aspen Creek Meadows, and a portion of Lakeshore. This lift station pumps through a force main all the way to the lagoons. All other lift stations between the Main Lift Station and the lagoons pump into the force main which connects the Main Lift Station to the wastewater lagoons. The generator designated for this lift station is situated within the office garage, which serves as the workshop across the street. It is hard wired so the trailer with the generator on it does not have to move. The exhaust system is externally vented through the wall. An automatic transfer switch activates the generator, which automatically initiates every Monday for routine checks and also in response to power failures. Within the lift station, check valves are installed, and the pumps are designed to handle a capacity of 375 gpm at a total dynamic head of 120 feet. Figure 3-7 to Figure 3-10 show pictures of this lift station.

FIGURE 3-7: MAIN LS SITE

FIGURE 3-8: MAIN LS WET WELL

FIGURE 3-9: MAIN LS CONTROL PANEL

FIGURE 3-10: MAIN LS GENERATOR

Deficiencies

- Pumps are having trouble decreasing depth in storage; if flows increase over time, this will cause issues with the lift station
- Guide rail system is very old and outdated
- Valve box next to lift station damaged
- Lack of power disconnect at lift station
- No flow meter

Recommendations

- Increase pumping capacity
- Repair/replace valve box, guide rail replacement and the power disconnect
- Add flow meter

South Reserve Lift Station

The South Reserve Lift Station is located at the main entrance to the Reserve development alongside US Highway 89, and it pumps wastewater directly into the force main running from the Main Lift Station to the lagoons. The South Reserve Lift Station receives flows from the Reserve 1-3 and from the Reserve 4-5 subdivisions. The design flowrates of this lift station vary based on the activity of the upstream lift station (Main Lift Station). The design flow is 99.4 gpm with a corresponding head of 85.9 feet when the Main Lift Station is pumping. When the Main Lift Station is offline, the design flow of the South Reserve Lift Station is 215 gpm with a head of 74.5 feet. This lift station, however, has experienced difficulties pumping into the force main. Photos of this lift station are shown in Figure 3-11 to Figure 3-14.

FIGURE 3-11: SOUTH RESERVE LS SITE

FIGURE 3-12: SOUTH RESERVE LS WET WELL

FIGURE 3-13: SOUTH RESERVE LS CONTROL PANEL

FIGURE 3-14: SOUTH RESERVE LS GENERATOR

Deficiencies:

- Lift station has to pump directly into pressure line and is unable to pump into force main when Main Lift Station is on due to insufficient pump head capacity
- Lift Station overflowed last spring due to infiltration and significant wastewater volumes. Required continuous monitoring by the operator for approximately three weeks
- No flow meter

Recommendations

- Increase pumping capacity
- Add flow meter

North Reserve Lift Station

The North Reserve Lift Station is located at the North entrance to the Reserve development alongside US Highway 89. This lift station also pumps directly into the pressure line running from the Main Lift Station and the lagoons. The North Reserve Lift Station receives flows only from the Reserve 6 subdivision. The pumps have a design flow of 225 gpm at 121 ft of head and the lift station currently only serves about 3 residences. This is the only lift station that has an orange safety grate/screen under the lift station lid to prevent accidental falls into the wet well. Photos of this lift station are presented in Figure 3-15 to Figure 3-18.

FIGURE 3-15: NORTH RESERVE LS SITE

FIGURE 3-16: NORTH RESERVE LS WET WELL

FIGURE 3-17: NORTH RESERVE LS CONTROL PANEL

FIGURE 3-18: NORTH RESERVE LS SAFETY GRATE

Deficiencies

- Lift station has to pump directly into pressure line and is unable to pump into force main when Main Lift Station is on due to insufficient pump head capacity
- No flow meter

Recommendations

- Increase pumping capacity
- Add flow meter

Sub #9 Lift Station

Sub #9 is located up in the foothills to the west of the highway, along Hickock Drive, within the Bear Lake West subdivision. This lift station collects wastewater from approximately seven houses and then pumps it upfill far enough to go into the gravity system of BLW which then flows into the South Lift Station. This lift station has a design flow of 75 gpm at 36 feet of head. This lift station does not have an emergency generator but does have provisions to connect an emergency generator. Photos of this lift station are shown in Figure 3-19 to Figure 3-22.

FIGURE 3-19: SUB #9 LS SITE

FIGURE 3-20: SUB #9 LS WET WELL

FIGURE 3-21: SUB #9 CONTROL PANEL

FIGURE 3-22: SUB #9 LAYOUT

Deficiencies

- None

Recommendations

- Add flow meter

Bear Lake West Lift Station

The Bear Lake West Lift Station is located up in the foothills to the west of the highway in the Bear Lake West Plats B & C subdivision. It collects flows from approximately eight homes and pumps it upfill far enough to go into the gravity system of Bear Lake West Plats B & C which then flows into a manhole along the gravity sewer line, upstream of the Main Lift Station. The design flow is 30 gpm at 97 feet of total dynamic head. Preparations for a concrete generator pad are underway, with the framework already in place. This pad is intended to support a generator in the near future. Access to this lift station is difficult as it is down a steep road. Figure 3-23 to Figure 3-26 show pictures of the Bear Lake West Lift Station.

FIGURE 3-23: BLW LS SITE

FIGURE 3-24: BLW LS WET WELL

FIGURE 3-25: BLW LS CONTROL PANEL

FIGURE 3-26: BLW LS VALVE VAULT

Deficiencies

- No restriction fence surrounding the lift station
- No flow meter

Recommendations

- Add flow meter

3.4.4. Collection System & Lift Station Capacity

A sewer model of the collection system, including gravity lines and the four lift stations along the highway and associated pressure mains was created using InfoSWMM. The model procedure and results are discussed in Section 3.5.

3.5. COLLECTION SYSTEM COMPUTER MODEL

This section summarizes the wastewater collection system model development process and existing collection system hydraulic analysis. It outlines the model construction and model calibration process, and documents existing deficiencies.

3.5.1. Model Software

The software modeling package InfoSWMM was selected as the modeling software for this project. InfoSWMM is a fully dynamic model which operates in conjunction with Esri ArcGIS and allows for evaluation of complex hydraulic flow systems and patterns.

3.5.2. Model Construction

Keller Associates used record drawings of the piping and lift stations to populate pipe diameter, invert elevation, rim elevation, and lift station data for the model. Keller Associates also collected pump curves from vendors based on the pump make and models found in the record drawings. As a lot of the record drawings are very old and often difficult to read, some elevations of manholes along the pressure line were estimated.

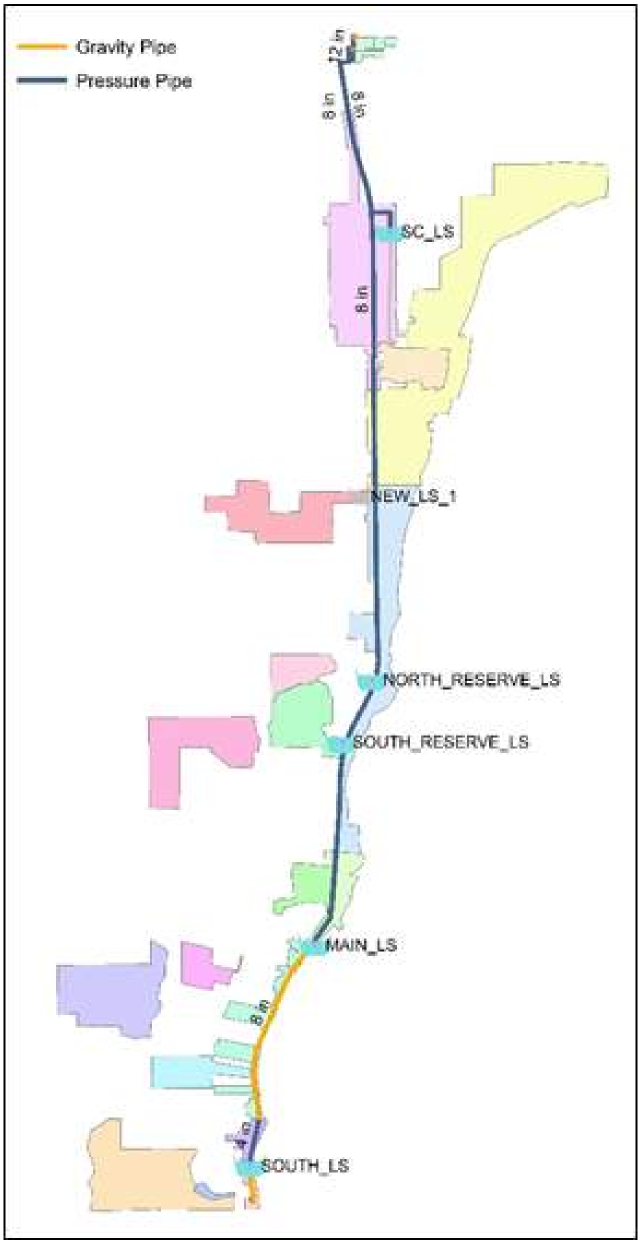
Four of the six lift stations owned and operated by FHARSD were included in the existing system model (South Lift Station, Main Lift Station, South Reserve, and North Reserve). To determine the total flow at the lagoons, the St. Charles Lift Station was also modeled with a separate pressure line leading to the lagoons.

The Bear Lake West Lift Station and Sub #9 Lift Station were not modeled, as those two lift stations are located on the hill and only pump wastewater from a few houses to the gravity collection system. Their flow were considered in the model coming in from the gravity collection system.

Lift station wet well dimensions and operational set points were taken from the record drawings. FHARSD has a SCADA system for each of their lift stations that records when the pumps turn on or off. It also displays the setpoints of the lift station lead and lag pumps; however, due to differences in calibration, it is uncertain that the depth of these setpoints are representative of when the pumps actually turn on and off. Therefore, the setpoints in the model were set to those listed in the record drawings. Lift station pumps were characterized by the pump curves obtained from Integrity Pump Solutions for the North and South Reserve pumps, from Pentair for the South and Main Lift Station, and from Tsurumi Inc. for the St. Charles pumps. The pump curves are attached in Appendix B. Pump field tests were not performed as part of this planning effort. All lift stations were modeled as duplex pump stations. Lift station capacities were evaluated using firm capacities (capacity with largest pump offline).

It is important to note that one of the basic assumptions of the hydraulic model is that all pipelines are free from physical obstructions such as roots and accumulated debris. Such maintenance issues, which certainly exist, must be discovered, and addressed through consistent maintenance efforts. The modeled capacities discussed in this chapter represent the capacities assuming the wastewater collection lines are in good working order. Figure 3-27 shows the modeled pipelines by size, type (gravity or pressure), and the lift stations modeled.

FIGURE 3-27: EXISTING CONDITIONS - MODEL



3.5.3. Model Key Assumptions and Boundary Conditions

The following sections summarize the assumptions and boundary conditions that were applied to this model.

As part of this study, flows from each lift station were determined and used to develop the planning criteria for the system. The number of connections within each subdivision were also determined and based on the flows at each lift station; flows were established for nodes representing various boundaries. The overview table as well as images showing the inlet nodes used in the model are presented in Appendix B.

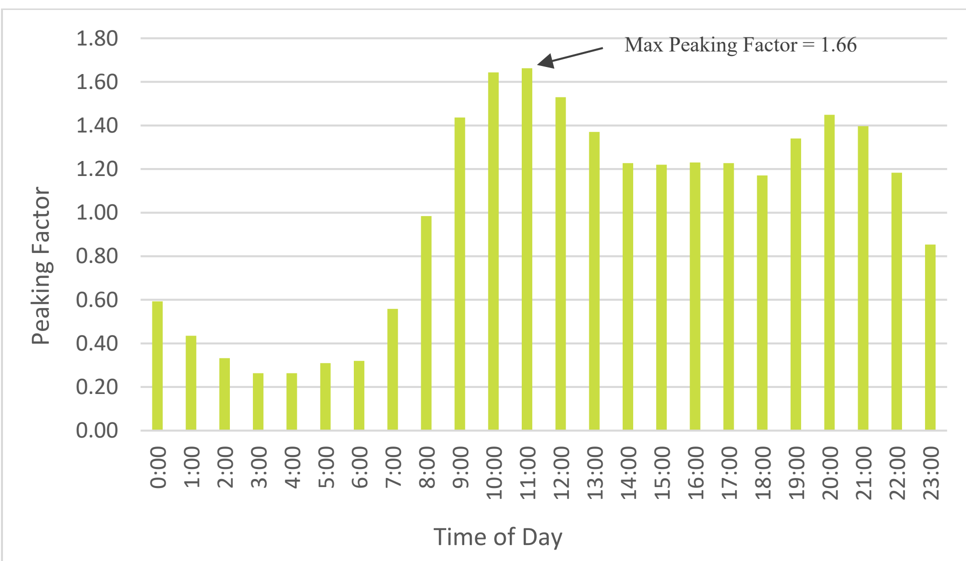
The following assumptions were made for pipes, manholes, lift stations, and outfalls:

- All pipes are in good repair
- All pipes are free of debris
- Manning's n values for PVC and HDPE pipes are 0.011
- Unknown invert elevations are calculated based on minimum slope requirements
- Unknown rim elevations are calculated based on rim elevations of manholes nearby and Google Earth Elevations
- The lagoon site is modeled as a fixed outlet with a backwater elevation of 7 feet

3.5.4. Model Calibration and Results

Model loads refer to the wastewater flows that enter the wastewater collection system and are comprised of wastewater collected from individual services (base flows). Based on the high number of vacation homes in the PPPA, system flows were modeled after a diurnal curve determined for a holiday. Enfinger, P.E. and Stevens, P.E. released a technical paper titled "Sewer Sociology – The Days of Our (Sewer) Lives" in 2006, in which sewer flows were measured and graphed for different communities throughout the US. This study shows diurnal curves, which are graphs showing the flowrate over the course of a 24-hour period, for different land uses, holidays, and other categories. Given that the project area primarily consists of residential properties, including numerous vacation homes and second homes, it is probable that the diurnal curve will resemble the patterns observed in sewer usage during various holidays. The diurnal curve, as shown in Figure 3-28, for Labor Day was selected for the Figure 3-28 (Patrick L. Stevens & Kevin L. Enfinger, 2006). Loads for the model were developed and calibrated in several stages as described below.

FIGURE 3-28: DIURNAL CURVE FOR FHARSD MODEL



The maximum day demand for each lift station was back-calculated as follows:

$$\frac{PHF}{MDF} = 1.66 \; and \; PHF = ADF * 5.6$$

Using the two equations above, they were used to find the following:

$$\frac{ADF * 5.6}{MDF} = 1.66 \; and \; therefore, \boldsymbol{MDF} = \frac{\boldsymbol{ADF * 5.6}}{\boldsymbol{1.66}}$$

The existing and future flows for the lift stations are shown in Table 3-7.

TABLE 3-7: INFLOW DATA FOR EXISTING AND FUTURE FLOWS

Lift Station	Subdivisions	Current Count	Current MDD		Future Count	Buildout MDD	
			gpm[1]	gpd/EDU		gpm	gpd/EDU
South LS	Bear Lake West	275	50	190	503	80	190
	Country Club Estates	15			28		
	Lakeshore 5	52			52		
	Lakeshore 6	20			22		
Main LS	Lakeside Estates	66	240	690	138	515	690
	Bear Lake West Plats B & C	179			435		
	Aspen Creek Meadows	9			68		
	Lakeshore 4	33			102		
	Fish Haven West	47			52		
	Lakeshore 3	63			118		
South Reserve	Reserve 1-3	17	135	2735	41	285	2735
	Reserve 4-5	55			110		
North Reserve	Reserve 6	3	5	1545	55	60	1545
St Charles LS	St Charles	157	125	1160	174	190	1160
	7 Mile Ranch	0			60		
New LS at Kentucky Estates	Kentucky Estates	0			17	80	690
	Lakeshore Section 1	0			50		
	Lakeshore Section 2	0			103		

Based on these flows, the flow at each node in the system was calculated and assigned to each junction in the model. A table showing these calculations is included in Appendix B. The following section shows the results of the model for existing and future flows. The existing flows were evaluated first to ensure the model was working well and representing the system fairly accurately. Once the existing model scenario appeared to be well calibrated, another scenario showing future flows was created and evaluated.

3.5.5. Existing Max Day Flow Results

The following sections describe the results of the current conditions using existing maximum day flow data. These sections also evaluate whether the model is reflecting the system correctly.

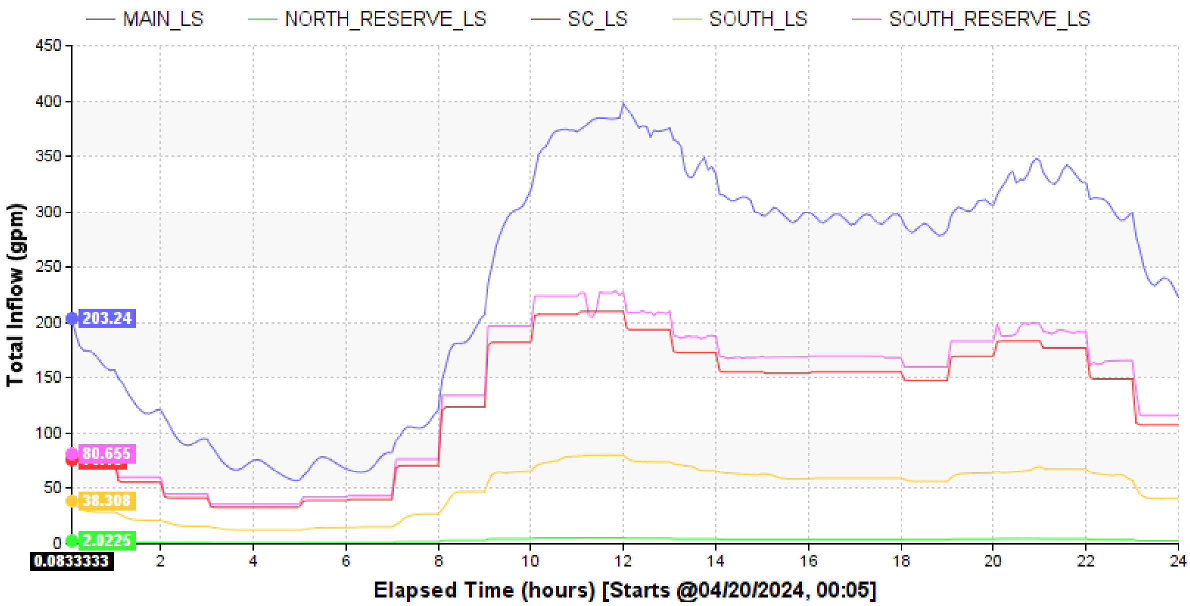
3.5.6. Existing Base Flow

Since actual flow measurements were not taken for this study, the flows determined from the lift station run time, established in Section 3.6.2. , were used to establish flows for the model. An average maximum day flow was assigned to each modeled manhole or node based on spatial allocation of the wastewater loads. The sum of these flows had to equal the total inflow at each lift station. Since a diurnal curve was applied to the inflow at each node, the total inflow varied based on the time of day. Inflows into each lift station are presented in Figure 3-29.

The following inflows were expected based on the current flows for each lift station:

- South Lift Station: 50 gpm
- Main Lift Station: 240 gpm
- South Reserve Lift Station: 140 gpm
- North Reserve Lift Station: 5 gpm
- St Charles Lift Station: 130 gpm

FIGURE 3-29: TOTAL INFLOW INTO EACH LIFT STATION FOR EXISTING CONDITIONS



Existing Wet Well Operation

Each wet well was evaluated based on the depth in the well. The record drawings were used to determine the startup depths and shutoff depths for the lead and lag pump in each lift station. These depths are shown in Table 3-8.

TABLE 3-8: STARTUP AND SHUTOFF DEPTHS FOR EACH PUMP

Design Criteria	South LS	Main LS	South Reserve LS	North Reserve LS	SC LS
Lag Pump Startup Depth (ft)	5.0	5.0	5.0	5.5	7.43
Lead Pump Startup Depth (ft)	3.5	4.0	2.5	2.5	7.03
Shutoff Depth (ft)	1.0	1.0	1.5	1.5	0.67

It is important that the pumps start at these levels and that the lag pump is only used in unusual peak flows, to prevent flooding. However, flooding may still occur if the flow into the lift station is too great for the capability of both the lag and lead pumps, even if both pumps are operating.

Accuracy of the model was also established by making a comparison between the design flowrates of each pump and the pumping rates in the model. Table 3-9 shows the design flowrates of each pump in the system.

TABLE 3-9: DESIGN FLOW AND HEAD FOR EACH LIFT STATION

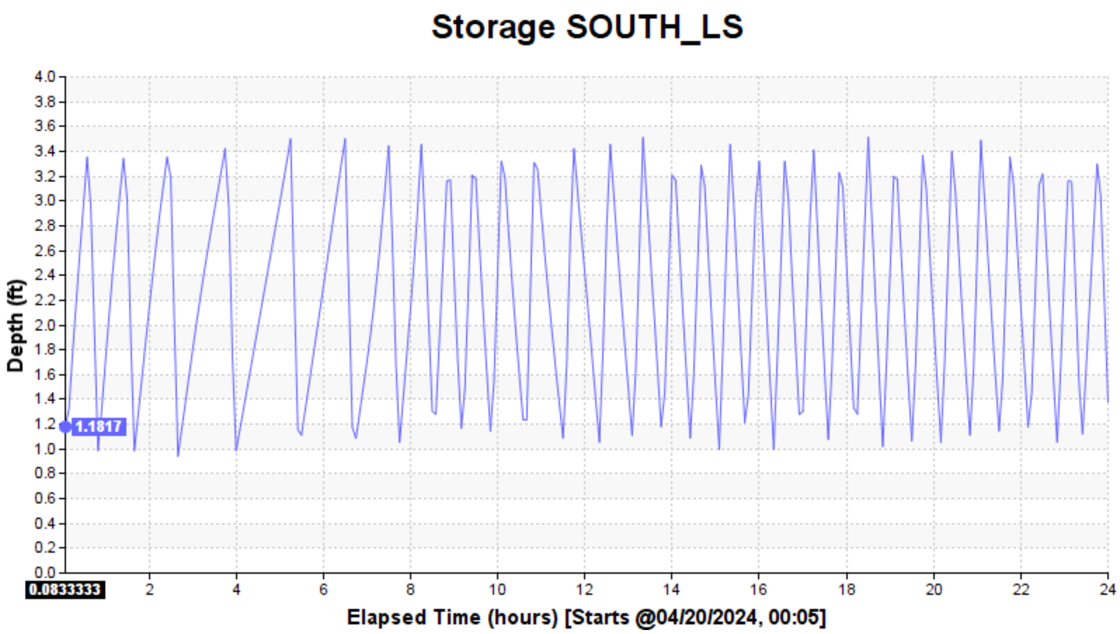
Design Criteria	South LS	Main LS	South Reserve LS	North Reserve LS
Flow (gpm)	100	375	99 or 215[1]	225.21
Head (ft)	45	120	86 or 75	121

1. *The flowrate of this pump can vary, depending on whether it is pumping into the pressure line while the Main LS is running or when it is off. Consequently, this variation also impacts the required head.*

3.5.7. South Lift Station Wet Well Depth - Existing

The operating depth in the South Lift Station wet well varies between 1.0-3.5 feet, which indicates that the pumps are turning on when they need to and they are able to keep up with the demand, since operating depths never go above 3.5 feet. Figure 3-30 shows the depth of the wet well throughout the course of the day.

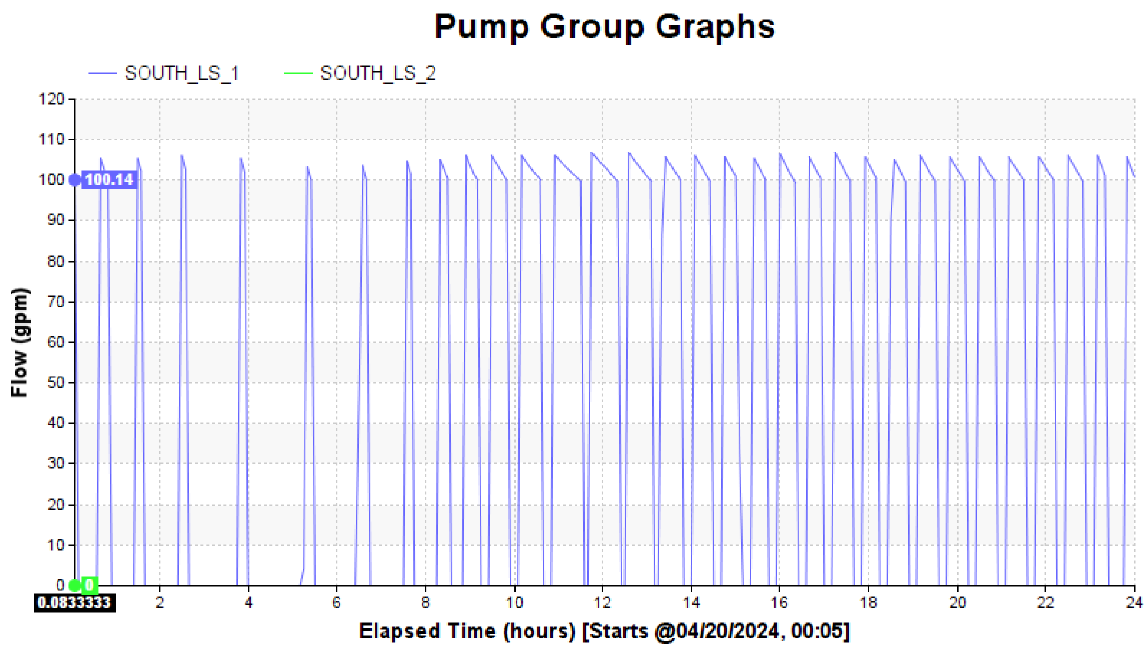
FIGURE 3-30: SOUTH LS PUMPING RATES - EXISTING



3.5.8. South Lift Station Pumping Rate – Existing

Figure 3-31 shows the times at which the pumps in the South Lift Station turned on and when they were off over the course of one day. South Lift Station 1 represents the lead pump and South Lift Station 2 represents the lag pump. Note that the lag pump never ran because the lead pump was able to keep up with the flows. The design flow of the South Lift Station pump is 100 gpm based on the record drawings. The graph below shows that the pump was running at approximately 105 gpm, which is fairly close to the design point and therefore this appears to behave as expected. Note that due to the flows being much lower during the night, the pump did not turn on as often as it did later in the day, which reflects the varying flows during the day. For these reasons, it appears this lift station is working correctly in the model.

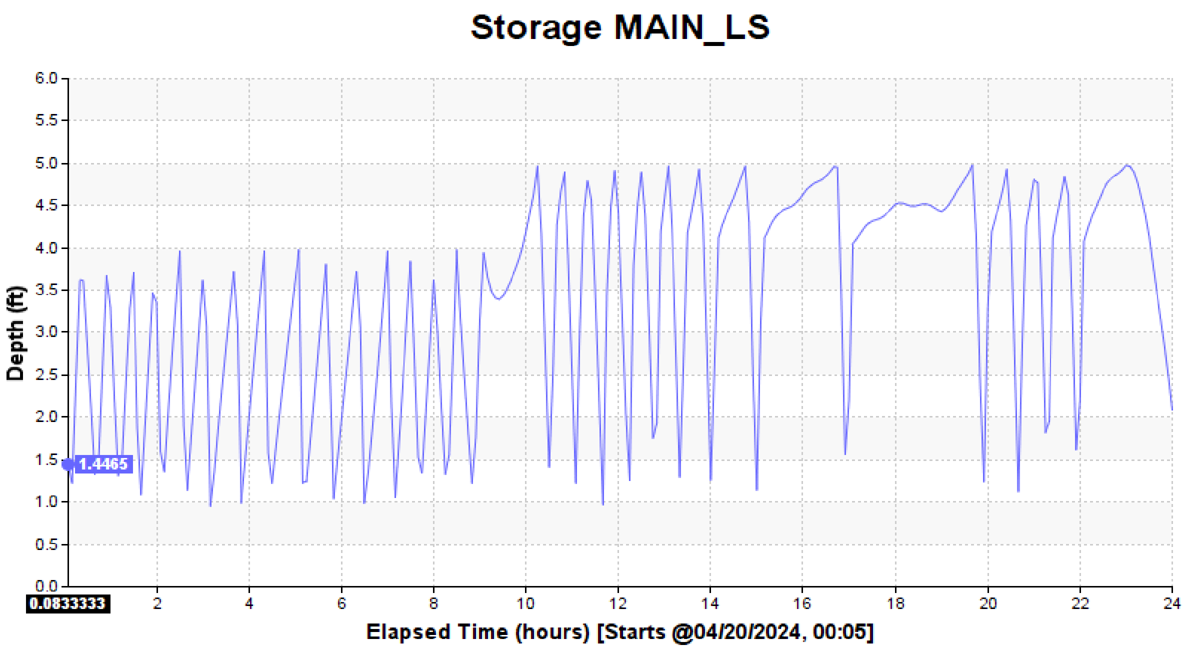
FIGURE 3-31: SOUTH LS PUMPING RATES - EXISTING



3.5.9. Main Lift Station Wet Well Depth - Existing

The Main Lift Station wet well water depth ranges from 1 to 5 feet. Since the level in the wet well doesn't exceed 5 ft, it indicates that the two pumps are able to keep up with the demand. To do this, the lag pump is being used as shown in Figure 3-33. The water depths in this wet well over the course of one day are shown in Figure 3-32.

FIGURE 3-32: DEPTH IN MAIN LS WET WELL - EXISTING

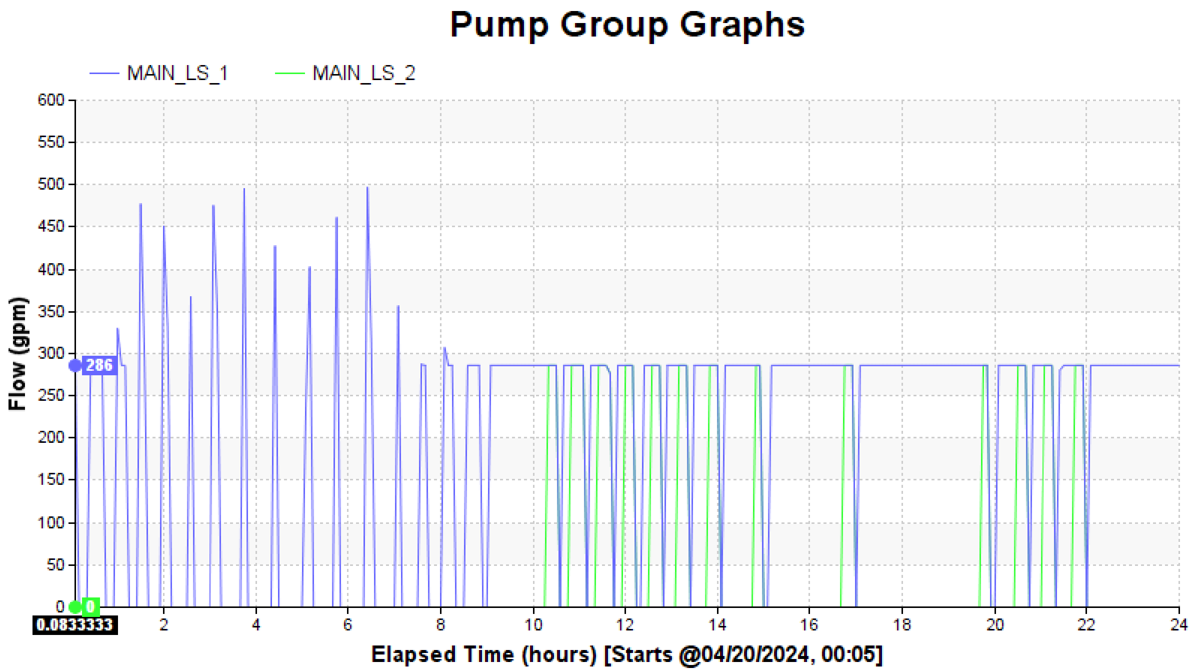


3.5.10. Main Lift Station Pumping Rate - Existing

The pump start-up times are shown in Figure 3-33, which show the lead pump in blue and the lag pump in green. When the simulation first starts, the lift station already has water in it from the previous day, therefore the lead pump runs to get it pumped down. While flows are low, the lead pump can keep up with the inflow on its own, however as the inflow rate increases, the lead pump is unable to pump enough. This causes the lag pump to turn on and they both continue to run simultaneously for the rest of the day.

The Main Lift Station pumps all the way to the lagoons, which consists of an 8-inch pressure line of approximately 39,100 feet length. It then transitions to a small 1,200 feet section of 12-inch pipe. Based on these lengths, diameters, and a roughness coefficient of 110, the manually calculated head loss for the pipe alone is 96 feet for a flow of 285 gpm; 160 feet for a flow of 375 gpm; and 272 feet for a flow of 500 gpm. With head losses this high, the pumps are running at the end of their pump curve and are not efficient.

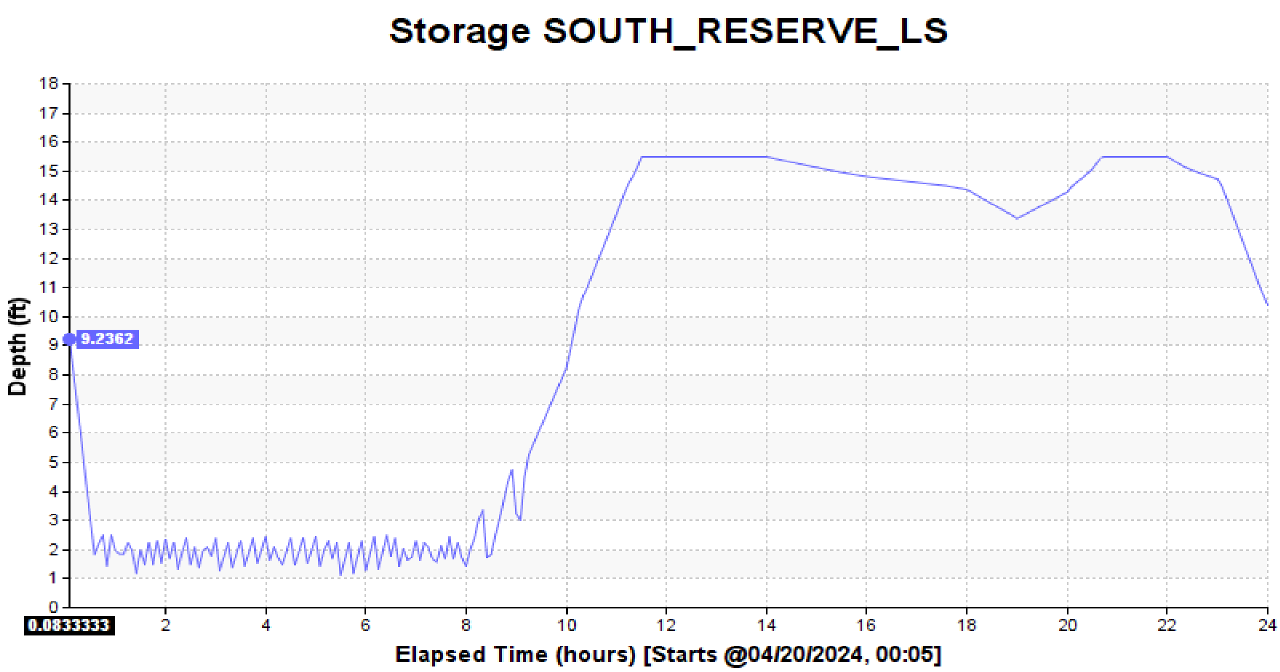
FIGURE 3-33: MAIN LS PUMPING RATES - EXISTING



3.5.11. South Reserve Lift Station Wet Well Depth – Existing

The wet well depth for the South Reserve Lift Station is shown in Figure 3-34. The graph indicates that the lift station can keep up with the inflows during the night well, as the depth remains between 1 and 3 feet. However, once flows increase during the day, the pumps can no longer keep up and the water reaches above the maximum level and overflows.

FIGURE 3-34: DEPTH IN SOUTH RESERVE LS WET WELL - EXISTING

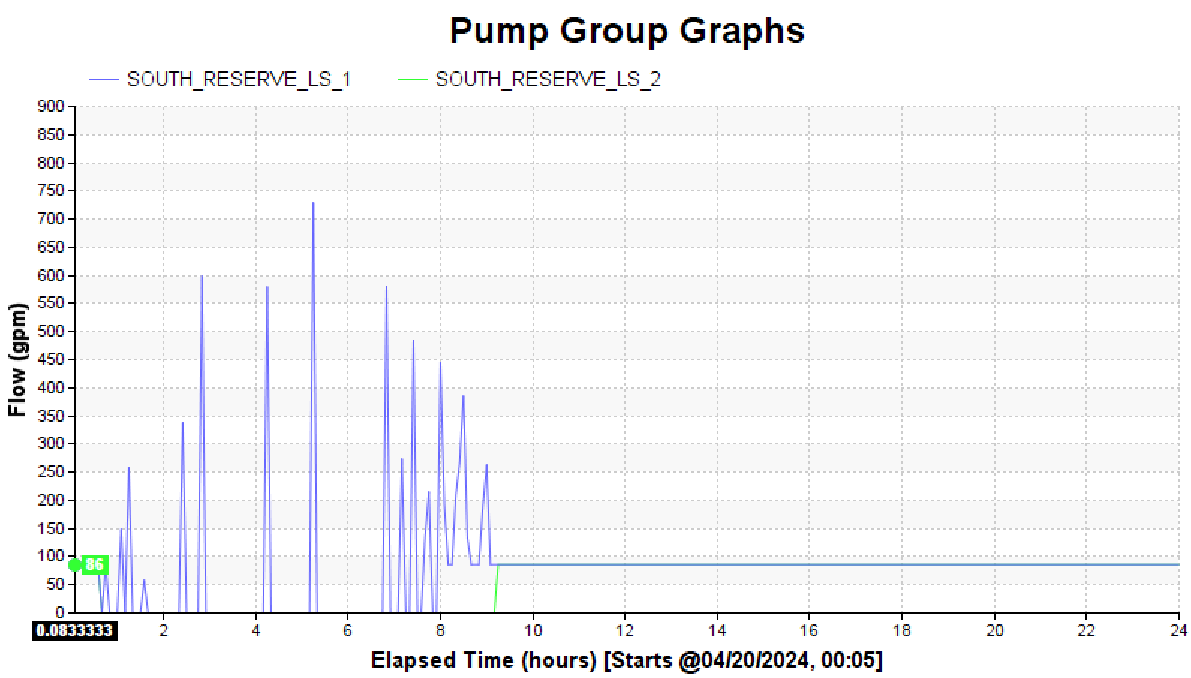


3.5.12. South Reserve Lift Station Pumping Rate – Existing

The pump in the South Reserve Lift Station has to pump directly into the pressure main. When the Main Lift Station is not running, the pumps have no problem pumping into the pipeline; however, when the Main Lift Station pumps are on, the South Reserve Lift Station is unable to reach high enough flowrates to keep the wet well water depth low. Figure 3-35 shows the pumping rates of the lead pump (South Reserve Lift Station 1) and the lag pump (South Reserve Lift Station 2). The design flowrate of the pumps is 215 gpm. The model shows that the pumps are running at approximately 85 gpm later in the day, when the Main Lift Station is on. However, when it does not have to pump into the pressurized line, the model shows flows much larger than 215 gpm.

The lead pump is unable to keep up with the inflow on its own, which causes the lag pump to turn on during the day. As previously seen in Figure 3-34, the lift station overflows at the peak of the day. This is most likely due to the pumps only pumping at approximately 85 gpm. The operator has reported that the pumps have trouble pumping while the Main Lift Station is running; this is represented in the model as well.

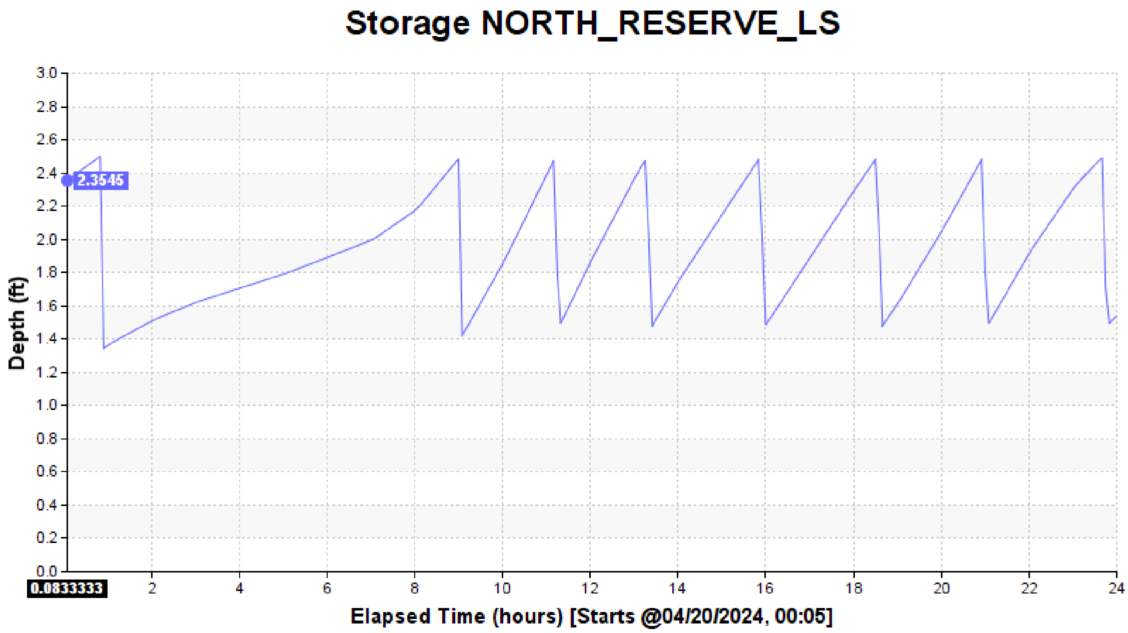
FIGURE 3-35: SOUTH RESERVE LS PUMPING RATE - EXISTING



3.5.13. North Reserve Lift Station Wet Well Depth – Existing

Figure 3-36 shows the water depth in the wet well of the North Reserve Lift Station. The water depth remains between 1.2 and 2.6 feet, indicating that the pumps can pump without the wet well overflowing.

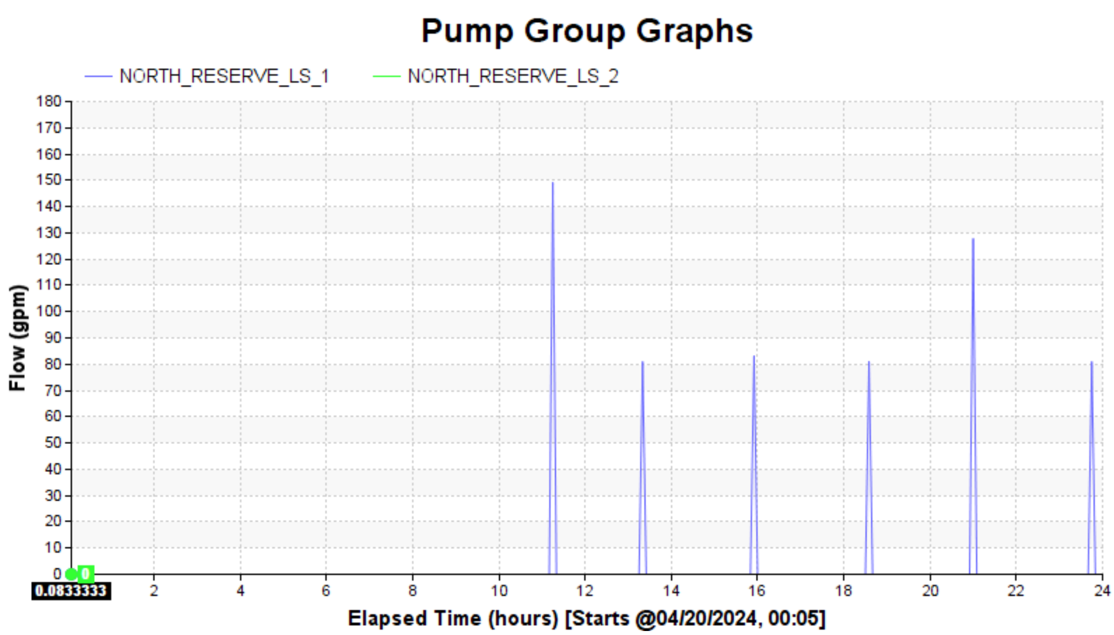
FIGURE 3-36: DEPTH IN NORTH RESERVE LS WET WELL - EXISTING



3.5.14. North Reserve Lift Station Pumping Rate – Existing

The pumping rates of the North Reserve Lift Station pumps are shown in Figure 3-37. Since the lag pump never has to turn on, it appears that the lead pump is able to keep up with the existing demands and only turns on a few times during the day. The design flowrate of the pumps in the North Reserve Lift Station is 225 gpm, which is much higher than what is observed in the model. However, since this is not causing any issues, it appears this lift station is operating correctly in the model.

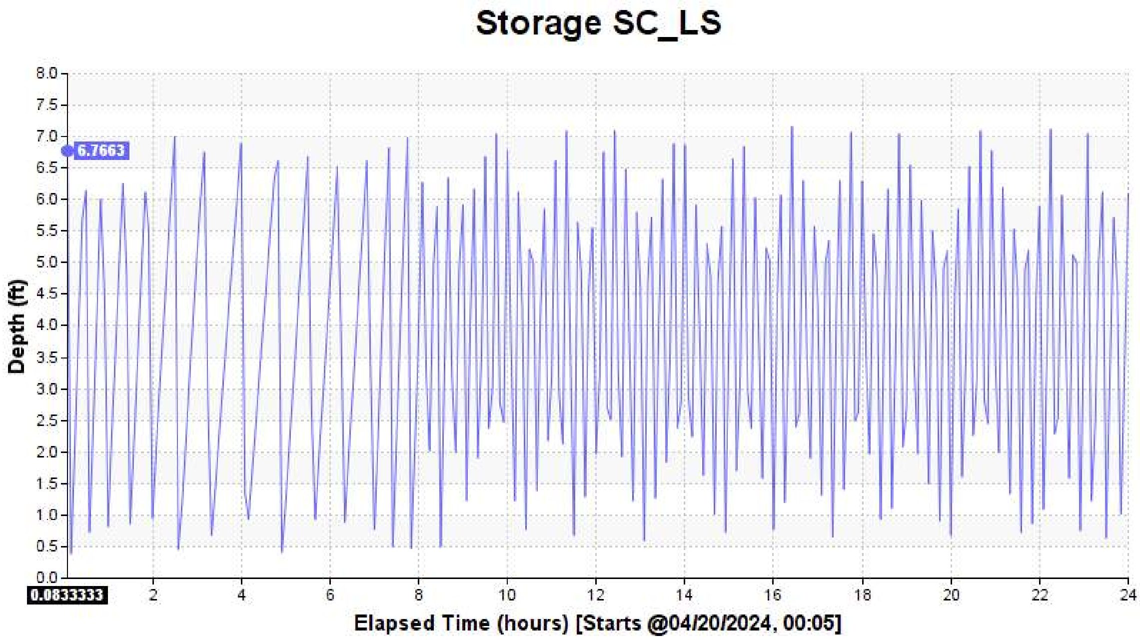
FIGURE 3-37: NORTH RESERVE LS PUMPING RATE - EXISTING



3.5.15. St. Charles Lift Station Wet Well Depth – Existing

The water depth in the St. Charles Lift Station wet well is shown in Figure 3-38. The water depth varies between 0.5 and 7 feet, which indicates that the pumps are able to keep up with the incoming flow and the lift station is not overflowing.

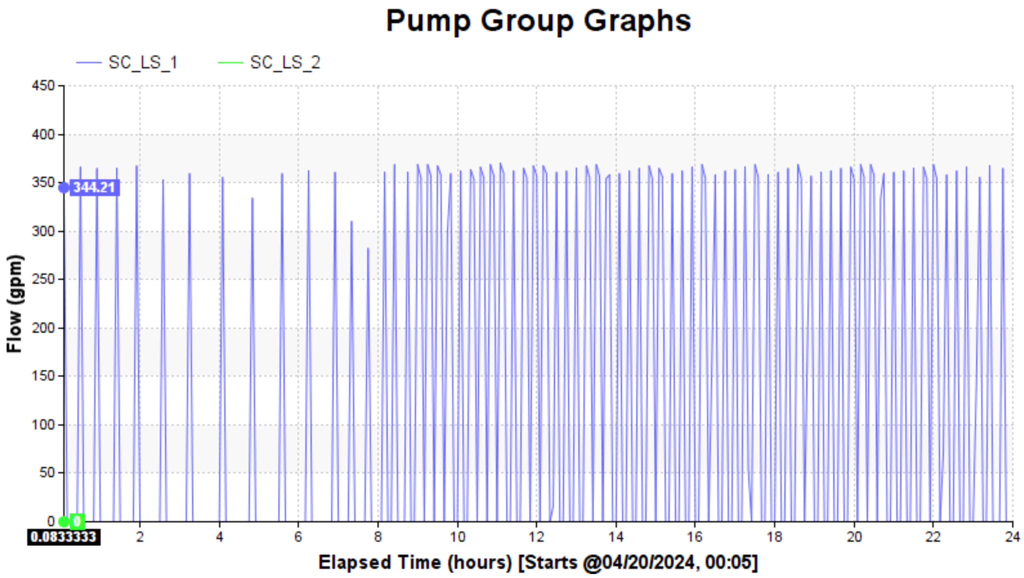
FIGURE 3-38: DEPTH IN SC LS WET WELL - EXISTING



3.5.16. St. Charles Lift Station Pumping Rate – Existing

The pumping rate of the St Charles Lift Station pumps is shown in Figure 3-39. The design flowrate of this pump is unknown. The model is running the pumps at approximately 350 gpm, which is the middle of the pump curve. Only the lead pump (SC Lift Station 1) has to run, indicating that the pump is able to keep up with the incoming flows.

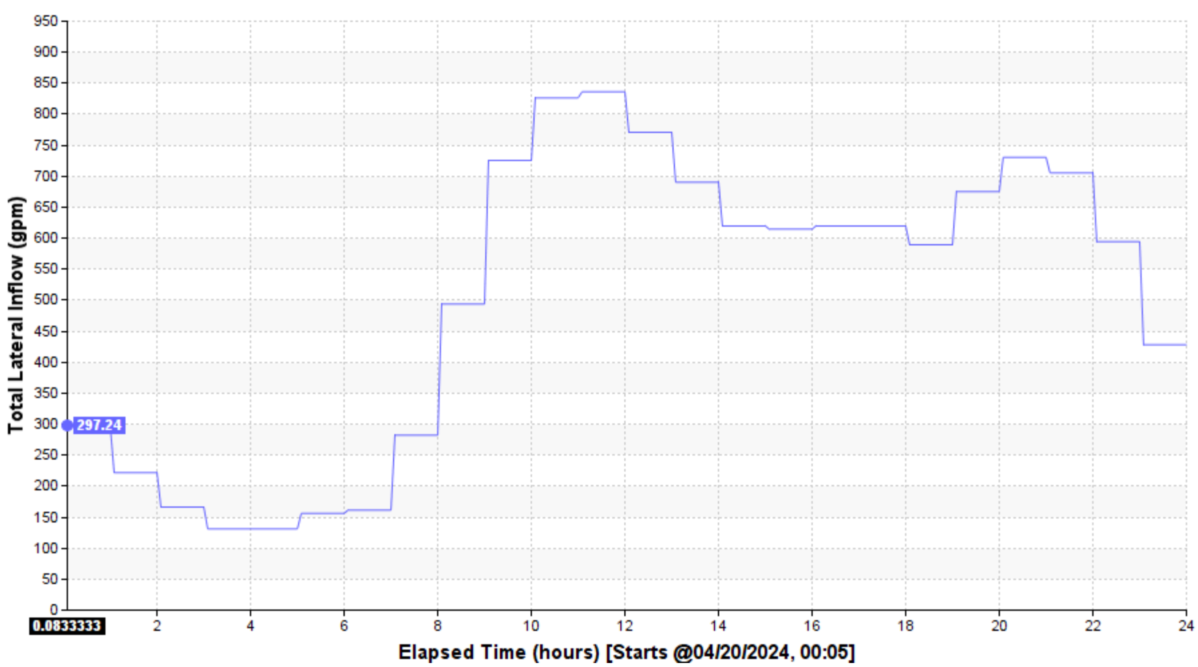
FIGURE 3-39: SC LS PUMPING RATE - EXISTING



Existing Total Outflow

The total flow into the lagoon system should be approximately 505 gpm, which represents the maximum day demand. The peak hour flow should be approximately 840 gpm, based on a peaking factor of 1.66. The model results of the total outflows at the lagoons (Primary Cell + Cell 1), the average maximum day demands appear to be around 500 gpm and the flows increase to approximately 800 gpm at their peak. These results are presented in Figure 3-40. These results appear to be accurate.

FIGURE 3-40: TOTAL INFLOW INTO LAGOON SYSTEM (PRIMARY CELL + CELL 1) - EXISTING



Existing Pipe Velocities

The minimum velocity required in the pipes is 2 ft/s, but it is ideal to have a scour velocity of 2.5 ft/s when the lift station first starts up to prevent settlement. Velocities should be under 6 to 8 ft/s to keep head losses at a minimum. The results reveal that during existing conditions, the maximum velocities through the pipelines are mostly adequate.

There is one segment of gravity pipe, between the South Lift Station and the Main Lift Station that has flows that are less than 2 ft/s. Since the invert elevations were taken off the record drawings rather than survey data, it is possible that they are different.

Future Max Day Results

The following sections describe the results of the future conditions using future maximum day flow data. In the future modal, an additional lift station was added at the Kentucky Estates Lift Station to collect wastewater from Kentucky Estates and parts of Lakeshore. A long gravity main was also added in the future model from the 7 Mile Ranch subdivision directly to the St. Charles inflow node. In the actual event this line is installed in the future, it would most likely tie into the existing St. Charles gravity mains. As this study does not include the current layout of the wastewater collection system in St. Charles, this line was drawn in to purely represent only the flows produced by St. Charles and the 7 Mile Ranch subdivision.

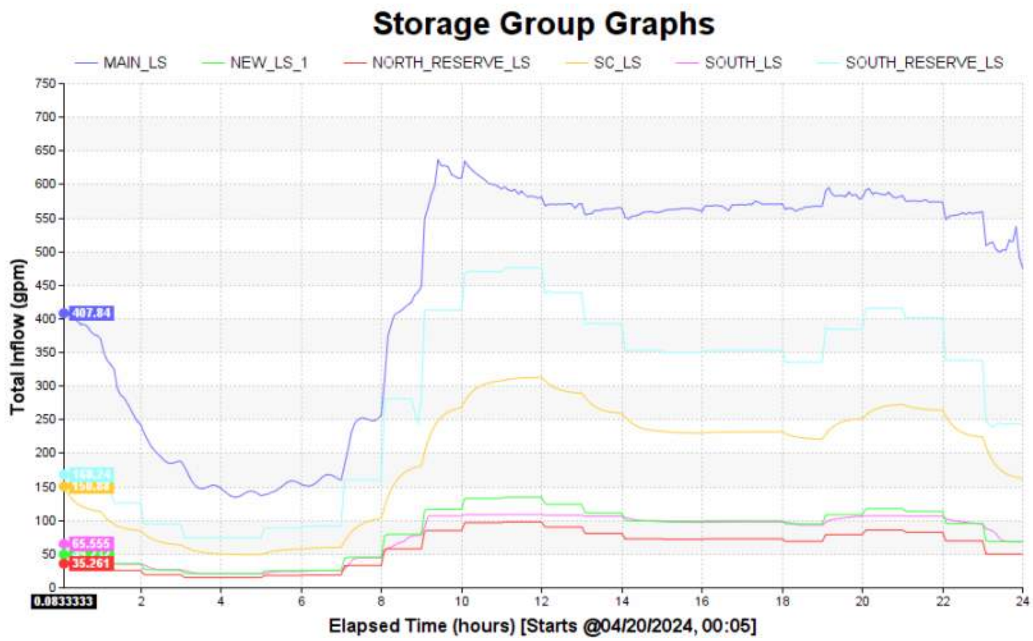
Future Base Flow

The following inflows were expected based on the current flows for each lift station:

- South Lift Station: 80 gpm
- Main Lift Station: 436 gpm
- South Reserve Lift Station: 287 gpm
- North Reserve Lift Station: 59 gpm
- St. Charles Lift Station: 189 gpm
- New Lift Station 1 (at Kentucky Estates): 81 gpm

Based on these known inflow values the flows coming into each lift station appear to be fairly accurate. Figure 3-41 displays the total inflow into each lift station for future conditions.

FIGURE 3-41: TOTAL INFLOW INTO EACH LIFT STATION FOR FUTURE CONDITIONS



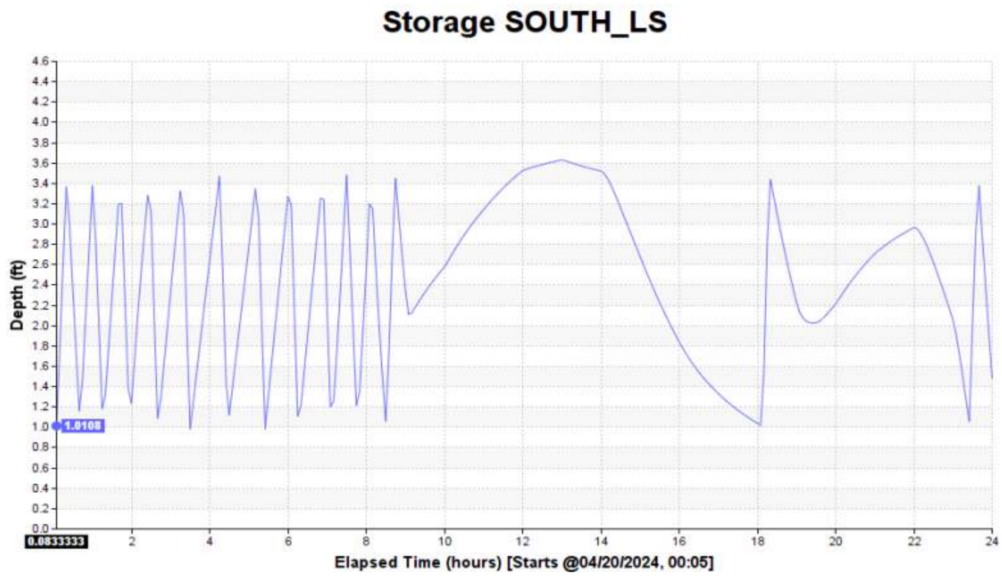
Future Existing Wet Well Operation

This section describes the water depth and pumping rates at each lift station to evaluate whether pumps are adequate for future flows or if upgrades are necessary.

3.5.17. South Lift Station Wet Well Depth – Future

As shown in Figure 3-42, the depths in the South Lift Station remain between 1 and 3.6 feet, which indicates that the pumps are able to keep up with the inflow rate and the lift station is not at risk of overflowing.

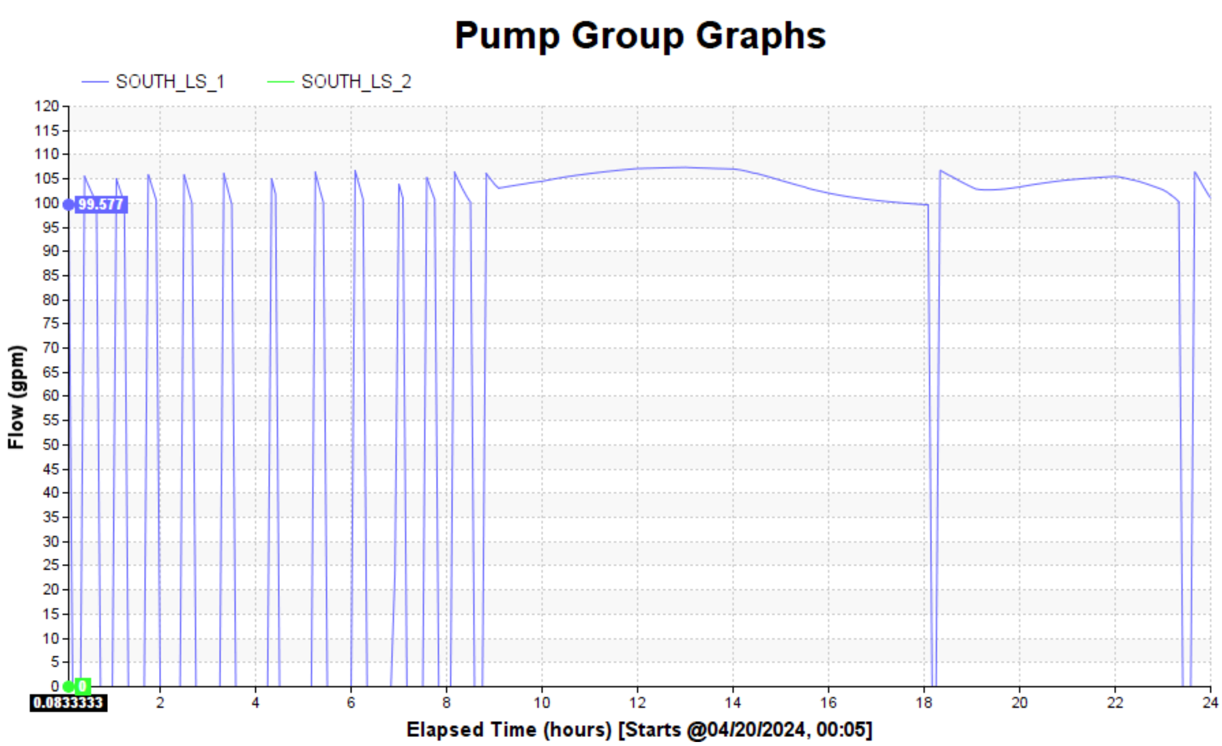
FIGURE 3-42: SOUTH LS WET WELL DEPTH – FUTURE



3.5.18. South Lift Station Pumping Rate – Future

As shown in Figure 3-43, the South Lift Station pumps are designed to flow at approximately 100 gpm. Using future flowrates, the pump runs slightly above 100 gpm and it appears that one pump is able to keep up with the inflow rate and the lag pump does not have to turn on. Therefore, this lift station is sufficient in future conditions.

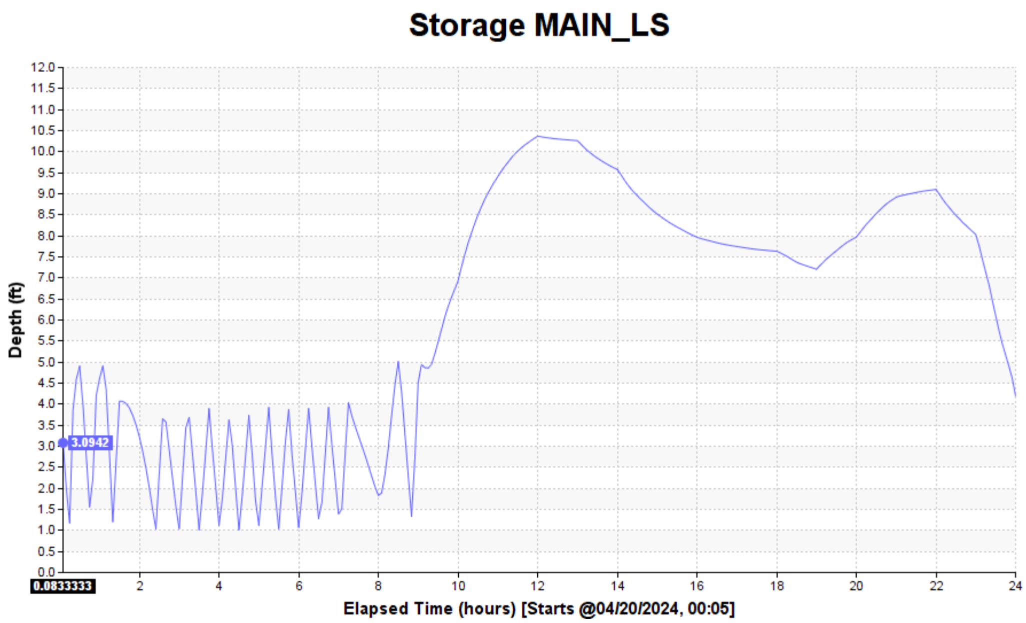
FIGURE 3-43: SOUTH LS PUMPING RATES - FUTURE



3.5.19. Main Lift Station Wet Well Depth – Future

As shown in Figure 3-44, the Main Lift Station has depths varying from 1 to 10 feet. The height of the wet well is 14.5 feet. Therefore, this lift station is not overflowing, but the pumps are starting to have trouble pumping down. This may cause issues if flows continue to increase over time.

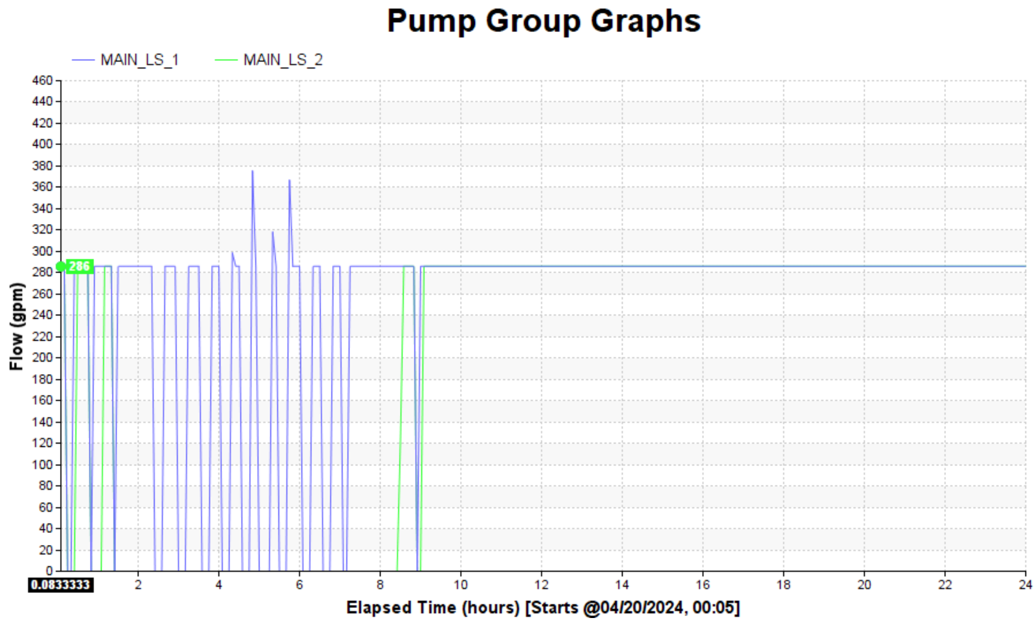
FIGURE 3-44: MAIN LS WET WELL DEPTH - FUTURE



3.5.20. Main Lift Station Pumping Rate – Future

As shown in Figure 3-45, the pumps in the Main Lift Station are pumping at a flowrate of approximately 280 gpm, which is not quite as high as their design flowrate. When only the lead pump is on, it can pump a little bit higher, getting closer to the design flowrate; however, when the lag pump also is on, they can only pump up to approximately 285 gpm. The depth in the wet well rises as high as 10.5 feet, which indicates that these pumps are no longer able to keep up with demands as easily. Improvements to this lift station will be discussed in the alternatives section of this report.

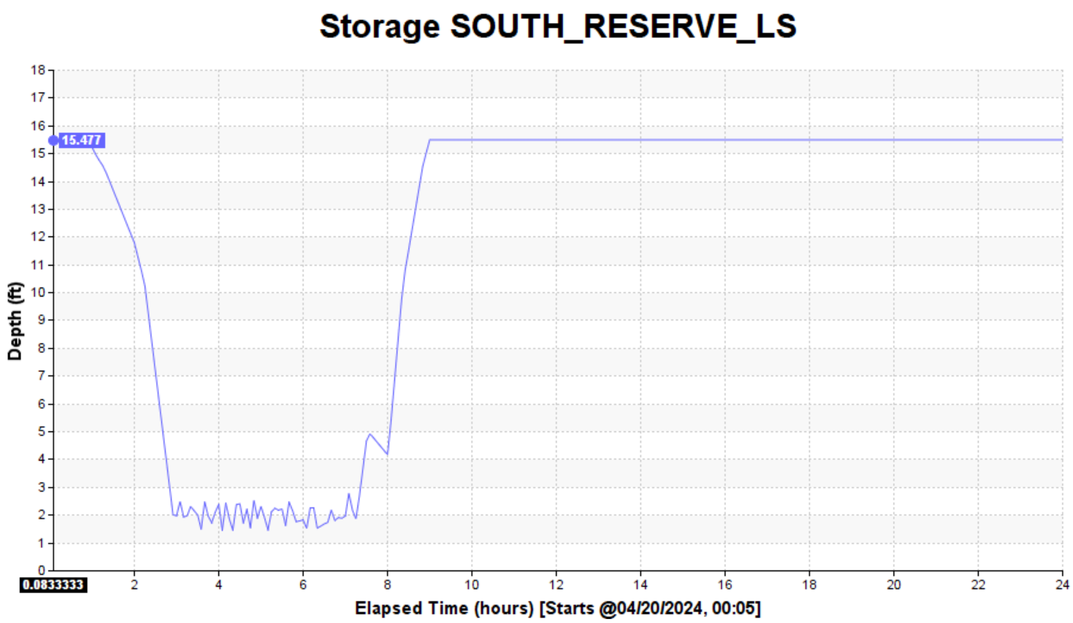
FIGURE 3-45: MAIN LS PUMPING RATES - FUTURE



3.5.21. South Reserve Lift Station Wet Well Depth – Future

As shown in Figure 3-46, the South Lift Station has depths ranging from 1.5 to 15.5 feet. This is the total height of the wet well, which indicates that this lift station is overflowing and the pumps are unable to keep up with the inflow.

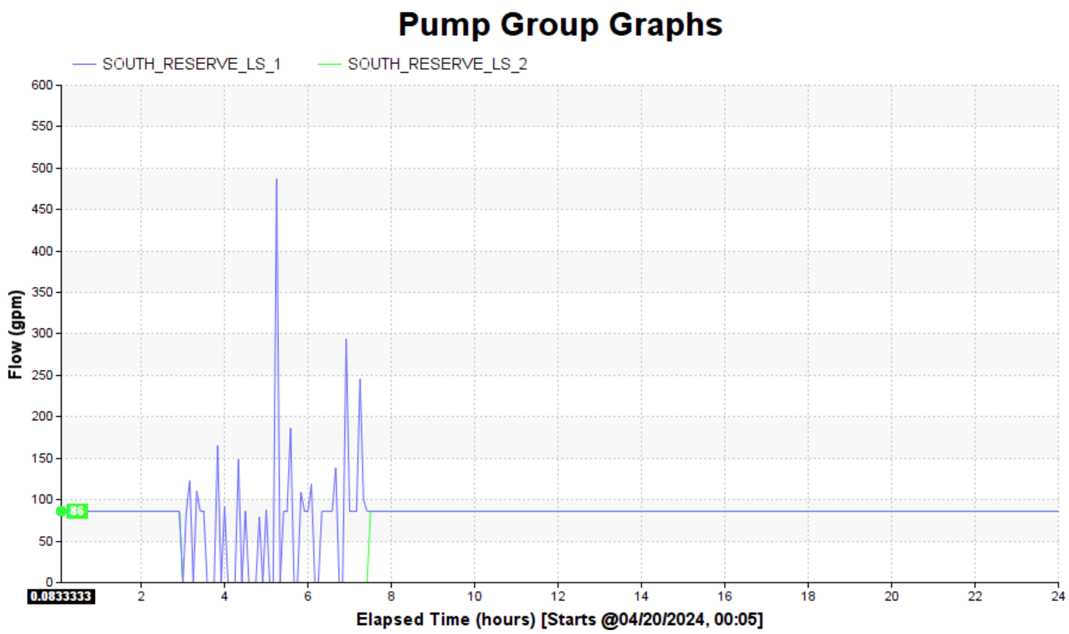
FIGURE 3-46: SOUTH RESERVE LS WET WELL – FUTURE



3.5.22. South Reserve Lift Station Pumping Rate – Future

As shown in Figure 3-47, the pumps in the South Reserve Lift Station are unable to pump at high flowrates when the Main Lift Station is in operation. This was seen in the existing conditions and again in the future conditions. The wet well graph shows that the depth is 15.5 feet, which is the maximum depth of the wet well. Therefore, the wet well is overflowing for the majority of the day. Improvements for this lift station are presented in the alternatives section of this report.

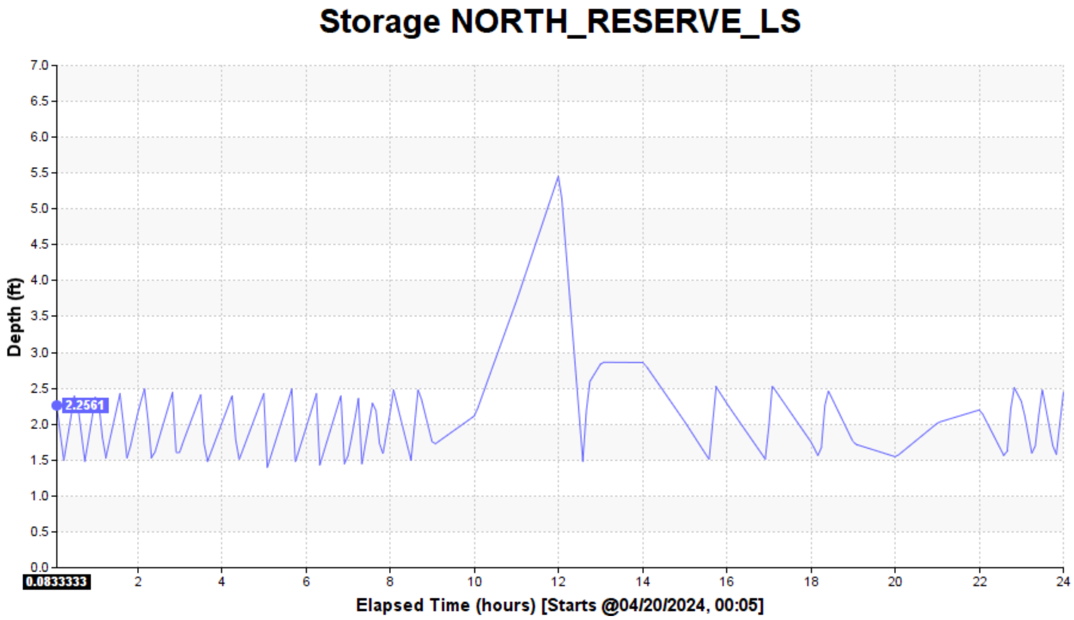
FIGURE 3-47: SOUTH RESERVE LS PUMPING RATE - FUTURE



3.5.23. North Reserve Lift Station Wet Well Depth – Future

As shown in Figure 3-48, the North Reserve Lift Station varies in depth from 1 to 5.5 feet. These depths are very reasonable, and the pumps are able to pump the wet well down far enough to prevent overflowing.

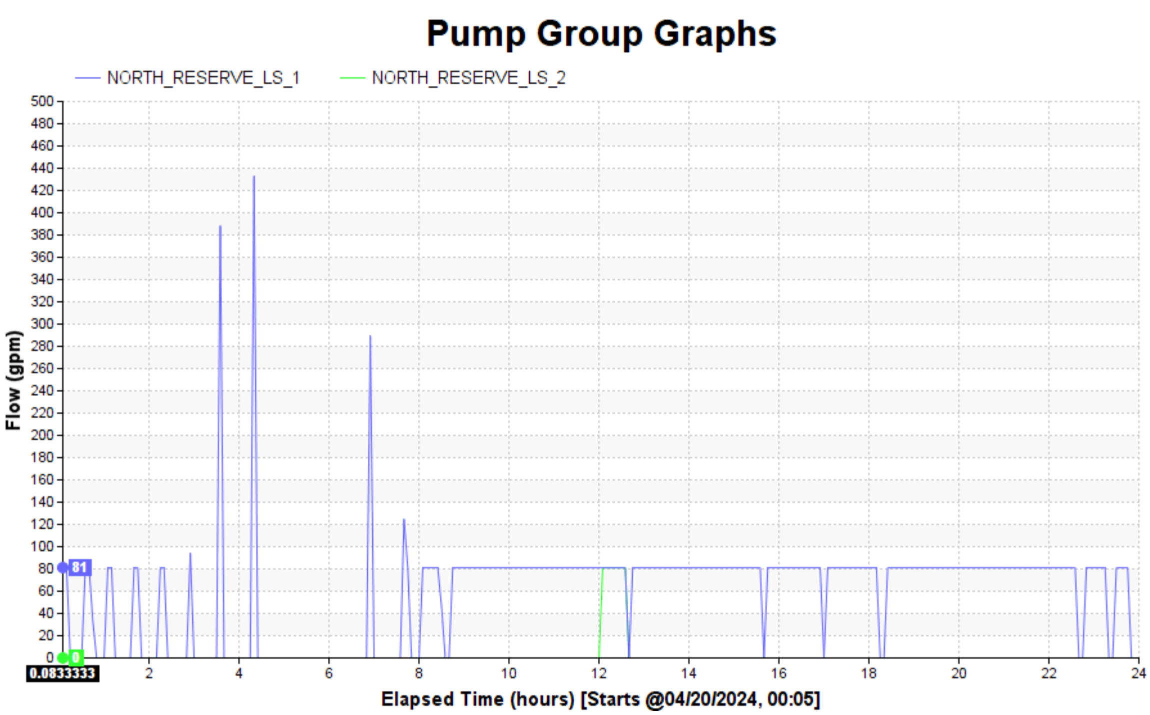
FIGURE 3-48: NORTH RESERVE LS WET WELL DEPTH - FUTURE



3.5.24. North Reserve Lift Station Pumping Rate – Future

As shown in Figure 3-49, the North Reserve Lift Station pumps are running at approximately 80 gpm, which is well below their design point. Only when system flows are low, during the night, does this lift station reach higher pumping rates. With future flows, this lift station has to turn on its lag pump during high flows.

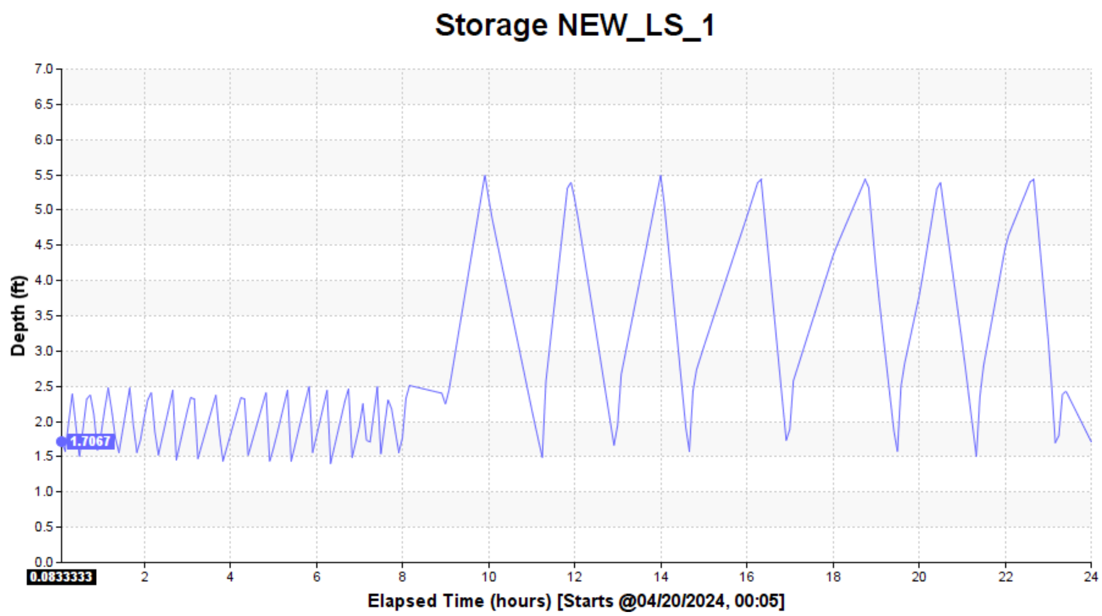
FIGURE 3-49: NORTH RESERVE LS PUMPING RATES - FUTURE



3.5.25. New Lift Station 1 Wet Well Depth – Future

A new Lift Station 1 is placed at Kentucky Estates and is only activated in the future flow model. As shown in Figure 3-50, the New Lift Station 1 has depths like that of the North Reserve Lift Station, since the same pump was used for the model as well as similar startup and shutoff depths.

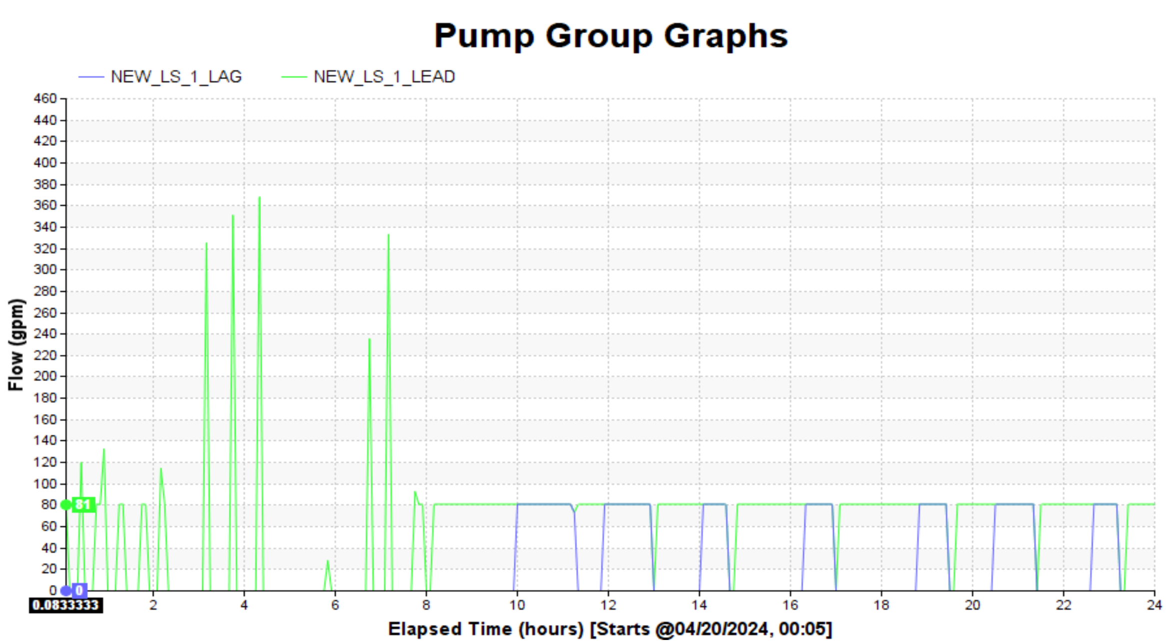
FIGURE 3-50: NEW LS 1 WET WELL DEPTH - FUTURE



3.5.26. New Lift Station 1 Pumping Rate – Future

The New Lift Station 1 is placed at Kentucky Estates and is only activated in the future flow model. If this lift station is considered, it will be designed to meet peak demands as shown in Figure 3-51.

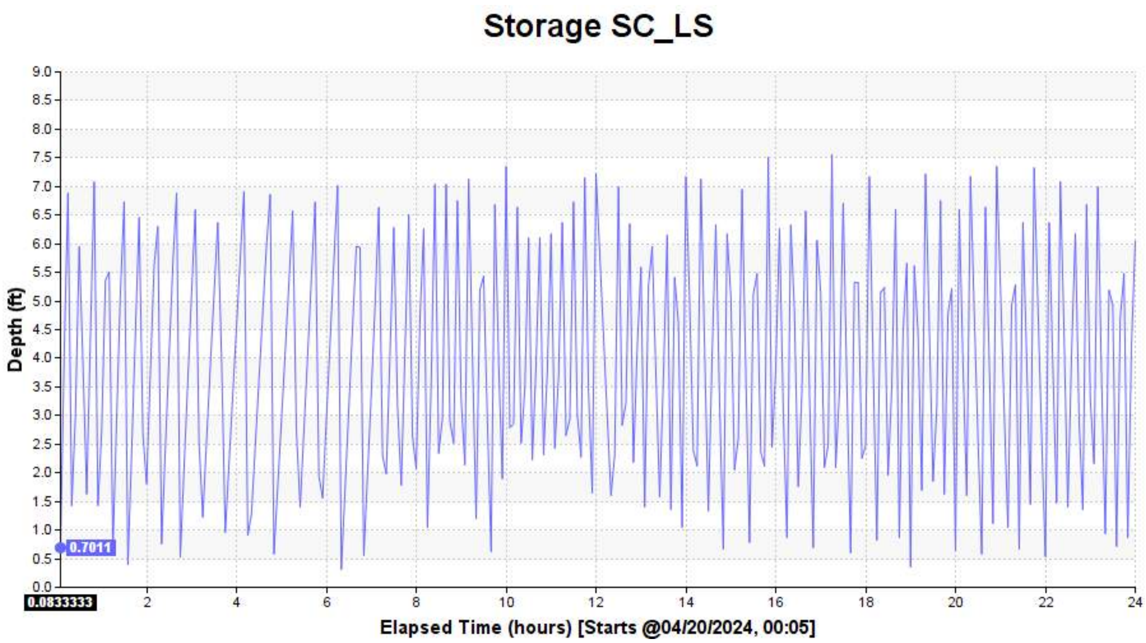
FIGURE 3-51: NEW LS 1 PUMPING RATE - FUTURE



3.5.27. St. Charles Lift Station Wet Well Depth – Future

As shown in Figure 3-52, the SC Lift Station has depths ranging from 0.5 to 7 feet. This lift station is over 19 feet high and therefore not at risk of overflowing.

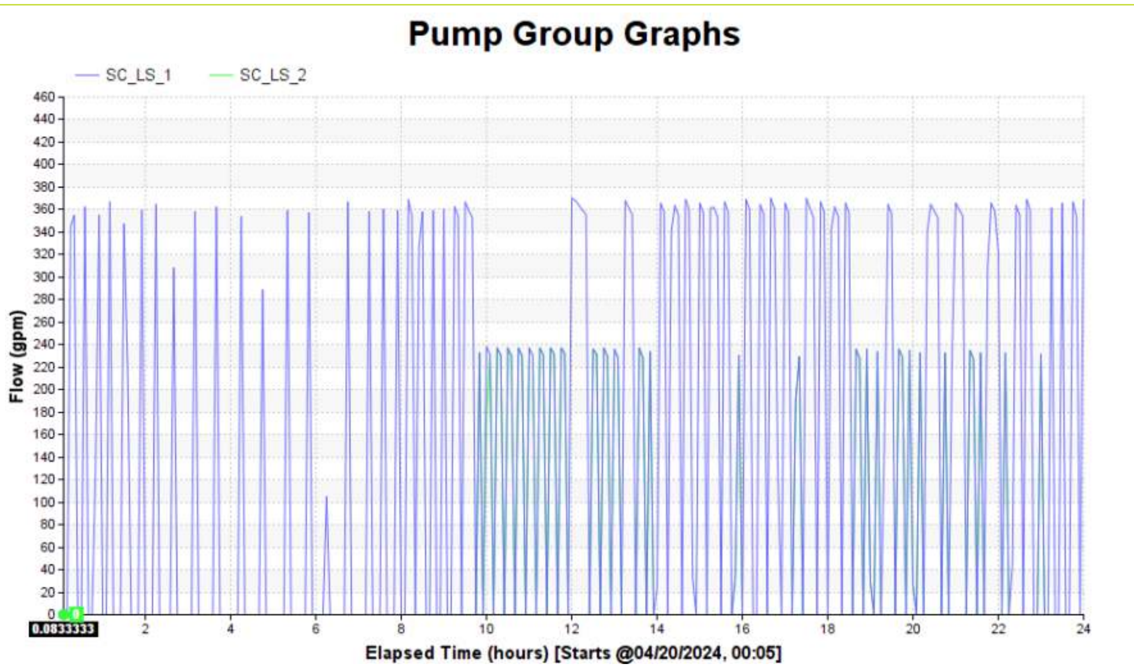
FIGURE 3-52: SC LS WET WELL DEPTH - FUTURE



3.5.28. St. Charles Lift Station Pumping Rate – Future

As shown in Figure 3-53, the St. Charles Lift Station pumps are pumping at a flowrate of approximately 360 gpm. Future inflows are quite high, requiring the lag pump to turn on during high flows.

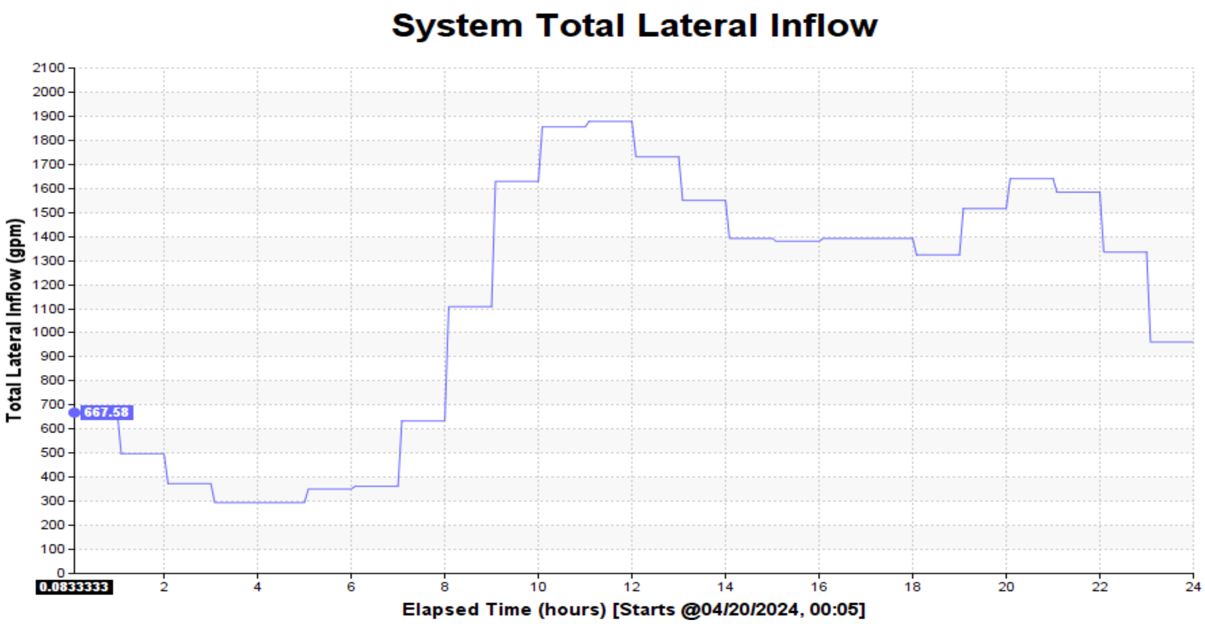
FIGURE 3-53: SC LS PUMPING RATE - FUTURE



Future Total Outflow

The total maximum day demand flow into the lagoon system is approximately 1,132 gpm. The peak hour flow is approximately 1,880 gpm, based on a peaking factor of 1.66. The model results of the total outflows at the lagoons (Primary Cell + Cell 1), the average maximum day demands appear to be around 1,200 gpm and the flows increase to approximately 1,900 gpm at their peak. These results are presented in Figure 3-54, and the total volume is presented in the tables attached in Appendix B.

FIGURE 3-54: TOTAL INFLOW INTO LAGOON SYSTEM (PRIMARY CELL + CELL 1) - FUTURE

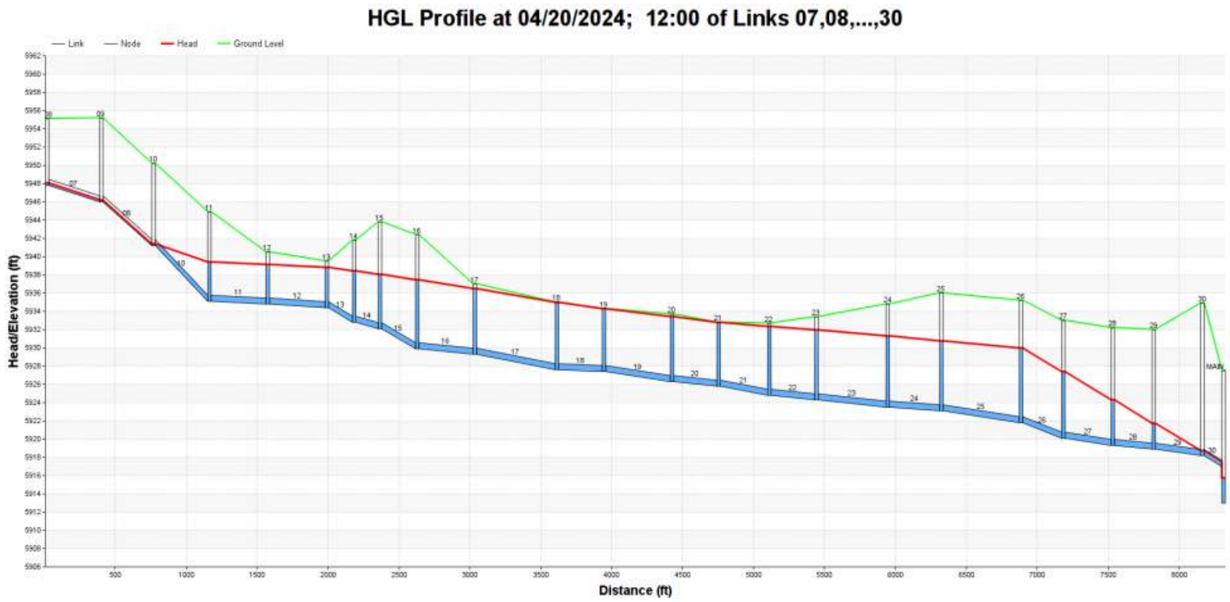


Future Pipe Velocities

The results reveal that during future conditions, the maximum velocities through the pipelines are mostly adequate. There are a few segments that have velocities that are lower than 2 ft/s, which are the same segments as those identified in the existing conditions. Similarly, there are a few segments that have high velocities which are the same as those described in the existing conditions.

As mentioned in existing conditions for pipe velocities, it was discovered in the model that the segment of gravity main between the South Lift Station and the Main Lift Station has slower velocities due to the slopes of the pipe being less than the preferred design of 0.004 ft/ft. In the future buildout scenario, this causes the manholes in this section to overflow due to wastewater backing up in the system. Figure 3-55 shows the profile view of the wastewater depth and its associated head at peak hours in the day.

FIGURE 3-55: GRAVITY LINE SOUTH OF MAIN LIFT STATION PROFILE AT BUILDOUT



3.5.29. Collection System Deficiencies & Need for Project

Deficiencies and issues throughout the collection system reported by the operator and observed through the course of this study are summarized below:

- Segments of gravity pipe between South Lift Station and Main Lift Station have slopes less than the standard 0.4% and after the Main Lift Station show velocities less than 2 fps during max flows.
- No flow meters for the current SCADA system.
- Flooding/backing up at South Reserve Lift Station

3.6. REGULATIONS

3.6.1. Clean Water Act

The Federal Water Pollution Act was established in 1948 and extensively revised in 1972 to become the Clean Water Act (CWA). The CWA has two major components which apply to municipalities. Title II and VI provisions provide federal financial assistance for municipal sewage treatment plant construction, and the CWA also establishes regulatory requirements that apply to municipal dischargers. The CWA is considered a technology-forcing statute due to increasingly stringent regulations that force additional treatment solutions to be developed.

Under the CWA, certain responsibilities are delegated to the states where there is an established federal-state cooperative relationship. Under this agreement, the federal government creates standards, and the states implement and enforce these standards. Under the CWA, all discharges into a water body must be authorized by an Idaho Pollutant Discharge Elimination System (IPDES) Permit administered through the Idaho Department of Environmental Quality.

3.6.2. Idaho Recycled Wastewater Rules

To prevent pollution of surface and groundwater when using recycled water for irrigation, groundwater recharge, landscape impoundments, and other beneficial reuses, Idaho's Recycled Wastewater Rules (IDAPA 58.01.17) govern the practice. A permitting process for a Wastewater Reuse permit has been established.

3.7. WASTEWATER TREATMENT SYSTEM

3.7.1. Design Considerations

The design of wastewater lagoons is governed by Idaho DEQ and IDAPA 58.01.16. Section 493 in IDAPA lists the basis of lagoon design. These rules pertain to all new and existing lagoons. A brief summary of the rules is provided below:

<u>Lagoon Design Considerations:</u>

- Wastewater lagoons should be placed a minimum of 200 feet from residential property lines.
- A wastewater treatment pond system shall consist of a minimum of three (3) cells designed to facilitate both series and parallel operations. Two-cell systems may be utilized in installations of less than 50,000 gallons per day.
- Lagoon piping should be designed to permit isolation of any cell without affecting the transfer and discharge capabilities of the entire system.
- Dikes should be constructed of relatively impervious material, be at least 10 feet wide, and not steeper than 1:3 (V:H), but with inner slopes no flatter that 1:4 (V:H). A minimum freeboard of

3 feet is required (2 feet allowed for systems with less than 50,000 gallons per day), with minimum pond depth of 2 feet.

- The pond area should be enclosed with an adequate fence to prevent entering of livestock and discourage trespassing.
- All-weather access road and warning signs should be provided. At least one sign on each side of the site and one for every 500 feet of its perimeter.

Lagoons can be classified into two typical categories, aerated and facultative lagoons. In aerated lagoons, oxygen is supplied primarily using mechanical or diffused air aeration rather than natural processes (Environmental Protection Agency, 2002). Aerated lagoons can reliably produce an effluent with both Biochemical Oxygen Demands (BOD) and Total Suspended Solids (TSS) less than or equal to 30 mg/L if provisions for settling are included at the end of the system; however, aerated lagoons are typically not as effective as facultative lagoons in removing ammonia, unless specifically designed to encourage nitrification.

Facultative lagoons are neither mechanically mixed nor aerated which is how the FHARSD lagoons currently operate. A layer of water near the surface contains dissolved oxygen due to atmospheric reaeration and algal photosynthesis. This condition supports aerobic and facultative organisms. The bottom of the lagoon contains sludge deposits and supports anaerobic organisms. In facultative lagoons, the intermediate stratum of water ranges from aerobic near the top layer and anaerobic near the bottom. The stratification may persist due to temperature-induced water density gradients. Temperature inversions can occur during the spring and fall when a decrease in surface temperature increases the density of the surface stratum of water. As the top layer of water cools and increases in density, turnover can occur, causing resuspension of settled materials, increasing turbidity, and releasing objectionable odors (Environmental Protection Agency, 2002).

3.7.2. Existing Conditions

The FHARSD treatment system consists of five lagoons with a combined capacity of 67 million gallons (MG). These include the Primary Cell, Cell #1, Cell #2, Cell #3, and the Winter Storage Cell. The Primary Cell and Cells #1 and #2 are used primarily for settling. Cell #3 and the Winter Storage Cell are used primarily for storage and additional evaporation and settling. The new Primary and Winter Storage Cells were constructed in 2006 due to increasing flows and limited winter storage. Figure 3-56 shows the lagoon site layout and Table 3-10 shows the total volume in million gallons (MG) and surface acreage of each lagoon.

The lagoon effluent is land applied to an 18-acre land application site located northeast of the lagoons. Keller performed the design and DEQ granted the District a Beneficial Reuse Permit to discharge the lagoon effluent at the loading rates. This permit can be viewed in Appendix A.

FIGURE 3-56: WASTEWATER LAGOON SITE LAYOUT

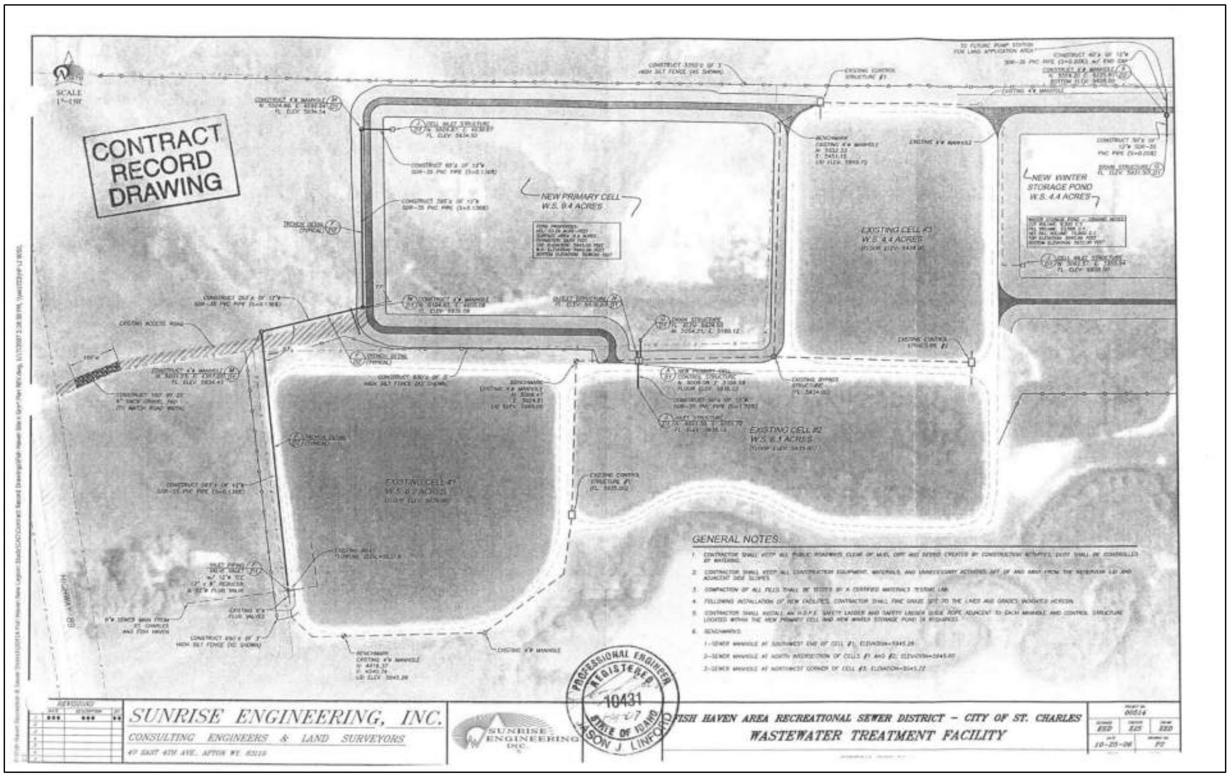


TABLE 3-10: TREATMENT FACILITIES CHARACTERISTICS

Lagoon	Surface Area (acres)	Total Operating Volume (MG)
Cell #1	6.2	13.0
Cell #2	6.1	14.3
Cell #3	4.4	11.4
Primary Cell	9.4	17.4
Winter Storage	4.4	10.5
	Total	**67**

Seepage testing of Cells #1, #2, and #3 was last performed in November of 2021. All three lagoons have an allowable seepage rate of 0.25 inches per day because they were built prior to April 15, 2007. The testing results are shown in Table 3-11. All three lagoons passed and were classified as Category 1. This classification indicates that both the average seepage rate and the highest point on the upper error bar were below the regulatory limit.

The Primary Cell and Winter Storage Lagoon were last tested 10 years ago and were tested again in the Summer of 2024. These two lagoons have a maximum allowed seepage rate of 0.125 in/day because they were constructed after April 15, 2007.

TABLE 3-11: LAGOON SEEPAGE TESTING RESULTS

Lagoon	Liner	Seepage (in/day)	Allowed Seepage (in/day)
Cell #1	Clay	0.036	0.25
Cell #2	Clay	0.147	0.25
Cell #3	Clay	0.163	0.25
Primary Cell	HDPE	0.037	0.125
Winter Storage Lagoon	HDPE	0.023	0.125

3.7.3. Emergency Operation

FEMA has not completed a study in Bear Lake County to determine flood hazard for the project area.

3.7.4. Lagoon Capacity

Determination of treatment lagoon capacity is an appraisal of the maximum inflow conditions under which the lagoons can operate. Based on flow data for current and projected populations, the current site is reaching capacity.

A water balance based on lagoon influent flow and evaporation was completed to determine the anticipated evaporative capacity of the lagoon sites.

Table 3-12 lists the estimated capacity of the treatment lagoon system at 40-year buildout. Current annual inflows are 61 MG and the lagoon capacity is estimated at 33 MG. Lagoon seepage rates were also factored into the outflow capacity of the system and estimated based on previous seepage test results. It is estimated that at the current inflow rates and if all available storage is used, the lagoons will reach maximum capacity by 2032 depending on annual inflows and evaporation.

TABLE 3-12: LAGOON CAPACITY

Description	Lagoons
Annual Influent Volume (MG)	61
Annual Precipitation Volume (MG)	9
Annual Evaporative Capacity (MG)	33
Storage Capacity Needed in 2064 (MG)	108

Hydraulic Retention Time

For a lagoon system to treat wastewater to an acceptable level, sufficient detention time in the lagoons before discharge is required. The detention time is a function of volume and flow rate. The acceptable range for treatment by a facultative lagoon system is 25 – 180 days per EPA guidance (US Environmental Protection Agency, 1983). Temperature also plays an important role in the required detention time as cold temperatures decrease biological activity. The hydraulic retention time is shown in Table 3-13.

TABLE 3-13: HYDRAULIC RETENTION TIME

Cell	Hydraulic Retention Time (Days)		
	Current Conditions	20-Year	40-Year
Primary Cell	87	62	34
Cell #1	65	47	26
Cell #2	71	51	28
Cell #3	57	41	22
Total HRT	**280**	**201**	**111**

The total HRT indicates that there is sufficient time available for treatment of current flows. With 20 and 40-year future flows, the hydraulic retention time is 201 and 111 days respectively. This is still within the acceptable range per EPA, giving the water enough time in the lagoons to be treated prior to land application.

3.7.5. Land Application Site

The 18-acre land application site is located within the NE SW of Section 1 of the Township 15 S and Range 43 E at an elevation of 5,939 feet. It is generally located about one mile north of St. Charles and one mile east of US Highway 89. The site consists of approximately 18 acres of irrigable land. The historical use of this land and the land surrounding it has been primarily for agricultural purposes. The site has been permitted by the DEQ reuse permit number M-087-03, which was effective starting in May of 2015 and will be effective until May 13th, 2025. This permit can be viewed in Appendix A.

With the purchase of the property, FHARSD obtained 35 shares (0.7 cfs) of irrigation water from Spring Creek. This water can be used as supplemental irrigation water if needed. The water is diverted from the head gate of the spring to allow farmers to share the water on a turn basis from the head gate all the way down to the properties near the Lake. These 35 shares equate to 3 hours of water per share approximately every 2-3 weeks. FHARSD can use irrigation water continuously for 4 days and 9 hours before they must release the water to continue flowing to the next farmer.

Alfalfa was chosen as the crop for the land application site. Alfalfa is a perennial crop that should be planted in the first year and harvested for the following five years. Beginning the sixth year, grass hay could be planted for two years and then alfalfa hay for another five years to alternate the crop and change the nutrient uptake from the site. Its root depth can reach between 3-15 feet.

Depending on the precipitation year, there can be more water than needed for the land application site under current conditions. Data indicates that for the full buildout scenario of 1,840 equivalent dwelling units (EDUs) the total amount of winter storage needed is 108 MG or roughly 31 acres. The land application needed at that point in time will be 140 acres. Rather than purchasing land, the District could consider a long-term lease.

3.7.6. Treatment System Deficiencies and Need for Project

Deficiencies and issues throughout the treatment system reported by the operators and observed through the course of this study are summarized below:

- Inadequate wintertime storage capacity
- The Land Application Site has inadequate capacity for current and future conditions.

3.8. INFLUENT CHARACTERISTICS

The wastewater flow from FHARSD is all considered residential. Influent quality and characteristics are not monitored because there are no influent monitoring requirements as part of the wastewater reuse permit.

3.9. EFFLUENT CHARACTERISTICS

Effluent characteristics for FHARSD wastewater were sampled for their land application site. The most recent sampling occurred in October of 2023. The results are summarized in Table 3-14.

TABLE 3-14: RECYCLED WASTEWATER SAMPLING

Sampling Date	Constituent				
	Nitrate as N (mg/L)	pH	Total Dissolved Solids (mg/L)	Total Kjeldahl Nitrogen (mg/L)	Total Phosphorus as P (mg/L)
2023 Avg.	1.0	8.6	517.0	3.4	2.0
6/21/2023	1.0	8.6	448.0	4.0	2.2
8/30/2023	1.0	8.8	560.0	2.0	1.3
9/5/2023	1.0	8.6	572.0	5.3	1.6
10/3/2023	1.0	8.3	488.0	2.4	2.9

3.10. OPERATION & MAINTENANCE BUDGET

FHARSD charges a flat sewer rate of $26.00 per equivalent residential connection and a single structure hook up fee is $8,000, which consists of a $5,000 hook-up fee and a $3,000 impact fee. An itemized annual Operation and Maintenance (O&M) Budget for financial years 2019 to 2022 was provided by the District and is shown in Table 3-15. Projected O&M budgets will be considered as part of the cost analysis of each project alternative.

TABLE 3-15: ANNUAL OPERATION AND MAINTENANCE REVENUES & EXPENDITURES

Revenue/Expense	2019-2020	2020-2021	2021-2022
Revenue			
Maintenance/Operation	$262,776.00	$269,368.00	$293,677.00
Hook-up Fees	$136,400.00	$257,600.00	$386,000.00
Property Tax	$39,641.00	$32,328.00	$47,620.00
Sales Tax/Misc.	$6,252.00	$19,015.00	$7,278.00
Total Revenue	**$445,069.00**	**$578,311.00**	**$734,575.00**
Expenses			
Administrative	$21,333.00	$12,973.00	$16,607.00
Maintenance/Operations	$78,881.00	$102,770.00	$106,076.00
Debt Services	$131,458.00	$131,458.00	$131,458.00
Capital Improvement Fund	$213,397.00	$331,110.00	$480,434.00
Total Expenses	**$445,069.00**	**$578,311.00**	**$734,575.00**

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CHAPTER 4 - EVALUATION OF IMPROVEMENT ALTERNATIVES

In the development of viable solutions for FHARSD, the primary objective is to assist the District in the effective collection and treatment of its wastewater and to improve compliance with State and Federal standards in an economical manner. Solutions are developed on a case-by-case basis and recommendations are made after consideration of the best treatment solutions available and communication with FHARSD faculty and board members. In some cases, optimizing the operation of existing facilities is the best solution; however, at times, a new wastewater conveyance or treatment process will better provide for future needs.

Per the Idaho DEQ's facility planning study requirements, each design alternative is planned to meet the needs for a 20-year minimum period for treatment facilities, and a 40-year minimum period for the collection system, or an equivalent development benchmark for the discussed growth rate. It is important to note that the 20- and 40-year design horizons rely on assumptions that were made for the demands and populations within each time period. These population and demand projections are estimates based on the best information available but may vary due to the unpredictable nature of growth and human movement. Equivalent development benchmarks could reasonably occur earlier or later than the proposed time periods; however, in all cases, the information presented herein meets or exceeds the industry and governing agency's standard for these types of predictions.

Discussion in this section is presented in general terms regarding project alternatives for collection system improvements, additional treatment processes, and wastewater disposal in order to provide a background for the various solutions available to the District. These alternatives are given an initial screening to remove those deemed impractical or which do not meet the District's needs.

Various alternatives exist to correct the identified system deficiencies. The alternatives discussed in the remainder of this study are evaluated based upon their ability to resolve the District's needs, anticipated costs, environmental impacts, and operation and maintenance requirements.

The estimated capital and operation and maintenance (O&M) costs presented are concept level cost estimates only (Class 5 as defined by the American Association of Cost Engineers), which are used to provide sufficient accuracy for broad planning purposes. These estimates include costs associated with engineering services, contractor overhead and profit, and contingency to compensate for changes in the cost of construction and unexpected conditions. The cost estimates herein are based on the perception of current conditions at the project location. This estimate reflects an opinion of probable costs at this time and is subject to change as the project design matures. Keller Associates has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's methods of determining prices, competitive bidding or market conditions, practices, or bidding strategies. Keller Associates cannot and does not warrant nor guarantee that proposals, bids, or actual construction costs will not vary from the cost estimates presented herein.

4.1. REGIONALIZATION

Regionalization entails establishing a regional management and/or other physical consolidation of multiple wastewater systems. Since the City of St. Charles and FHARSD, both discharge into the same lagoon system, these two systems are regionalized. The City of Bloomington is approximately 3.5 miles north of the lagoons. However, Bloomington had a 2020 census population of 199, which is significantly smaller than the population served by FHARSD (U.S. Census Bureau, 2022). Therefore, regionalization of the wastewater system would not be advantageous. There are some smaller towns to the South of the FHARSD, however, these are located in Utah and regionalization with any of these towns is also out of the question. Because of this, regionalization will not be considered any further.

Environmental Impacts:

- The alternative of Regionalization would centralize treatment of municipal wastewater for FHARSD, the City of St. Charles and the City of Bloomington, Idaho and would likely require routing of wastewater trunk lines through previously undisturbed ground. Additionally, a centralized treatment plant would increase discharge of treated wastewater, which may require upsizing of facility components.

4.2. COLLECTION SYSTEM ALTERNATIVES

The collection system has lift station and pipeline capacity deficiencies that need to be addressed. This section identifies the improvement alternatives and associated environmental impacts to consider.

4.2.1. No Action Alternative

Under this alternative, the District would choose to not make capital improvements but focus efforts on optimizing and preserving the existing collection system as currently constituted.

Environmental Impacts:

- Current conditions may result in environmental impacts such as sewer spills and overflows due to lack of capacity. This alternative is not preferred because the existing collection system does not have capacity for the existing or future flows.

4.2.2. Upsize Force Main Diameter

Under this alternative, the force main between the Main Lift Station and the lagoons would be replaced by a larger diameter pipe. The minimum diameter of pipe required is 15 inches. Any diameter less than this would not relieve the stress occurring in the South Reserve and Main Lift Station. It is also important for the velocity of the wastewater to be 2 ft/s to avoid buildup of solids inside the pipe. The increased diameter of the pipe would make the velocities less than the design 2 ft/s. To replace the entire length of the PVC pipe, which still has potential years of service left, would also be expensive compared to other alternatives. Because of these reasons, this alternative will not be considered further.

Environmental Impacts:

- All environmental impacts are confined within the right of way. No additional environmental impacts beyond current conditions and the right of way would result from the selection of this alternative.

4.2.3. Upsize Pump Capacity

Under this alternative, any lift station with pumping capacity deficiencies would be upsized to meet necessary flows and pressures without upsizing the existing 8-inch force main. This alternative would result in velocities exceeding 5 to 8 ft/s in the existing 8-inch force main, which is not recommended. The required increased pressure would exceed the pressure rating of the existing piping systems. The power costs would also be excessive. Because of these reasons, this alternative will not be considered further.

Environmental Impacts:

- All environmental impacts are confined within the right of way under the contractor’s control. No additional environmental impacts beyond current conditions and the right of way would result from the selection of this alternative.

4.2.4. Install Parallel Pressure Line

Under this alternative, rather than replacing the existing force main with a larger pipe, a parallel force main would be installed from the Main Lift Station to the lagoons. No lift station modifications considered in this alternative.

Parallel pipes were analyzed ranging from 8-inch to 18-inch to determine which diameter would result in reduced head loss so the pumps could handle the design flows. An 18-inch parallel force main would suffice, but the resulting velocities would be well below the design 2 ft/s. The cost to install a parallel 18-inch force main was also considered to be prohibitive.

Environmental Impacts:

- All environmental impacts are confined within the right of way under the contractor's control. No additional environmental impacts beyond current conditions and the right of way would result from the selection of this alternative.

4.2.5. Install Parallel Pressure Line and Upgrade Pump Capacity

Under this alternative, both the parallel pressure line alternative from Section 4.2.4 and the upsized pump capacity from Section 4.2.3 would be utilized. While the data from the model shows this alternative would work, it is not recommended because it is cost prohibitive and not as efficient as the alternative presented in Section 4.2.6. Because of these reasons, this alternative will not be considered any further.

Environmental Impacts:

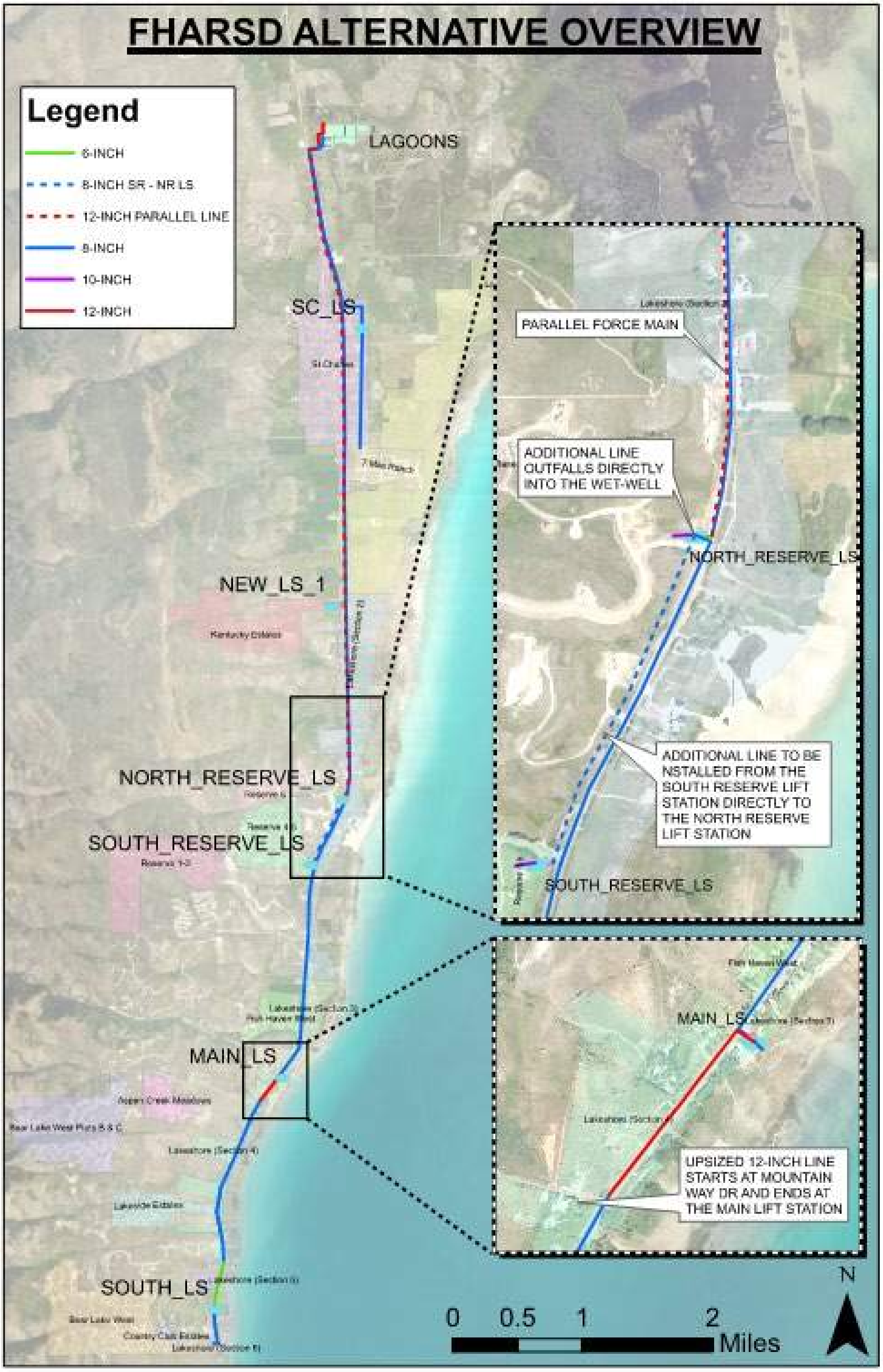
- All environmental impacts are confined within the right of way under the contractor's control. No additional environmental impacts beyond current conditions and the right of way would result from the selection of this alternative.

4.2.6. North Reserve Lift Station Retrofit

Under this alternative, the configuration of the force mains and lift stations would be modified to reduce the required head to pump to the lagoons. Rather than have the lift stations pump into the same long force main, the North Reserve Lift Station would be modified to become a regional lift station, and the force main piping from the Main and South Reserve Lift Stations would be redirected to the North Reserve's wet well. This would reduce the force main length that the Main and South Reserve Lift Station's pump into, thus reducing the pressure and head loss on the pumps and would result in increased pumping capacity.

The existing pressure main from the Main Lift Station would bypass the South Reserve Lift Station and outfall directly into the North Reserve Lift Station's wet well. An additional 8-inch diameter pressure line would be installed from the South Reserve Lift Station to the North Reserve Lift Stations wet well separate from the existing force main that the Main Lift Station would use. The South Reserve Lift Station would not need to be upsized. A parallel pressure line would be installed from the North Reserve Lift Station to the lagoons Figure 4-1 displays the layout of each new addition to the collection system under this alternative.

FIGURE 4-1: ALTERNATIVE OVERVIEW MAP



Environmental Impacts:

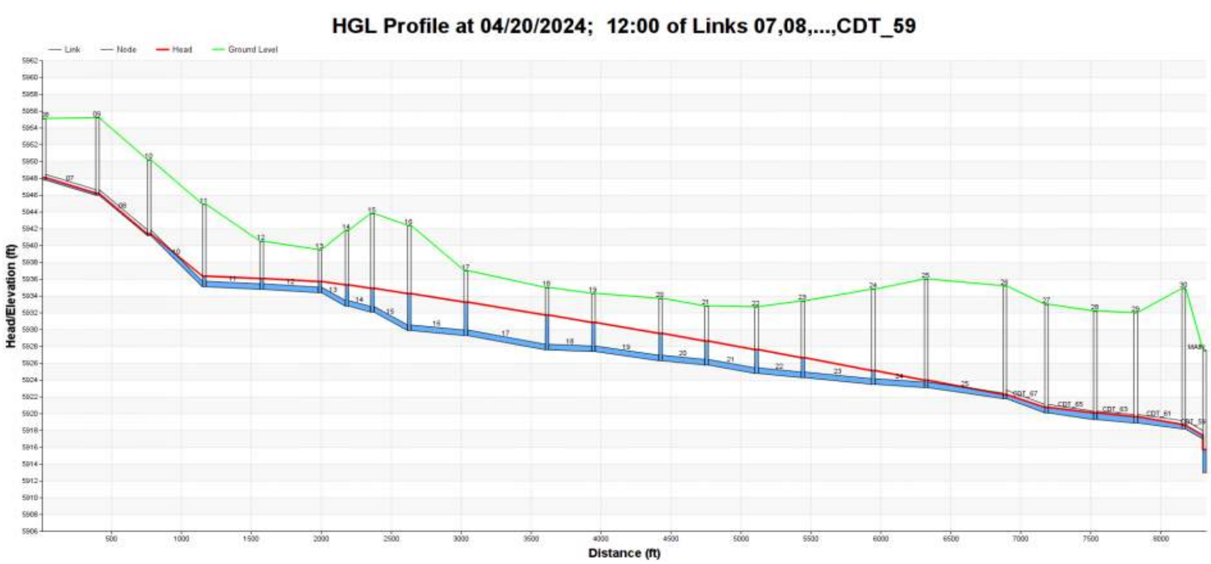
- All environmental impacts are confined within the right of way under the contractor's control. No additional environmental impacts beyond current conditions and the right of way would result from the selection of this alternative.

4.2.7. Upsize Gravity Line Between South and Main Lift Stations

As mentioned in Section 3.5.29; to mitigate the capacity issues between South and Main Lift Stations, we recommend actions to modify this section of the collection system to avoid wastewater backing up in the manholes.

This alternative would be divided into two phases. The first phase would include an immediate upsizing from an 8-inch diameter pipe to a 12-inch diameter pipe which would span from the Main Lift Station south to Mountain Way Drive (a street 1,500 feet south of the Main Lift Station). Despite the relaxed slopes in this section, this would be enough to guarantee no flooding would occur in this length of pipe between the South and Main Lift Stations. A reference to the location of the first phase is shown in Figure 4-1. The adjusted profile with upsized pipes is shown in Figure 4-2.

FIGURE 4-2: UPSIZED GRAVITY LINE SOUTH OF MAIN LIFT STATION PROFILE AT BUILDOUT



The second phase would include replacing the rest of the gravity line between the South Lift Station and the Main Lift Station with an upsized 12-inch pipe. This is preferred to address surcharging. This replacement could be done the next time the manholes or pipeline need to be updated.

Environmental Impacts:

- All environmental impacts are confined within the right of way under the contractor's control. No additional environmental impacts beyond current conditions and the right of way would result from the selection of this alternative.

4.3. COMPARISON OF COLLECTION SYSTEM ALTERNATIVES

Table 4-1 summarizes all presented alternatives with their advantages and disadvantages listed.

TABLE 4-1: COMPARISON OF COLLECTION SYSTEM ALTERNATIVES

Alternative	Advantages	Disadvantages
# 1 No Action Alternative Not Recommended	• None	• System fails to meet existing and projected demands
# 2 Upsize Existing Force Main Not Recommended	• No pump upsizes needed	• Velocities are too slow which would cause maintenance • High upfront cost to replace existing PVC pipe with adequate remaining service life
# 3 Upsize Pump Capacity Not Recommended	• Only the pumps would need to be addressed	• Required pressure would exceed existing pipeline ratings • Velocities caused by the upsized pumps are too fast • Power cost would be expensive
# 4 Install Parallel Force Main Not Recommended	• Creates redundancy when paired with existing force main • No pump upsizing is needed	• Only viable option is an 18-inch diameter pipe which is cost prohibitive • Velocities are too slow which would cause maintenance
# 5 Install Parallel Force Main and Upsize Pump Capacity Not Recommended	• Creates redundancy when paired with existing force main	• This is the most expensive option
# 6 North Reserve Lift Station Retrofit	• Reduces required parallel piping between the South Reserve and Main Lift Stations • South Reserve Lift Station needs no upsizing	• Upsizing North Reserve Lift Station would be expensive
# 7 Upsize Gravity Line Between South and Main Lift Stations	• Addresses capacity issues from the Main Lift Station to the road Mountain Way Drive	• Expensive replacement

4.4. TREATEMENT SYSTEM ALTERNATIVES

4.4.1. No Action or Optimized Operation of Existing Facilities

Under this alternative, the District would elect to make no capital improvements but focus efforts on optimizing and preserving the existing collection and treatment facilities as currently constituted. However, due to the risk of the winter storage pond overflowing, this is not a viable alternative for the District to consider and is therefore not considered further.

Environmental Impacts:

- Potential for adverse environmental impacts from overflows and spills if no action is taken.

4.4.2. Increase Winter Storage Capacity

For the District to remain operating as currently, additional storage capacity is needed. This would require the District to expand the existing lagoons or construct an additional lagoon to provide additional storage and evaporative surface area. The District would need to purchase additional land adjacent to the existing lagoon site due to the expansion.

Preliminary calculations show an additional lagoon would need to be constructed to provide sufficient wastewater volume. The District has about 27 acres of unused land due northeast of the existing lagoons which is recommended to be the location for additional lagoons as shown by Figure 4-3. By using all the said land that is available, an estimated 54 MG of wastewater storage, which equates to approximately 17 acres of surface area with an average 10 feet water depth, would provide enough capacity for the next 25 years.

The total 54 MG can be split between two phased lagoons; the lagoon to be built to increase capacity by 15 years and the lagoon to increase capacity another 15 years. The first lagoon would need to be approximately 10.5 acres (water surface area) and 10 feet deep (13 feet with freeboard) to store approximately 34 MG of wastewater. The lagoon to be built after would need to be approximately 6.5 acres (water surface area) and 10 feet deep (13 feet with freeboard) to store approximately 20 MG of wastewater.

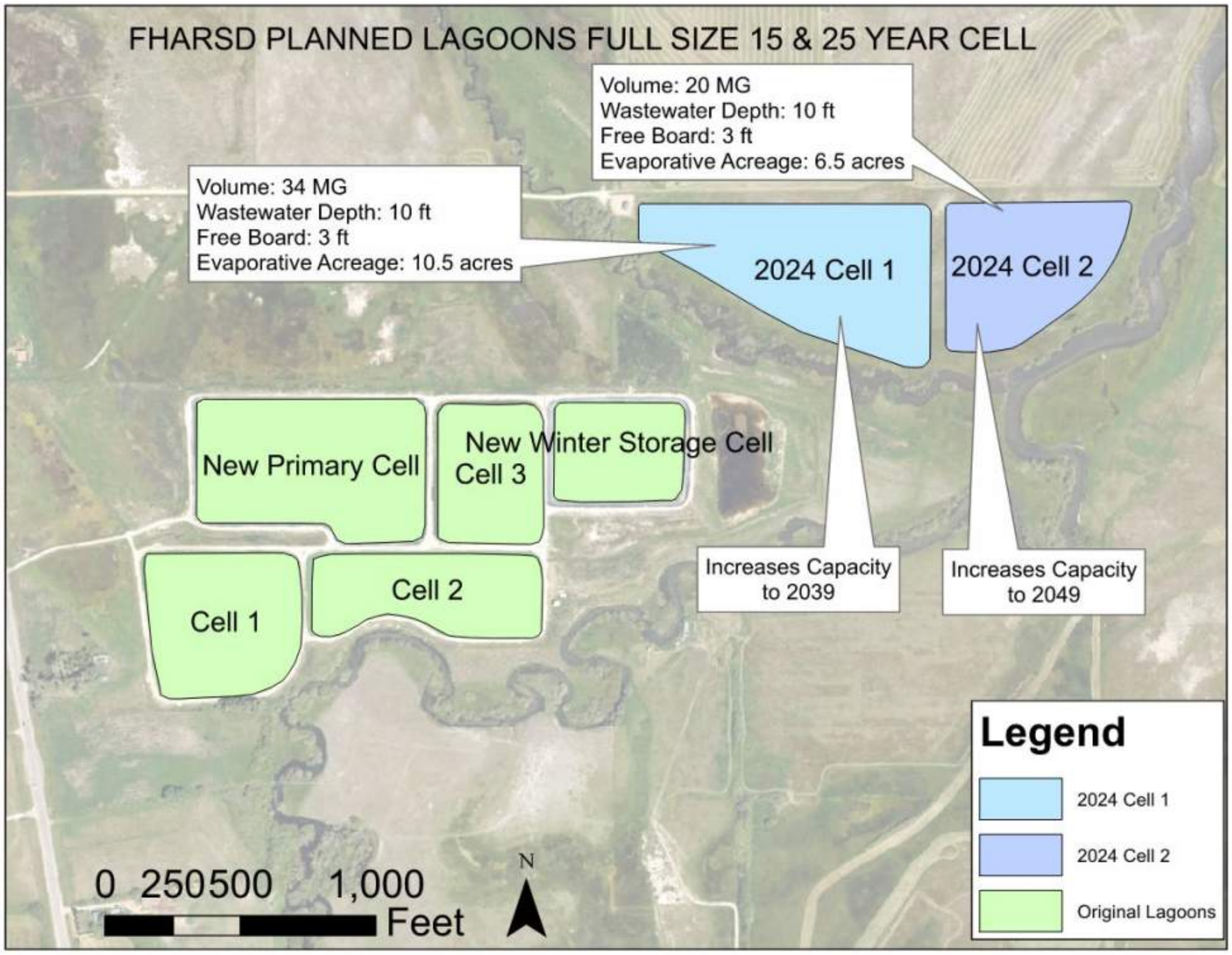
Per IDAPA 58.01.16, a minimum separation of two feet must be maintained between the bottom of the lagoon and the maximum groundwater line (Idaho Dept. of Environmental Quality, 2022). The nearby stream water elevation shows the groundwater elevation is close to 2 feet beneath the existing grade. Lagoon retention banks will need to be 13 feet above grade considering the anticipated 10 feet wastewater depth and 3 feet of freeboard.

It is recommended the first lagoon be a high priority and be built immediately. The second lagoon, which is still recommended to be a priority one concern, can be built concurrently with the first. However, if funding restricts the second pond to be built then and the District needs more time to obtain grants, the second pond is not required to be built until 2039. Table 4-2 summarizes the sizing needed for both new lagoons. Figure 4-3 illustrates the location and size of the proposed lagoons.

TABLE 4-2 NEW STORAGE LAGOON SUMMARIES

	15-Year Lagoon	25-Year Lagoon
Volume (MG)	34	20
Volume (Acre-ft)	104	63
Wastewater Depth (ft)	10	10
Evaporative Acreage (Acres)	10.4	6.3

FIGURE 4-3: PLANNED LAGOONS



Environmental Impacts:

- Land adjacent to the existing lagoons would be converted into an effluent storage lagoon for the foreseeable future. However, this land could be returned to its present state in the event the lagoon is decommissioned at a future date. Installation of new lagoon will temporarily disturb ground within the District right-of-way and impact local air quality due to construction activities (equipment exhaust and dust). It is anticipated that these impacts will primarily be localized to the area of construction.

4.4.3. Land Application

As with some of the other alternatives discussed above, there are several different wastewater disposal methods. Wastewater can be reused for irrigation (landscape and/or agricultural), groundwater recharge, making snow, etc. depending on the effluent characteristics. The effluent characteristics for FHARSD wastewater were sampled for their land application site usage in 2023. These results, which can be viewed in Table 3-11, meet the requirements for land application. Treated effluent from the lagoons could be used to irrigate edible crops (if the reused water does not come into contact with the edible portion of the crop), roadside vegetation, fodder or seed crops, and/or forested sites.

As the current water treatment system utilizes a land application site as the primary disposal method, the most practical reuse alternative would be to apply treated effluent to locally grown crops such as alfalfa or grains on a new land application site. This would require alterations to existing pumping and piping facilities to deliver the reclaimed wastewater to the new application site, purchasing or negotiating a long-term lease for an adequately sized and usable application site, establishing site security measures, and developing a management plan which includes meeting IDEQ monitoring requirements for land application. The existing irrigation pump station does have assets that can be reused including the existing structure and its related components, the chlorine diffuser, and the 16-inch pump cans.

Preliminary discussions have been had with a property owner to the north of the existing land app site about using some property for the new land app site. The existing land app site could be sold if desired. A new pipeline along the highway would be needed from the existing pump station to the new land application site. The site currently has irrigation rights which would be retained for supplemental irrigation which will be needed since the site is larger than FHARSD has reclaimed water for. See Figure 4-4.

FIGURE 4-4: PROPOSED LAND APPLICATION SITE & PIPELINE

Environmental Impacts:

- Land along the highway will be disturbed during construction for the pipeline. Land application uses the nutrients in the reclaimed water for crop nutrient uptake, decreasing fertilizer application. Water conservation will improve as more of the wastewater effluent will be used for crops.

4.4.4. Mechanical Plant and IPDES Permit

The basis of this alternative would be to apply for and obtain an IPDES permit to be able to discharge treated wastewater. There are numerous items that would need to be worked out with DEQ including permit limits and the discharge point. The discharge location may impact the permit limits. The closest discharge point would be Spring Creek which runs adjacent to the lagoon system and flows into Bear Lake. Other options to avoid discharging into Bear Lake could be into the Bear Lake Canal below the Lifton Pump Station or into Bloomington Creek. The assigned permit limits would determine the level of treatment required and complexity of a treatment plant. Changing to a mechanical plant would increase the required operator licensure. In phone calls, DEQ had indicated that a new permit application would likely be in the 5-year range for processing and potentially issuing a new permit. Design and construction would take another 2-3 years before a plant could be up and running. Because of the timing, a mechanical plant will not be feasible currently as there is a building moratorium in place that the District would like to address and be able lift it. While a detailed cost estimate was not prepared for this alternative, total project costs would likely be in the $40 million range. This alternative will not be considered further at this time.

Environmental Impacts:

- Building a mechanical treatment plant would likely require acquiring additional property to build the plant on to be able to keep the existing treatment lagoons in operation. This would disturb a new area. A mechanical plant would treat the wastewater to a higher quality than is currently treated by the lagoons. Additional power would be needed by a mechanical plant than by the lagoons.

4.5. DISINFECTION ALTERNATIVES

The level of wastewater treatment required is dependent on the method of reuse. For example, water used to irrigate a public park (Class A) must meet a higher treatment standard than water used for irrigation of alfalfa at a restricted site (Class D). Because FHARSD operates a total evaporative lagoon system with a land application site, the District is required to disinfect their lagoon effluent to a minimum Class D standard prior to infiltration or land application.

4.5.1. Chlorination / Dichlorination

Chlorine is commonly used as a wastewater and drinking water disinfectant in the US and can be introduced as a gas, liquid, or solid. When comparing it to other forms of disinfection, chlorine can be more cost-effective due to its well-developed history of use in wastewater treatment and its efficacy against pathogenic organisms. However, chlorine is also toxic to aquatic life and can form halogenated organic compounds which is of primary concern in drinking water applications. Additionally, chlorine is highly corrosive and requires increasingly stringent safety regulations to be met for storage, shipping, and use.

This is the current disinfection method FHARSD operates which has produced the effluent characteristics as shown in Table 3-11. Because of this, the recommended disinfection alternative is to make any adjustments needed to the chlorine diffusion system due to capacity changes caused by additional land application acreage.

Environmental Impacts:

- Lower total coliform concentrations in the treated effluent would have a beneficial impact on downstream ecosystems. Chlorine would need to be properly stored at the site to prevent unwarranted spills. The chlorine system would likely require a low power feed to operate.

4.6. PUBLIC PARTICIPATION

Community engagement in the project planning process is critical to its success. The purpose of a wastewater utility is to serve the needs of the community. As such, involvement of the community in the planning process can help develop public understanding of the need for the project, funding requirements, and revenue strategies. If the District decides to move forward with a project, a bond election or judicial confirmation will follow to secure funding of the selected alternative(s).

A public open house was made conducted on December 4, 2024 to the public which discussed the planning study, its findings, and the project alternatives considered. An explanation of where the public could access the planning study and provide comments was included. The presentation and notification information are provided in Appendix D.

A 14-day public comment period was held following the release of the public meeting recording. A copy of the planning study was made available for review at the St. Charles City Hall and public comments were encouraged.

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CHAPTER 5 - IMPLEMENTATION & FUNDING ANALYSIS

5.1. PREFERRED ALTERNATIVES

5.1.1. Preferred Collection System Alternative

The selected collection system alternative is a combination of multiple alternatives from Section 4.2. The preferred projects and their estimated costs, including those that are associated with the collection system are shown in the Capital Improvement Plan in Table 5-1.

Improvements to the South Reserve, North Reserve, and Main Lift Stations will be implemented as noted in CIP 2.1, CIP 2.2 and CIP 2.4. This includes replacing the North Reserve and Main Lift Stations with larger lift stations, along with adding an additional force main from the South Reserve Lift station directly into the wet well of the North Reserve Lift Station. Once the North Reserve Lift Station is improved and the flow capacity increased, a parallel force main will be needed in CIP 2.6.

To address possible future overflow in manholes south of the Main Lift Station, the gravity sewer from Mountain Way Drive to the Main Lift Station would be upsized to a 12-inch diameter pipe. This is designated as CIP 2.3. Later upsizing for the rest of the gravity sewer between the South and Main Lift Stations to a 12-inch is designated as CIP 3.1, as the demand to have of the entire gravity sewer upsized is not needed in the next 20 years.

Upgrades to the existing SCADA system by installing flow meters is included in CIP 2.5. It is desired by the District that flow meters would be installed in every lift station in the collection system. These flow meters can then be tied into the existing SCADA system for monitoring. These flow meters may be added to previous projects if lift stations are worked on previously.

5.1.2. Preferred Treatment System Alternative

The selected treatment system alternative is a combination of multiple alternatives from Section 4.4. The preferred projects and their estimated costs, including those that are associated with the lagoons, are shown in Table 5-1.

The preferred treatment system alternative selected by the FHARSD is to construct an additional 13-acre lagoon now (CIP 1.1) and then later a 10-acre lagoon, CIP 2.7. Further information given on this alternative is shown in Section 4.4.2 in this report.

Along with the additional lagoon acreage to be added, an additional 76-acres minimum of land application for the treated wastewater in a land application site would be added, as associated with CIP 1.2. Further information on this alternative is given in Section 4.4.3 in this report.

5.1.3. Operator Licensing

An operator at a wastewater treatment facility must be licensed at a class equal to or greater than the classification of the treatment system they operate and must be designated by the system as having direct supervision of and responsibility for the performance of operations of a specified wastewater treatment system (IDAPA 58.01.16).

The current District wastewater system classification is a lagoon treatment facility. The addition of a new total evaporative lagoon would not change the system classification. Therefore, no additional licensure is anticipated to be required for the current District wastewater operators.

5.2. CAPITAL IMPROVEMENT PLAN

A CIP has been developed for the District based on the preferred alternatives. The CIP outlines a prioritization schedule and provides an opinion of probable cost for those improvements. The CIP summary and their associated costs are shown in Table 5-1. Each CIP project is grouped by priority, with Priority 1 being the highest. Figure 5-1 shows the Priority 1 Improvements. Table 5-2 displays the recommended schedule on when each Priority 1 project should begin along with starting the Priority 2 projects.

Priority 1 includes District infrastructure upgrades that are considered immediate needs for the wastewater system. These pressing needs include upsizing winter storage space, additional land application acreage, and replacing selected lift stations along with additions of piping in the collection system. Following the completion of the Priority 1 Improvements, it is recommended that spot repairs of the wastewater collection system be continued as District budgets allow, based on the condition observed during the closed-circuit television (CCTV) surveys, lines that were not previously CCTV surveyed for various reasons should also be considered as needing upgrades unless determined otherwise by the District.

TABLE 5-1: CAPITAL IMPROVEMENT PLAN

Project ID #	Project Name	Primary Purpose	Total Estimated Cost[1] (2024 Dollars)
Priority 1 Improvements (Prior to 5 Years)			
1.1	Winter Storage Lagoon - Phase I	Additional winter storage is needed	$ 6,360,000
1.2	Land Application Site	Additional land application acreage is needed	$ 4,740,000
		Total Priority 1 Improvements (rounded)	**$11,100,000**
Priority 2 Improvements (Prior to 20 Years)			
2.1	Miscellaneous South Lift Station Upgrades	Miscellaneous needs to be addressed	$ 110,000
2.2	North Reserve Lift Station Replacement	South Reserve Lift Station lacks capacity	$ 2,160,000
2.3	Upsize Gravity Main Between South and Main Lift Stations	Address capacity needs	$ 550,000
2.4	Main Lift Station Replacement	Main lacks capacity for future flows	$ 1,100,000
2.5	Flow Meter Installation	Install flow meters in all lift stations	$ 280,000
2.6	Parallel Force Main	Increase capacity of the collection system	$ 12,220,000
2.7	Winter Storage Lagoon - Phase II	Additional winter storage is needed	$ 3,580,000
		Total Priority 2 Improvements (rounded)	**$16,420,000**
Priority 3 Improvements (Prior to 40 Years)			
3.1	Upsize Gravity Line Between South and Main Lift Stations	Address remaining capacity needs	$ 3,130,000
		Total Priority 3 Improvements (rounded)	**$3,130,000**
		TOTAL SYSTEM IMPROVEMENT COSTS TO THE DISTRICT (rounded)	**$ 30,650,000**

1. The cost estimate herein is based on our perception of current conditions at the project location. This estimate reflects our opinion of probable costs at this time and is subject to change as the project design matures. Keller Associates has no control over variances in the cost of labor, materials, equipment, services provided by others, contractor's methods of determining prices, competitive bidding or market conditions, practices or bidding strategies. Keller Associates cannot and does not warrant or guarantee that proposals, bids or actual construction costs will not vary from the costs presented herein.

FIGURE 5-1:PRIORITY 1 IMPROVEMENTS

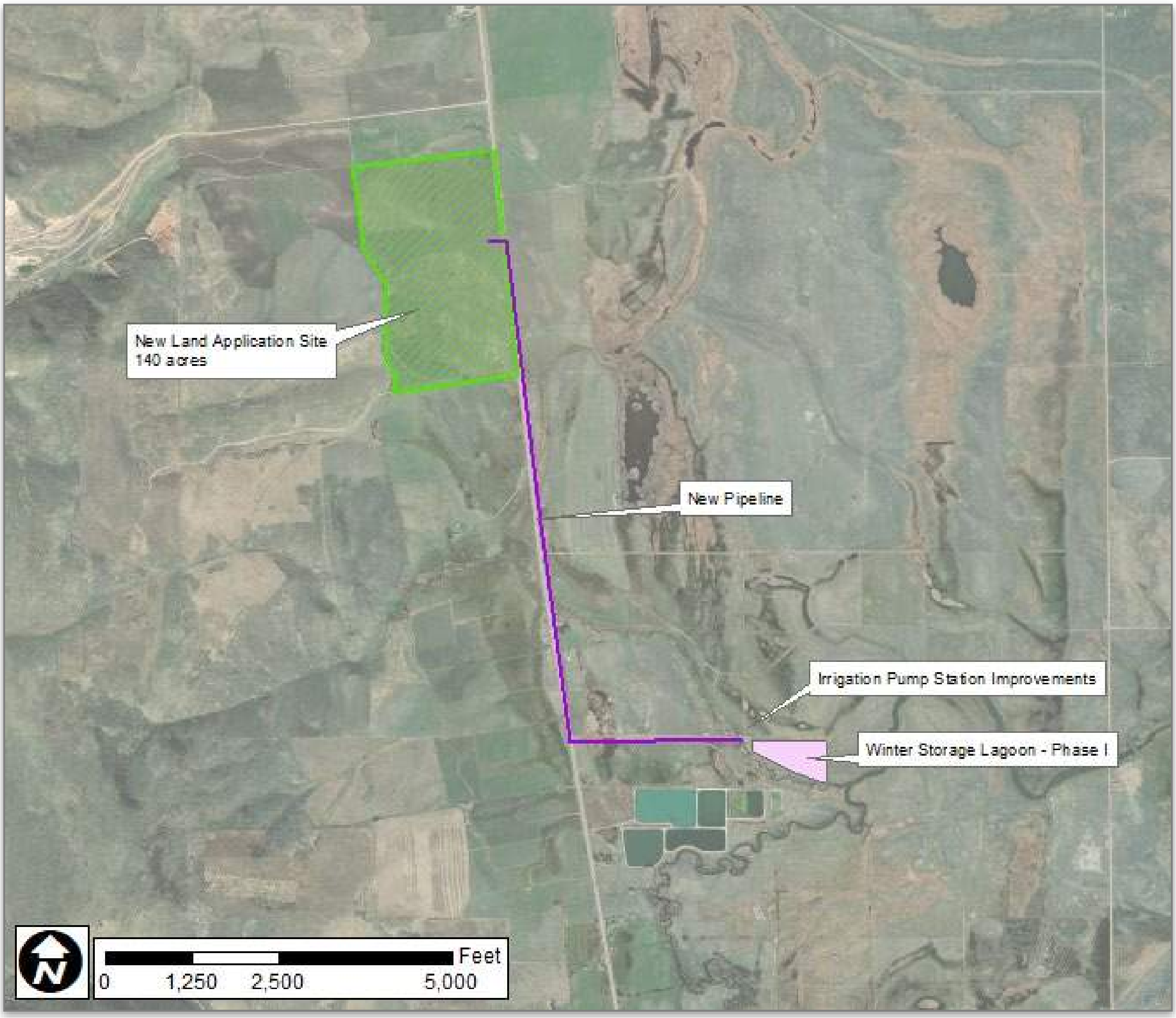

TABLE 5-2: CAPITAL IMPROVEMENT PLAN SCHEDULE

CIP ID	CIP Item[1]	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
1.1	Winter Storage Lagoon[5]	$ 751,000	$ 3,365,400	$2,243,600								
1.2	Land Application Site	$ 560,000	$ 2,508,000	$1,672,000								
2.1	Misc. S. LS Upgrades			$ 22,000	$ 88,000							
2.2	N. Res. LS Replacement					$ 432,000	$1,728,000					
2.3	Upsize GM: S. to Main LS[4]										$ 110,000	$ 440,000
2.4	Main LS Replacement										$ 220,000	$ 880,000
2.5	Flow Meter Installation[3]										$ 56,000	$ 224,000
Total Capital Costs		**$1,311,000**	**$ 5,873,400**	**$3,937,600**	**$ 88,000**	**$ 432,000**	**$1,728,000**	**$ -**	**$ -**	**$ -**	**$ 386,000**	**$1,544,000**
Annual Replacement Costs[2]		**$ -**	**$ 65,000**	**$ 65,000**	**$ 89,000**	**$ 89,000**	**$ 113,000**	**$113,000**	**$113,000**	**$113,000**	**$ 113,000**	**$ 440,000**
Total Costs		**$1,320,000**	**$ 5,940,000**	**$4,010,000**	**$ 180,000**	**$ 530,000**	**$1,850,000**	**$120,000**	**$120,000**	**$120,000**	**$ 500,000**	**$1,990,000**

1. LS = Lift Station, FM = Force Main, GM = Gravity Main

2. Annual replacement costs are delayed unil 2026 to allow the majority of priority one projects to be completed. This includes all exisitng and planned infrasturcture replacements.

3. Flow meters can be installed earlier than prioritized.

4. Need for upsized pumps in the Main Lift Station to begin no later than 2034

5. Second lagoon can be constructed no later that 15 years on the account of splitting the funding

5.3. SYSTEM OPERATION & MAINTENANCE

The proposed improvements will have some impact on the operation and maintenance costs of the wastewater system. The installation of a new total containment lagoon is expected to only increase operation and maintenance costs marginally.

The District will need to plan for ongoing maintenance and replacement costs associated with infrastructure throughout the system. Planning for annual system replacement costs is vital to keeping the system functioning over the next several decades. Annualized costs associated with the replacement of the short-lived assets for the preferred alternative have been prepared and are shown in Table 5-3.

The annual replacement cost increase equates to $12/user/month based on 965 users.

TABLE 5-3: ANNUALIZED SHORT-LIVED ASSETS BY CATEGORY

Item	Replacement Cost	Cost/Year	20 Year Cost
Treatment System			
Lagoon Liners	$ 1,286,000	$ 52,000	$ 1,040,000
Land Application Site	$ 394,000	$ 13,000	$ 260,000
Lift Stations			
South Lift Station: 100 gpm flow	$ 498,000	$ 24,000	$ 480,000
Main Lift Station: 500 gpm flow	$ 498,000	$ 24,000	$ 480,000
South Reserve Lift Station: 300 gpm flow	$ 498,000	$ 24,000	$ 480,000
North Reserve Lift Station: 1000 gpm flow	$ 498,000	$ 24,000	$ 480,000
New Lift Station: 100 gpm flow	$ 498,000	$ 24,000	$ 480,000
Bear Lake West Lift Station: 100 gpm flow	$ 498,000	$ 24,000	$ 480,000
New Lift Station: 100 gpm flow	$ 498,000	$ 24,000	$ 480,000
Gravity Mains			
8-inch PVC Pipe - Excavation, Backfill	$ 259,383	$ 3,705	$ 75,000.00
10-inch PVC Pipe - Excavation, Backfill	$ 26,386	$ 377	$ 8,000.00
12-inch PVC Pipe - Excavation, Backfill	$ 67,620	$ 966	$ 20,000.00
Force Mains			
6-inch PVC Pipe - Excavation, Backfill	$ 231,000	$ 3,300	$ 66,000.00
8-inch PVC Pipe - Excavation, Backfill	$ 7,668,000	$ 109,543	$ 2,191,000.00
12-inch PVC Pipe - Excavation, Backfill	$ 6,215,000	$ 88,786	$ 1,776,000.00
		Originial Short-Lived Asset Yearly Cost	***$ 301,000***
		Yearly Increase	***$ 139,000***
		Total 20-year replacement budget	***$ 8,796,000***
		TOTAL ANNUAL COST FOR SHORT-LIVED ASSETS:	**$ 440,000**

5.4. USER RATE & FUNDING ANALYSIS

The sewer rates herein are estimated based upon potential funding from USDA Rural Development that would be repaid over 40-years at an interest rate of 2.5% and represent the low-cost funding option from the funding analysis that was discussed previously. It should be noted that information presented concerning potential grant funding and principal forgiveness are estimates only based on discussions with funding agencies, and that a more realistic funding package would include funds from multiple sources including USDA-RD, Idaho DEQ, Idaho Department of Commerce, Army Corps of Engineers, and other funding agencies.

The current monthly sewer rate for FHARSD is $26.00 for a single residence. Future rates should be set based upon the loan payment, debt service reserve, additional O&M, and Short-Lived Asset (SLA) reserve incurred by the alternative selected. Finally, the estimated monthly cost is calculated from the total annual cost of the project and the current number of EDUs reported by the District.

Other components of the simplified rate analysis are also shown in Table 5-4, including estimated grant amounts for the lagoon and all other CIP assets. However, it must be noted that significant grant funding is not typically available until rates approach or exceed 1.5% of the median household income (MHI). The District does not have an American Community Survey describing this MHI. However, based on information collected by the US Census Bureau, the 2022 American Community Survey estimates MHI for St. Charles at approximately $86,500. So therefore, based on the 1.5% of the MHI, significant grants may not be available until the District's rate for sewer services exceeds $109 (U.S. Census Bureau, 2022).

The rate analysis shows that the FHARSD would likely need to raise monthly rates to around $80 depending on the amount of grant funding that becomes available. Within Table 5-4, the estimated monthly cost is calculated from the total annual cost of CIP 1.1 and CIP 1.2, Total Evaporative Lagoons and Land Application Site, and the current number of connections, which is estimated to be 965.

TABLE 5-4: TOTAL EVAPORATIVE LAGOON AND LAND APPLICATION SITE FUNDING ANALYSIS

		DEQ	USDA-RD
Item		30 yrs/2.5%	40 yrs/3.875%
1.1	Winter Storage Lagoon - Phase I	$6,360,000	$6,360,000
1.2	Land Application Site	$4,740,000	$4,740,000
	Total Project Cost	**$11,100,000**	**$11,100,000**
DEQ Principal Forgiveness		$0	$0
USDA Grant		$0	$0
ACOE Grant		$0	$0
CDBG Grant		$0	$0
	Loan Amount	**$11,100,000**	**$11,100,000**
Annual Loan Payment*		$530,332	$550,422
Annual Debt Service Reserve, 10%		$53,033	$55,042
Annual O&M Costs		$0	$0
Annual SLAs		$42,000	$42,000
Total Annual Improvement Cost		$625,365	$647,464
2024 Monthly User Rate		$26.00	$26.00
Estimated User Rate Increase per Connection		**$54.00**	**$56.00**
New User Rate		**$ 80.00**	**$ 82.00**

5.5. FINANCING

FHARSD intends to begin considering funding options as soon as the study is completed. A letter of interest (LOI) was submitted to Idaho DEQ in January 2024. The grant was not obtained at that time, so a second LOI will be submitted to Idaho DEQ in January 2025. As soon as this report is completed, an funding request can be submitted to obtain a funding offer from USDA-RD. Grant funding from DEQ, USDA-RD, CDBG, and USACE are not likely based on the financial status of the District's constituents.

5.6. PROJECT IMPLEMENTATION AND SCHEDULE

Keller Associates' staff has worked closely with the District to analyze the wastewater system and develop improvement alternatives that will support the long-term needs of the community. Before proceeding with the design of the preferred alternative, an Environmental Information Document (EID) will be completed and approved by the funding agencies for the selected alternatives. The EID is viable for five years; therefore, it is prudent to include only those improvements that the District intends to undertake within the next five years. Additionally, preliminary engineering reports (PERs) will need to be developed as required by funding agencies. A schedule for implementing system improvements is presented in Table 5-5.

TABLE 5-5: PRELIMINARY PROJECT SCHEDULE

Event	Date
Complete WWFPS, submit to Idaho DEQ	December 2024
Receive Technical Approval and Agency Acceptance	January 2025
Submit LOI for DEQ funding	January 2025
Obtain Funding	July 2025
Begin Preliminary Engineering Report	July 2025
Finalize PER and begin Final Design	September 2025
DEQ Review of Design Plans	March 2026
Bid and Award Construction	June 2026
Finish Construction	October 2027

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APPENDIX A: BACKGROUND INFORMATION

USDA NRSC Soils Report
IPaC Resource list
National Register of Historic Places
St. Charles, Idaho Census Bureau Profile
DEQ Reuse Permit

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United States Department of Agriculture

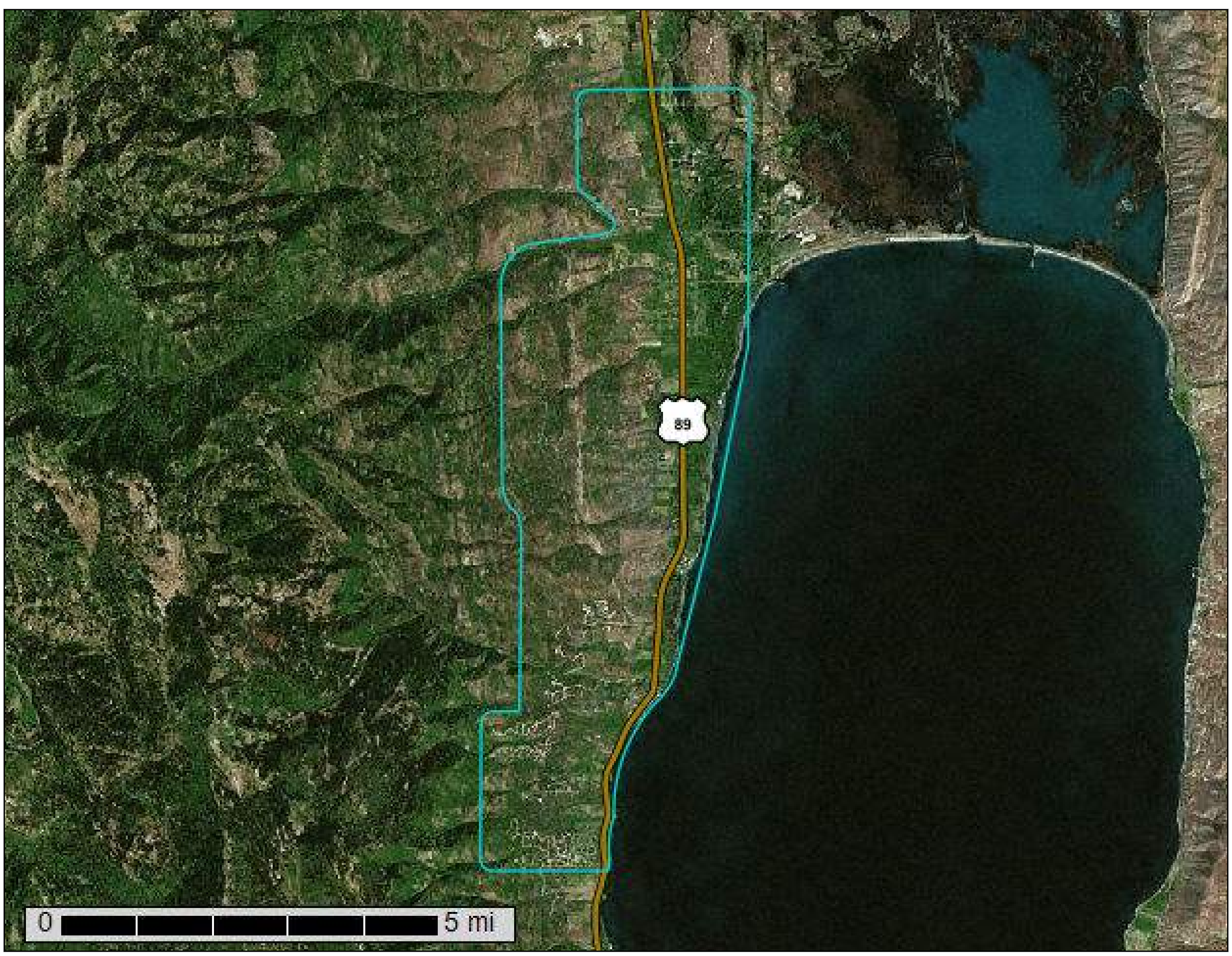
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Bear Lake County Area, Idaho, Caribou National Forest, Idaho and Wyoming, and Rich County, Utah

Fish Haven Area Recreational Sewer District (FHARSD)



February 15, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

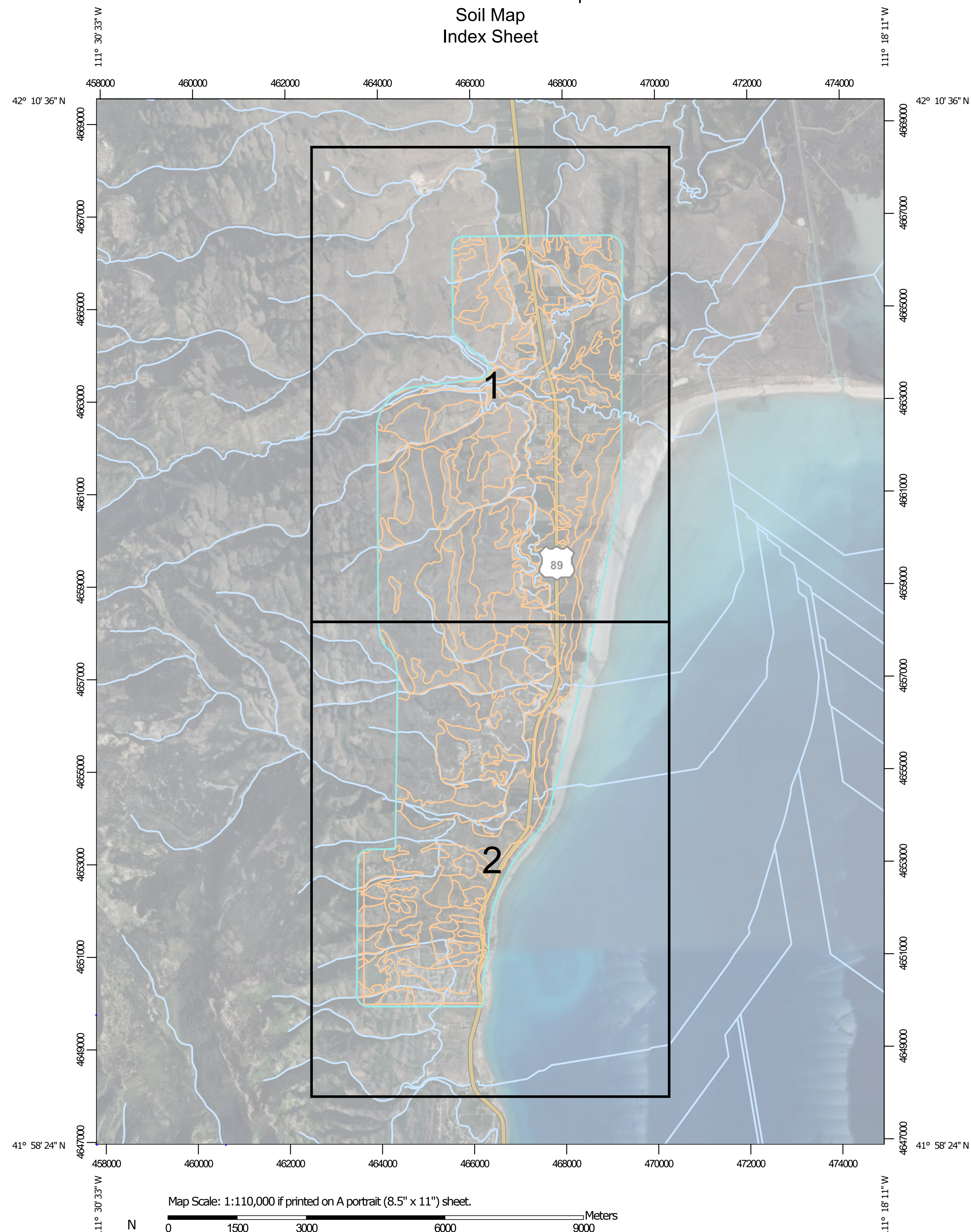
The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map
Index Sheet



Map Scale: 1:110,000 if printed on A portrait (8.5" x 11") sheet.

N

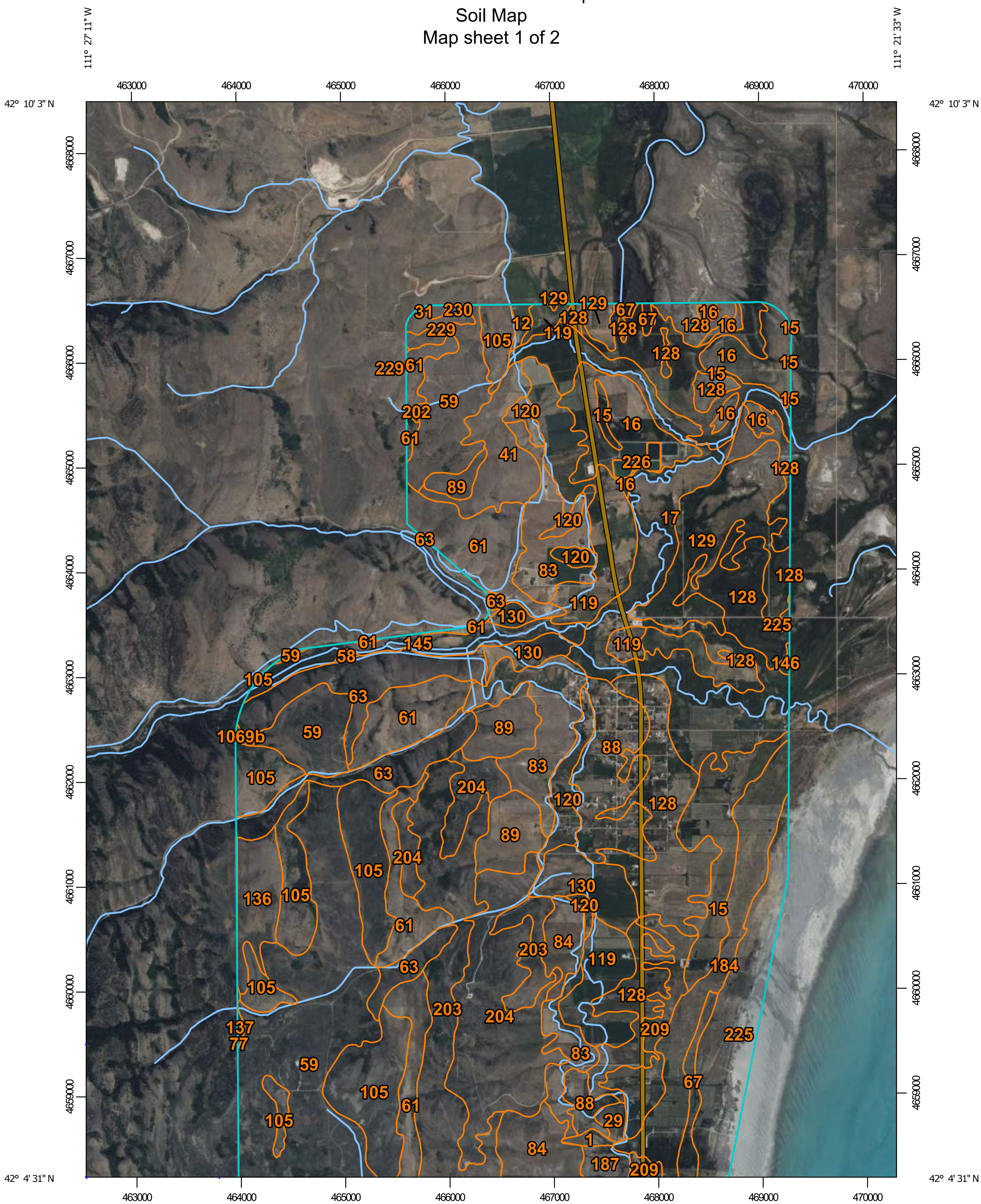
Meters: 0, 1500, 3000, 6000, 9000

Feet: 0, 5000, 10000, 20000, 30000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

Soil Map

Map sheet 1 of 2



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Map Scale: 1:50,000 if printed on A portrait (8.5" x 11") sheet.

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Meters: 0, 500, 1000, 2000, 3000

Feet: 0, 2000, 4000, 8000, 12000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

1

Map Sheet Location

Soil Map

Map sheet 2 of 2

Map Scale: 1:50,000 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 500, 1000, 2000, 3000

Feet: 0, 2000, 4000, 8000, 12000

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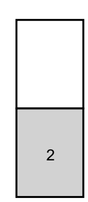
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84



Map Sheet Location

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Bear Lake County Area, Idaho
Survey Area Data: Version 11, Sep 6, 2022

Soil Survey Area: Caribou National Forest, Idaho and Wyoming
Survey Area Data: Version 10, Sep 6, 2022

Soil Survey Area: Rich County, Utah
Survey Area Data: Version 17, Aug 25, 2022

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 22, 2022—Aug 8, 2022

MAP LEGEND

MAP INFORMATION

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Ant Flat silty clay loam, 1 to 4 percent slopes	108.7	0.7%
12	Bancroft silt loam, 1 to 4 percent slopes	14.3	0.1%
15	Bear Lake-Bear Lake, ponded complex, 0 to 1 percent slopes	430.0	2.6%
16	Bear Lake-Chesbrook-La Roco complex, 0 to 2 percent slopes	308.2	1.9%
17	Bear Lake-Lago complex, 0 to 2 percent slopes	627.8	3.8%
29	Brifox-Lizdale complex, 4 to 12 percent slopes	18.9	0.1%
30	Brifox-Niter complex, 4 to 12 percent slopes	44.1	0.3%
31	Brifox-Niter complex, 12 to 25 percent slopes	4.7	0.0%
41	Cedarhill gravelly silt loam, 5 to 25 percent slopes	152.9	0.9%
47	Cedarhill-Clegg-Drage complex, 5 to 55 percent slopes	37.2	0.2%
58	Clegg silt loam, 4 to 20 percent slopes	443.0	2.7%
59	Clegg-Grecan complex, 4 to 20 percent slopes	2,355.2	14.4%
61	Crossley-Rock outcrop complex, 4 to 35 percent slopes	791.9	4.9%
63	Cupine-Dunford complex, 20 to 60 percent slopes	386.8	2.4%
67	Dinswamp mucky peat, 0 to 2 percent slopes	143.0	0.9%
77	Dranburn-Pontuge complex, 10 to 40 percent slopes	0.4	0.0%
83	Dutchcanyon gravelly silt loam, 4 to 12 percent slopes	634.9	3.9%
84	Dutchcanyon-Frenchollow complex, 5 to 20 percent slopes	212.0	1.3%
87	Fishaven-Dutchcanyon complex, 8 to 20 percent slopes	210.1	1.3%
88	Frenchollow silty clay loam, 1 to 4 percent slopes	266.0	1.6%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
89	Frenchollow silty clay loam, 4 to 20 percent slopes	485.4	3.0%
105	Hutchley-Cupine-Vitale complex, 2 to 60 percent slopes	1,052.6	6.4%
113	Jacanyon-Cleavage complex, 10 to 50 percent slopes	80.7	0.5%
119	Joes silt loam, 1 to 4 percent slopes	421.8	2.6%
120	Joes silt loam, 4 to 15 percent slopes	161.9	1.0%
125	Lag-Dollarhide-Rock outcrop complex, 5 to 60 percent slopes	9.2	0.1%
128	Lago-Bear Lake complex, 0 to 1 percent slopes	791.6	4.8%
129	Lago-Merkley complex, 0 to 2 percent slopes	361.6	2.2%
130	Lanoak silt loam, 1 to 4 percent slopes	173.5	1.1%
136	Leftfork-Cleavage complex, 5 to 40 percent slopes	117.2	0.7%
137	Lilcan-Rock outcrop-Jacanyon complex, 2 to 50 percent slopes	20.0	0.1%
145	Marshdale, occasionally flooded-Bloomcreek complex, 0 to 3 percent slopes	133.3	0.8%
146	Merkley silt loam, 0 to 2 percent slopes	4.4	0.0%
152	Nielsen-Dranburn-Hagenbarth complex, 5 to 40 percent slopes	72.8	0.4%
184	Sadducee-Bearbeach complex, 0 to 2 percent slopes	479.2	2.9%
187	Springhollow-Arbone complex, 4 to 12 percent slopes	49.6	0.3%
202	Swanpeak-Cloudless complex, 1 to 15 percent slopes	5.8	0.0%
203	Swanpeak-Dutchcanyon complex, 20 to 35 percent slopes	1,012.5	6.2%
204	Swanpeak-Dutchcanyon-Ant Flat complex, 12 to 20 percent slopes	2,169.5	13.3%
205	Thatcher silt loam, 4 to 12 percent slopes	85.8	0.5%
209	Thatcher-Joes complex, 1 to 4 percent slopes	188.3	1.2%
225	Water	741.7	4.5%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
226	Water, miscellaneous	19.1	0.1%
229	Wursten silt loam, 4 to 12 percent slopes	21.5	0.1%
230	Wursten silt loam, 12 to 20 percent slopes	4.3	0.0%
1069	Ireland, extremely stony surface-Drage family, complex, 15 to 35 percent slopes	213.4	1.3%
1069b	Ezbin family-Cavemountain, bouldery surface-Starley family, very stony surface, complex, 15 to 45 percent slopes	49.8	0.3%
38947	Spearhead family, very stony surface-Broad Canyon, very stony surface-Ezbin complex, 30 to 60 percent slopes, MLRA 47	48.4	0.3%
Subtotals for Soil Survey Area		**16,165.3**	**99.0%**
Totals for Area of Interest		**16,321.7**	**100.0%**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
152-BL	Nielsen-Dranburn-Hagenbarth complex, 5 to 40 percent slopes	13.3	0.1%
1069	Ireland, extremely stony surface-Drage family, complex, 15 to 35 percent slopes	58.7	0.4%
1069b	Ezbin family-Cavemountain, bouldery surface-Starley family, very stony surface, complex, 15 to 45 percent slopes	32.0	0.2%
38947	Spearhead family, very stony surface-Broad Canyon, very stony surface-Ezbin complex, 30 to 60 percent slopes, MLRA 47	11.6	0.1%
Subtotals for Soil Survey Area		**115.6**	**0.7%**
Totals for Area of Interest		**16,321.7**	**100.0%**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
47	Cedarhill-Clegg-Drage complex, 5 to 55 percent slopes	2.0	0.0%
113	Jacanyon-Cleavage complex, 10 to 50 percent slopes	10.5	0.1%
125	Lag-Dollarhide-Rock outcrop complex, 5 to 60 percent slopes	2.2	0.0%

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
204	Swanpeak-Dutchcanyon-Ant Flat complex, 12 to 20 percent slopes	10.4	0.1%
205	Thatcher silt loam, 4 to 12 percent slopes	14.5	0.1%
TBD	Thatcher silt loam, warm, 10 to 25 percent slopes	0.9	0.0%
W	Water	0.1	0.0%
Subtotals for Soil Survey Area		**40.6**	**0.2%**
Totals for Area of Interest		**16,321.7**	**100.0%**

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each interpretation.

Building Site Development

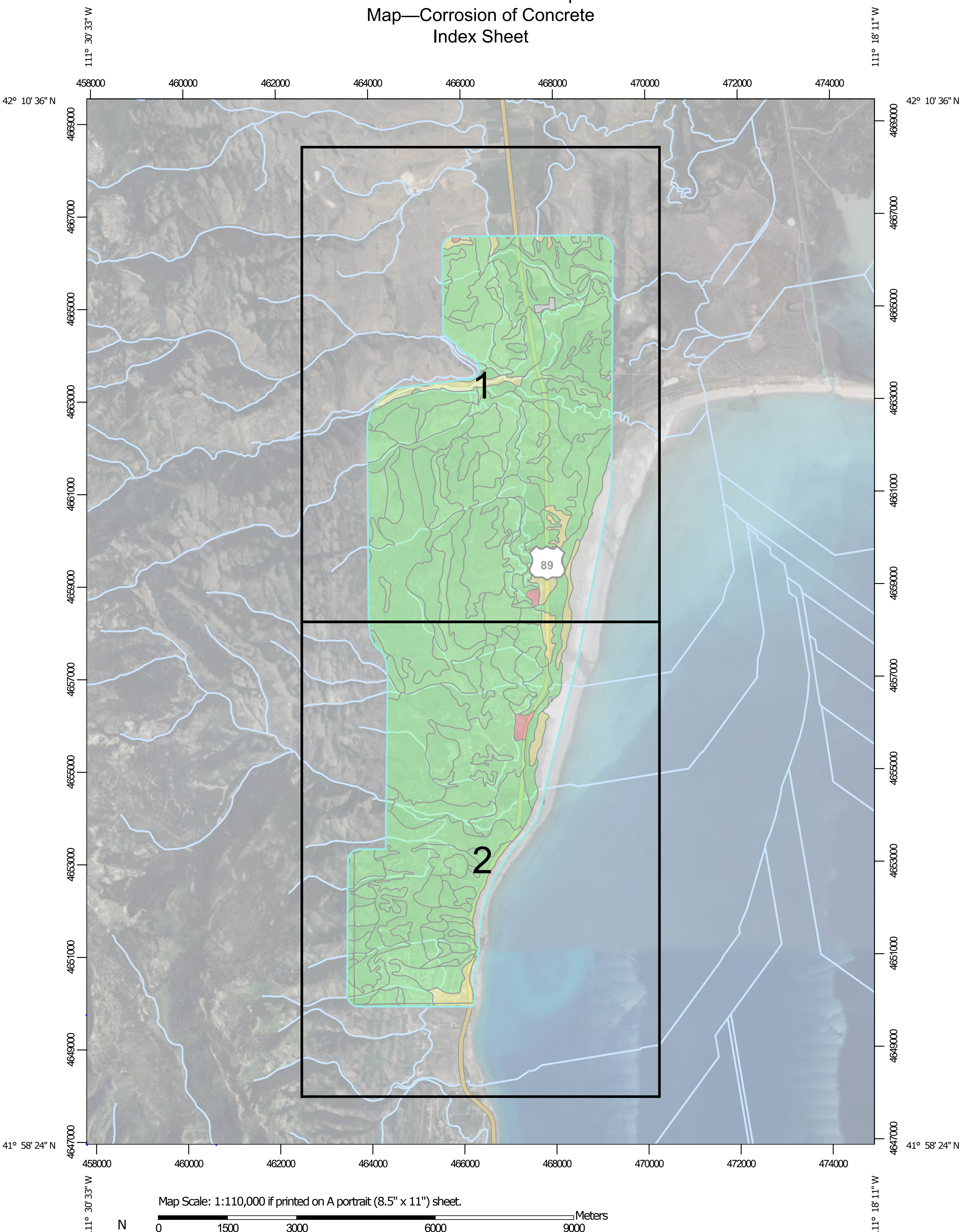
Building site development interpretations are designed to be used as tools for evaluating soil suitability and identifying soil limitations for various construction purposes. As part of the interpretation process, the rating applies to each soil in its described condition and does not consider present land use. Example interpretations can include corrosion of concrete and steel, shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping.

Corrosion of Concrete

"Risk of corrosion" pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens concrete. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the concrete in installations that are entirely within one kind of soil or within one soil layer.

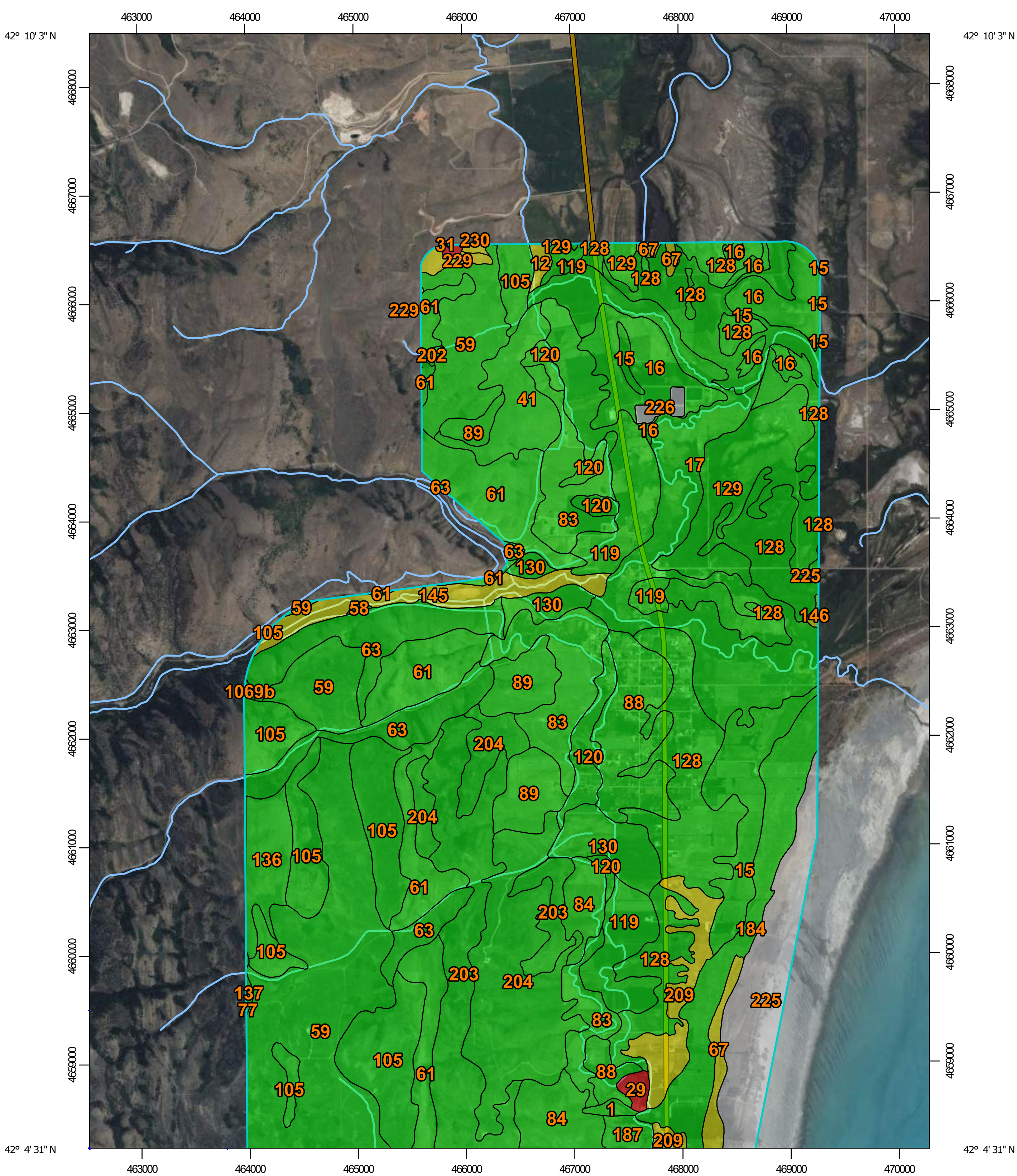
The risk of corrosion is expressed as "low," "moderate," or "high."

Map—Corrosion of Concrete
Index Sheet



Map—Corrosion of Concrete

Map sheet 1 of 2



Joins sheet 2

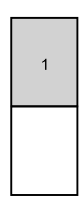
Map Scale: 1:50,000 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 500, 1000, 2000, 3000

Feet: 0, 2000, 4000, 8000, 12000

N

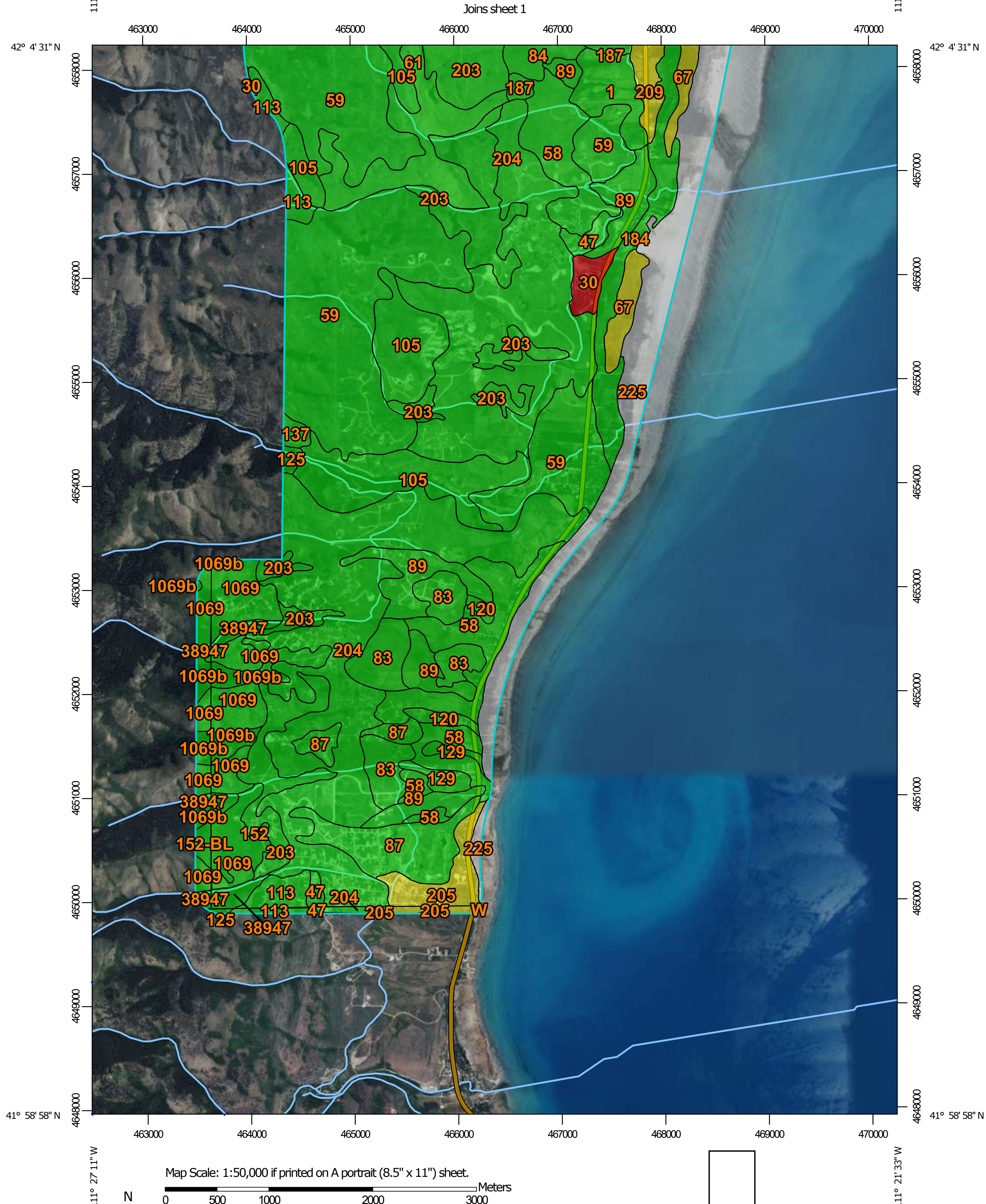
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84



Map Sheet Location

Map—Corrosion of Concrete

Map sheet 2 of 2



Map Scale: 1:50,000 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 500 1000 2000 3000

Feet: 0 2000 4000 8000 12000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

2

Map Sheet Location

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

High

Moderate

Low

Not rated or not available

Soil Rating Lines

High

Moderate

Low

Not rated or not available

Soil Rating Points

High

Moderate

Low

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Survey Area Data: Version 17, Aug 25, 2022

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MAP LEGEND	MAP INFORMATION
	The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Corrosion of Concrete

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Ant Flat silty clay loam, 1 to 4 percent slopes	Low	108.7	0.7%
12	Bancroft silt loam, 1 to 4 percent slopes	Moderate	14.3	0.1%
15	Bear Lake-Bear Lake, ponded complex, 0 to 1 percent slopes	Low	430.0	2.6%
16	Bear Lake-Chesbrook-La Roco complex, 0 to 2 percent slopes	Low	308.2	1.9%
17	Bear Lake-Lago complex, 0 to 2 percent slopes	Low	627.8	3.8%
29	Brifox-Lizdale complex, 4 to 12 percent slopes	High	18.9	0.1%
30	Brifox-Niter complex, 4 to 12 percent slopes	High	44.1	0.3%
31	Brifox-Niter complex, 12 to 25 percent slopes	High	4.7	0.0%
41	Cedarhill gravelly silt loam, 5 to 25 percent slopes	Low	152.9	0.9%
47	Cedarhill-Clegg-Drage complex, 5 to 55 percent slopes	Low	37.2	0.2%
58	Clegg silt loam, 4 to 20 percent slopes	Low	443.0	2.7%
59	Clegg-Grecan complex, 4 to 20 percent slopes	Low	2,355.2	14.4%
61	Crossley-Rock outcrop complex, 4 to 35 percent slopes	Low	791.9	4.9%
63	Cupine-Dunford complex, 20 to 60 percent slopes	Low	386.8	2.4%
67	Dinswamp mucky peat, 0 to 2 percent slopes	Moderate	143.0	0.9%
77	Dranburn-Pontuge complex, 10 to 40 percent slopes	Low	0.4	0.0%
83	Dutchcanyon gravelly silt loam, 4 to 12 percent slopes	Low	634.9	3.9%
84	Dutchcanyon-Frenchollow complex, 5 to 20 percent slopes	Low	212.0	1.3%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
87	Fishaven-Dutchcanyon complex, 8 to 20 percent slopes	Low	210.1	1.3%
88	Frenchollow silty clay loam, 1 to 4 percent slopes	Low	266.0	1.6%
89	Frenchollow silty clay loam, 4 to 20 percent slopes	Low	485.4	3.0%
105	Hutchley-Cupine-Vitale complex, 2 to 60 percent slopes	Low	1,052.6	6.4%
113	Jacanyon-Cleavage complex, 10 to 50 percent slopes	Low	80.7	0.5%
119	Joes silt loam, 1 to 4 percent slopes	Low	421.8	2.6%
120	Joes silt loam, 4 to 15 percent slopes	Low	161.9	1.0%
125	Lag-Dollarhide-Rock outcrop complex, 5 to 60 percent slopes	Low	9.2	0.1%
128	Lago-Bear Lake complex, 0 to 1 percent slopes	Low	791.6	4.8%
129	Lago-Merkley complex, 0 to 2 percent slopes	Low	361.6	2.2%
130	Lanoak silt loam, 1 to 4 percent slopes	Low	173.5	1.1%
136	Leftfork-Cleavage complex, 5 to 40 percent slopes	Low	117.2	0.7%
137	Lilcan-Rock outcrop-Jacanyon complex, 2 to 50 percent slopes	Low	20.0	0.1%
145	Marshdale, occasionally flooded-Bloomcreek complex, 0 to 3 percent slopes	Moderate	133.3	0.8%
146	Merkley silt loam, 0 to 2 percent slopes	Moderate	4.4	0.0%
152	Nielsen-Dranburn-Hagenbarth complex, 5 to 40 percent slopes	Low	72.8	0.4%
184	Sadducee-Bearbeach complex, 0 to 2 percent slopes	Low	479.2	2.9%
187	Springhollow-Arbone complex, 4 to 12 percent slopes	Low	49.6	0.3%
202	Swanpeak-Cloudless complex, 1 to 15 percent slopes	Low	5.8	0.0%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
203	Swanpeak-Dutchcanyon complex, 20 to 35 percent slopes	Low	1,012.5	6.2%
204	Swanpeak-Dutchcanyon-Ant Flat complex, 12 to 20 percent slopes	Low	2,169.5	13.3%
205	Thatcher silt loam, 4 to 12 percent slopes	Moderate	85.8	0.5%
209	Thatcher-Joes complex, 1 to 4 percent slopes	Moderate	188.3	1.2%
225	Water		741.7	4.5%
226	Water, miscellaneous		19.1	0.1%
229	Wursten silt loam, 4 to 12 percent slopes	Moderate	21.5	0.1%
230	Wursten silt loam, 12 to 20 percent slopes	Moderate	4.3	0.0%
1069	Ireland, extremely stony surface-Drage family, complex, 15 to 35 percent slopes	Low	213.4	1.3%
1069b	Ezbin family-Cavemountain, bouldery surface-Starley family, very stony surface, complex, 15 to 45 percent slopes	Low	49.8	0.3%
38947	Spearhead family, very stony surface-Broad Canyon, very stony surface-Ezbin complex, 30 to 60 percent slopes, MLRA 47	Low	48.4	0.3%
Subtotals for Soil Survey Area			**16,165.3**	**99.0%**
Totals for Area of Interest			**16,321.7**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
152-BL	Nielsen-Dranburn-Hagenbarth complex, 5 to 40 percent slopes	Low	13.3	0.1%
1069	Ireland, extremely stony surface-Drage family, complex, 15 to 35 percent slopes	Low	58.7	0.4%
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Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
38947	Spearhead family, very stony surface-Broad Canyon, very stony surface-Ezbin complex, 30 to 60 percent slopes, MLRA 47	Low	11.6	0.1%
Subtotals for Soil Survey Area			**115.6**	**0.7%**
Totals for Area of Interest			**16,321.7**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
47	Cedarhill-Clegg-Drage complex, 5 to 55 percent slopes	Low	2.0	0.0%
113	Jacanyon-Cleavage complex, 10 to 50 percent slopes	Low	10.5	0.1%
125	Lag-Dollarhide-Rock outcrop complex, 5 to 60 percent slopes	Low	2.2	0.0%
204	Swanpeak-Dutchcanyon-Ant Flat complex, 12 to 20 percent slopes	Low	10.4	0.1%
205	Thatcher silt loam, 4 to 12 percent slopes	Moderate	14.5	0.1%
TBD	Thatcher silt loam, warm, 10 to 25 percent slopes	Low	0.9	0.0%
W	Water		0.1	0.0%
Subtotals for Soil Survey Area			**40.6**	**0.2%**
Totals for Area of Interest			**16,321.7**	**100.0%**

Rating Options—Corrosion of Concrete

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

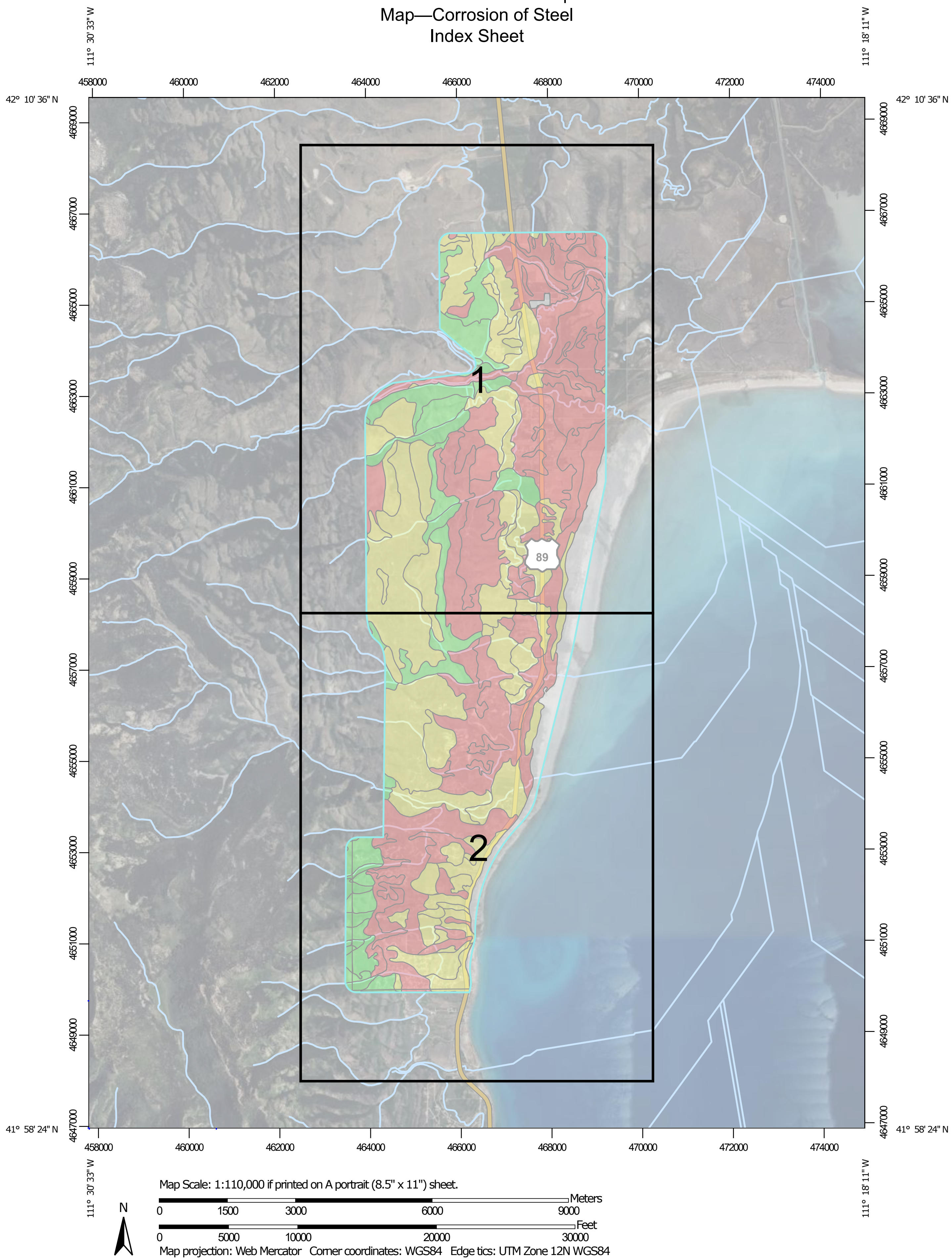
Tie-break Rule: Higher

Corrosion of Steel

"Risk of corrosion" pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel in installations that are entirely within one kind of soil or within one soil layer.

The risk of corrosion is expressed as "low," "moderate," or "high."

Map—Corrosion of Steel
Index Sheet



Map Scale: 1:110,000 if printed on A portrait (8.5" x 11") sheet.

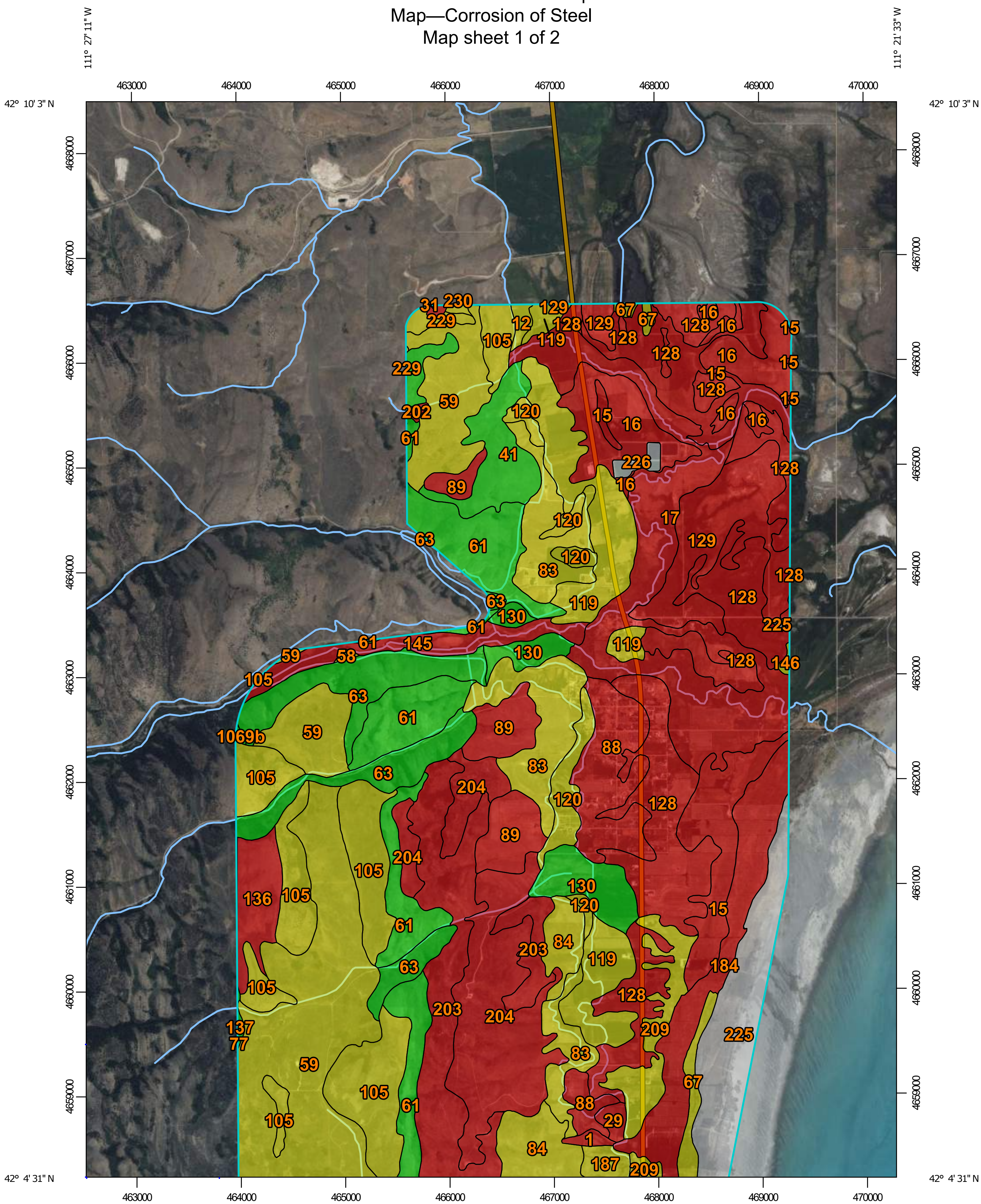
Meters: 0, 1500, 3000, 6000, 9000

Feet: 0, 5000, 10000, 20000, 30000

Map projection: Web Mercator   Corner coordinates: WGS84   Edge tics: UTM Zone 12N WGS84

Map—Corrosion of Steel

Map sheet 1 of 2



Joins sheet 2

Map Scale: 1:50,000 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0, 500, 1000, 2000, 3000

Feet: 0, 2000, 4000, 8000, 12000

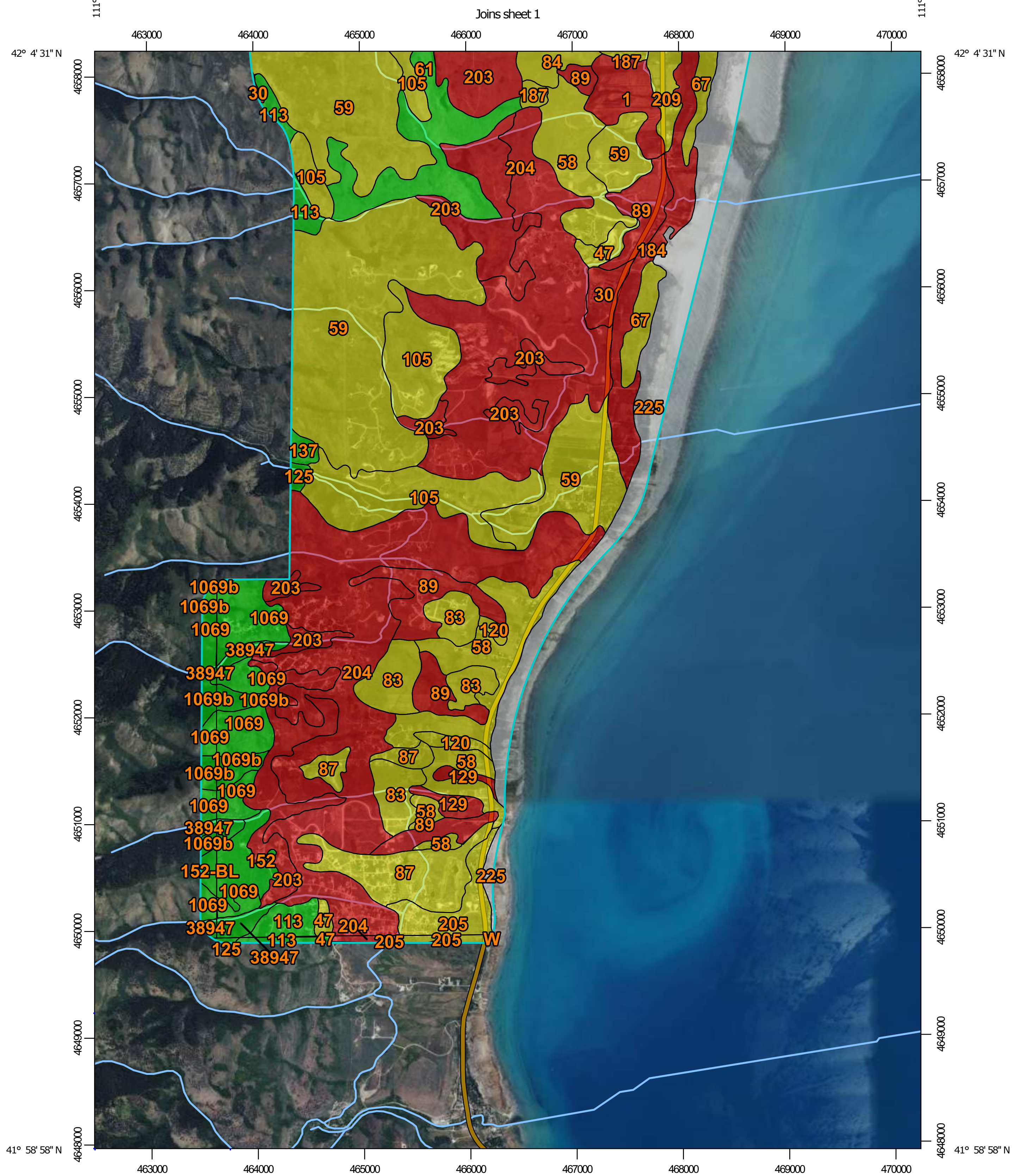
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

1

Map Sheet Location

Map—Corrosion of Steel

Map sheet 2 of 2



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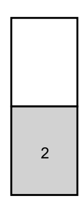
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84



Map Sheet Location

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

High

Moderate

Low

Not rated or not available

Soil Rating Lines

High

Moderate

Low

Not rated or not available

Soil Rating Points

High

Moderate

Low

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Background

Aerial Photography

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105	Hutchley-Cupine-Vitale complex, 2 to 60 percent slopes	Moderate	1,052.6	6.4%
113	Jacanyon-Cleavage complex, 10 to 50 percent slopes	Low	80.7	0.5%
119	Joes silt loam, 1 to 4 percent slopes	Moderate	421.8	2.6%
120	Joes silt loam, 4 to 15 percent slopes	Moderate	161.9	1.0%
125	Lag-Dollarhide-Rock outcrop complex, 5 to 60 percent slopes	Low	9.2	0.1%
128	Lago-Bear Lake complex, 0 to 1 percent slopes	High	791.6	4.8%
129	Lago-Merkley complex, 0 to 2 percent slopes	High	361.6	2.2%
130	Lanoak silt loam, 1 to 4 percent slopes	Low	173.5	1.1%
136	Leftfork-Cleavage complex, 5 to 40 percent slopes	High	117.2	0.7%
137	Lilcan-Rock outcrop-Jacanyon complex, 2 to 50 percent slopes	Low	20.0	0.1%
145	Marshdale, occasionally flooded-Bloomcreek complex, 0 to 3 percent slopes	High	133.3	0.8%
146	Merkley silt loam, 0 to 2 percent slopes	Moderate	4.4	0.0%
152	Nielsen-Dranburn-Hagenbarth complex, 5 to 40 percent slopes	Low	72.8	0.4%
184	Sadducee-Bearbeach complex, 0 to 2 percent slopes	High	479.2	2.9%
187	Springhollow-Arbone complex, 4 to 12 percent slopes	Moderate	49.6	0.3%
202	Swanpeak-Cloudless complex, 1 to 15 percent slopes	High	5.8	0.0%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
203	Swanpeak-Dutchcanyon complex, 20 to 35 percent slopes	High	1,012.5	6.2%
204	Swanpeak-Dutchcanyon-Ant Flat complex, 12 to 20 percent slopes	High	2,169.5	13.3%
205	Thatcher silt loam, 4 to 12 percent slopes	Moderate	85.8	0.5%
209	Thatcher-Joes complex, 1 to 4 percent slopes	Moderate	188.3	1.2%
225	Water		741.7	4.5%
226	Water, miscellaneous		19.1	0.1%
229	Wursten silt loam, 4 to 12 percent slopes	Moderate	21.5	0.1%
230	Wursten silt loam, 12 to 20 percent slopes	Moderate	4.3	0.0%
1069	Ireland, extremely stony surface-Drage family, complex, 15 to 35 percent slopes	Low	213.4	1.3%
1069b	Ezbin family-Cavemountain, bouldery surface-Starley family, very stony surface, complex, 15 to 45 percent slopes	Low	49.8	0.3%
38947	Spearhead family, very stony surface-Broad Canyon, very stony surface-Ezbin complex, 30 to 60 percent slopes, MLRA 47	Low	48.4	0.3%
Subtotals for Soil Survey Area			**16,165.3**	**99.0%**
Totals for Area of Interest			**16,321.7**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
152-BL	Nielsen-Dranburn-Hagenbarth complex, 5 to 40 percent slopes	Low	13.3	0.1%
1069	Ireland, extremely stony surface-Drage family, complex, 15 to 35 percent slopes	Low	58.7	0.4%
1069b	Ezbin family-Cavemountain, bouldery surface-Starley family, very stony surface, complex, 15 to 45 percent slopes	Low	32.0	0.2%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
38947	Spearhead family, very stony surface-Broad Canyon, very stony surface-Ezbin complex, 30 to 60 percent slopes, MLRA 47	Low	11.6	0.1%
Subtotals for Soil Survey Area			**115.6**	**0.7%**
Totals for Area of Interest			**16,321.7**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
47	Cedarhill-Clegg-Drage complex, 5 to 55 percent slopes	Low	2.0	0.0%
113	Jacanyon-Cleavage complex, 10 to 50 percent slopes	Low	10.5	0.1%
125	Lag-Dollarhide-Rock outcrop complex, 5 to 60 percent slopes	Low	2.2	0.0%
204	Swanpeak-Dutchcanyon-Ant Flat complex, 12 to 20 percent slopes	High	10.4	0.1%
205	Thatcher silt loam, 4 to 12 percent slopes	Moderate	14.5	0.1%
TBD	Thatcher silt loam, warm, 10 to 25 percent slopes	Moderate	0.9	0.0%
W	Water		0.1	0.0%
Subtotals for Soil Survey Area			**40.6**	**0.2%**
Totals for Area of Interest			**16,321.7**	**100.0%**

Rating Options—Corrosion of Steel

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Shallow Excavations

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

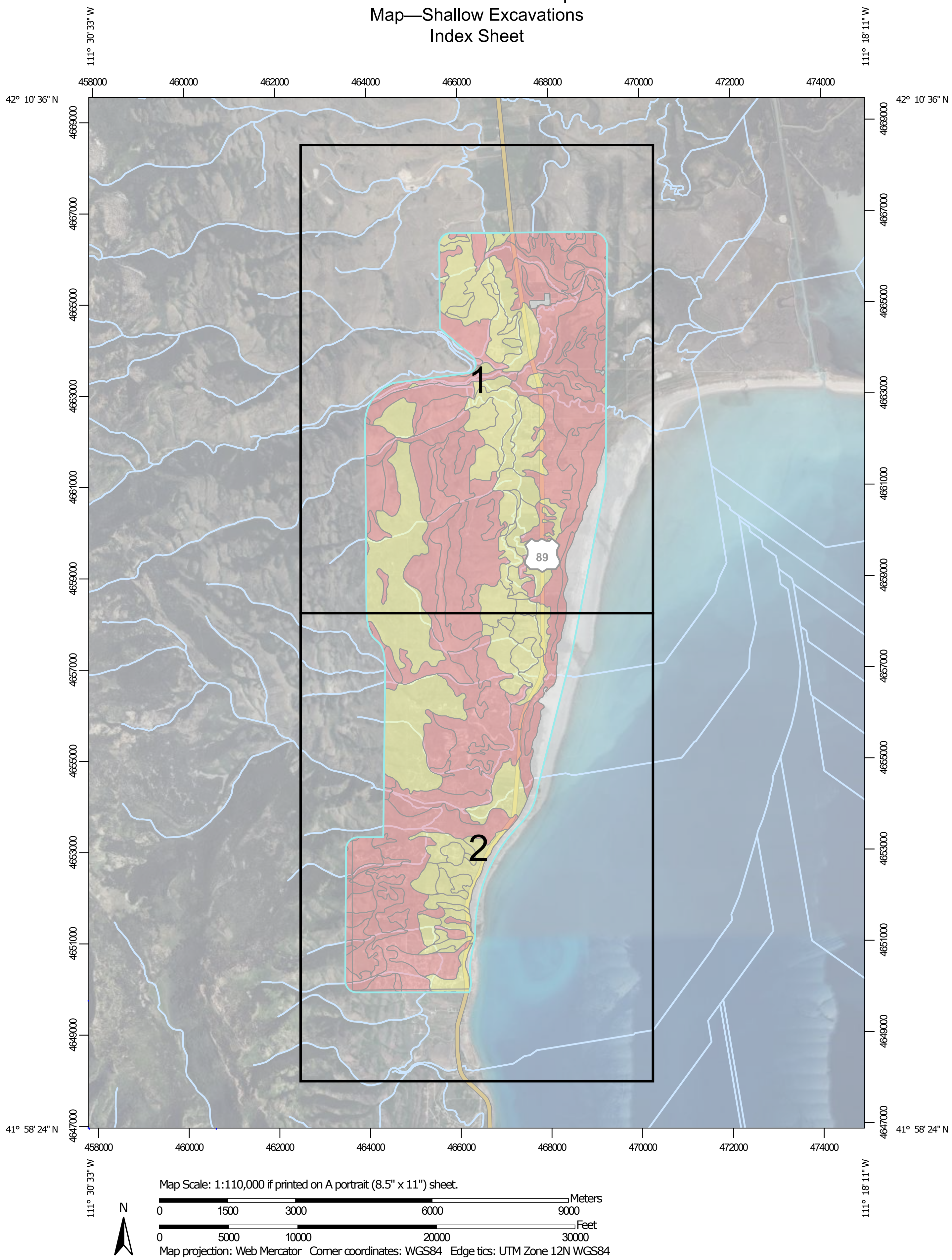
The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the specified use. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

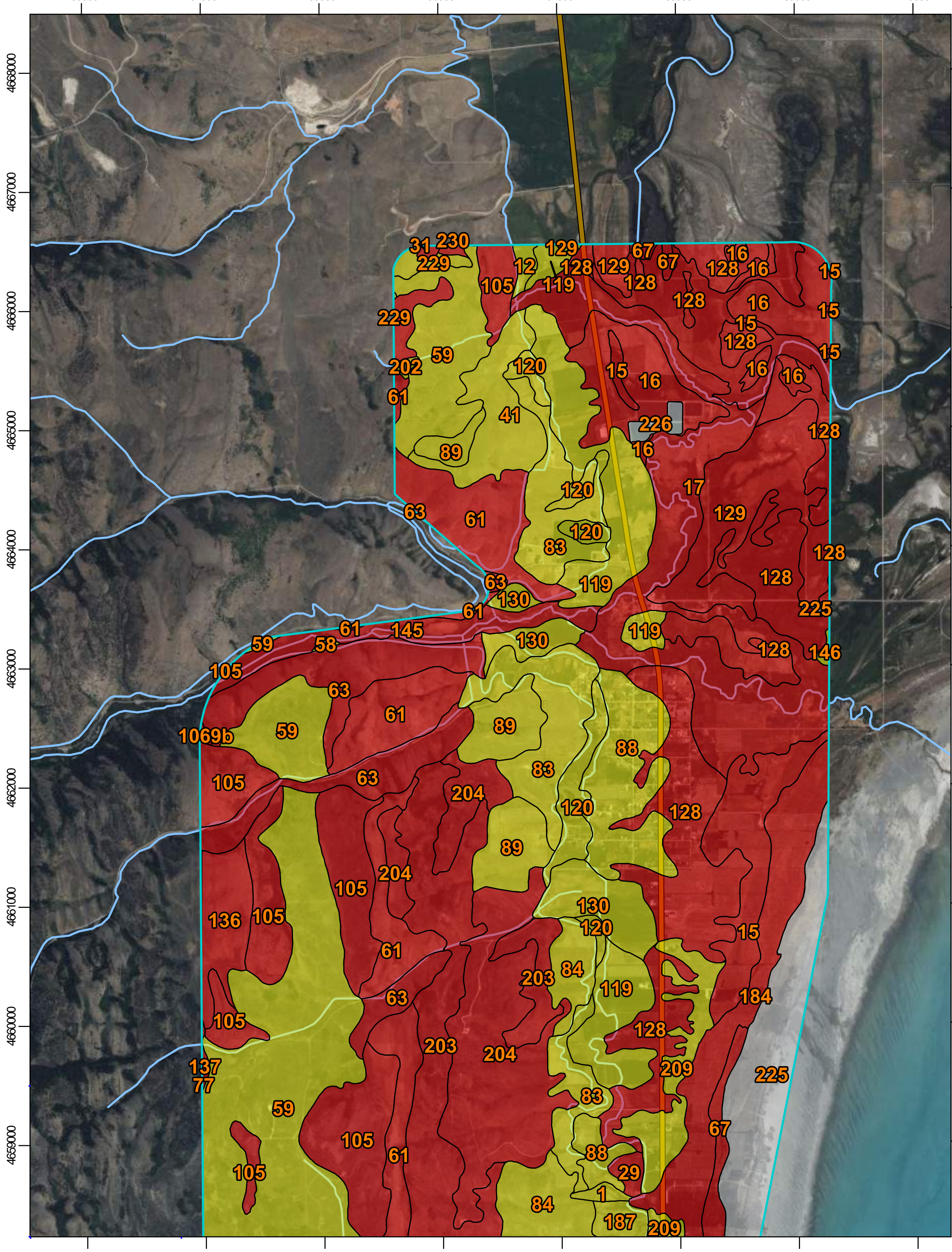
The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Map—Shallow Excavations
Index Sheet



Map—Shallow Excavations
Map sheet 1 of 2



Map Scale: 1:50,000 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 500, 1000, 2000, 3000

Feet: 0, 2000, 4000, 8000, 12000

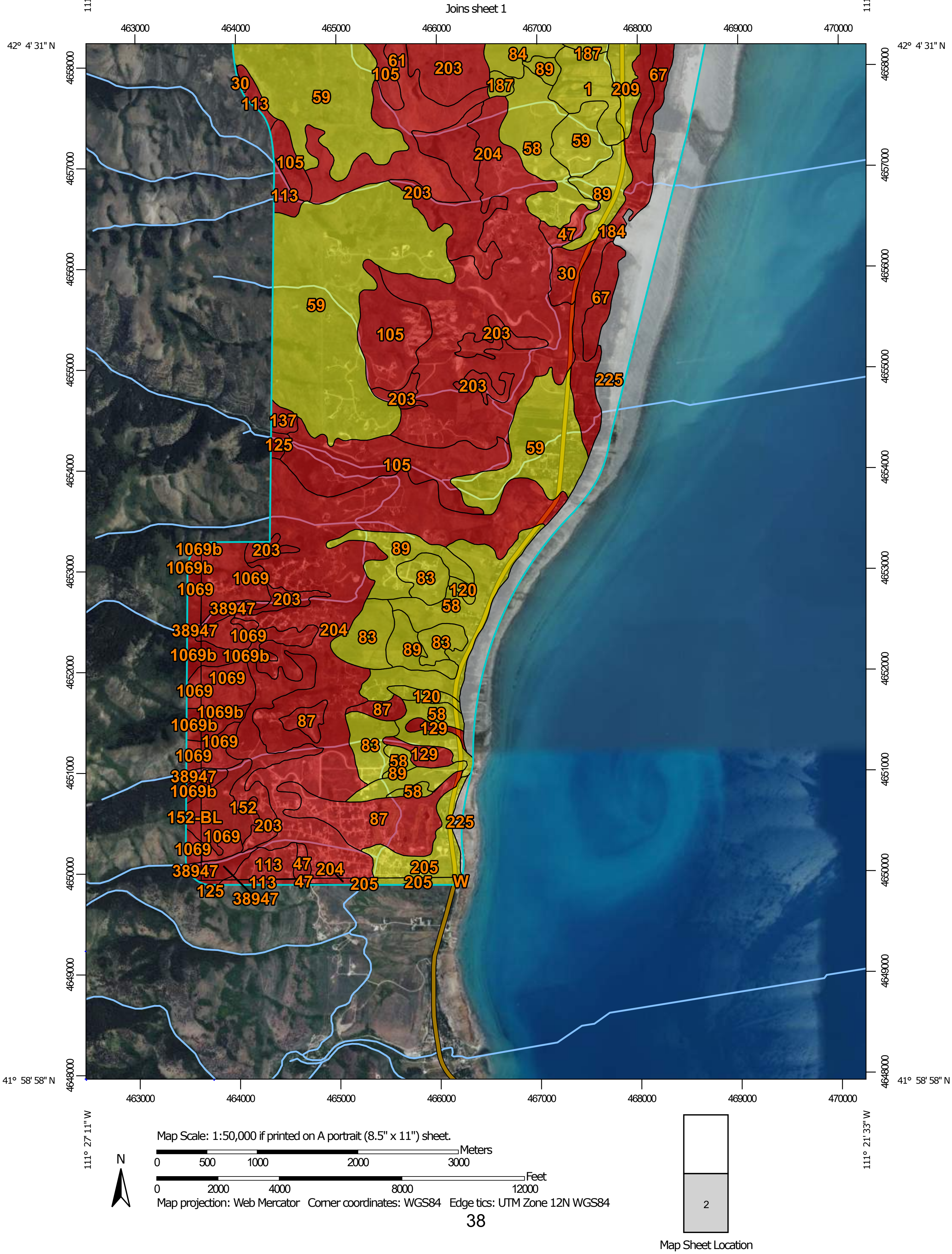
N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

Map Sheet Location: 1

Map—Shallow Excavations

Map sheet 2 of 2



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

Very limited

Somewhat limited

Not limited

Not rated or not available

Soil Rating Lines

Very limited

Somewhat limited

Not limited

Not rated or not available

Soil Rating Points

Very limited

Somewhat limited

Not limited

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Bear Lake County Area, Idaho
Survey Area Data: Version 11, Sep 6, 2022

Soil Survey Area: Caribou National Forest, Idaho and Wyoming
Survey Area Data: Version 10, Sep 6, 2022

Soil Survey Area: Rich County, Utah
Survey Area Data: Version 17, Aug 25, 2022

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 22, 2022—Aug 8, 2022

MAP LEGEND	MAP INFORMATION
	The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables—Shallow Excavations

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
1	Ant Flat silty clay loam, 1 to 4 percent slopes	Somewhat limited	Ant Flat (75%)	Too clayey (0.28)	108.7	0.7%
				Dusty (0.08)		
				Unstable excavation walls (0.01)		
12	Bancroft silt loam, 1 to 4 percent slopes	Somewhat limited	Bancroft (80%)	Dusty (0.09)	14.3	0.1%
				Unstable excavation walls (0.01)		
15	Bear Lake-Bear Lake, ponded complex, 0 to 1 percent slopes	Very limited	Bear Lake (55%)	Depth to saturated zone (1.00)	430.0	2.6%
				Dusty (0.17)		
				Unstable excavation walls (0.01)		
			Bear Lake, ponded (25%)	Ponding (1.00)		
				Depth to saturated zone (1.00)		
				Dusty (0.17)		
				Unstable excavation walls (0.01)		
16	Bear Lake-Chesbrook-La Roco complex, 0 to 2 percent slopes	Very limited	Bear Lake (40%)	Depth to saturated zone (1.00)	308.2	1.9%
				Dusty (0.17)		
				Unstable excavation walls (0.01)		
			Chesbrook (25%)	Depth to saturated zone (1.00)		
				Dusty (0.17)		
				Unstable excavation walls (0.01)		
			La Roco (15%)	Depth to saturated zone (1.00)		
				Dusty (0.17)		
				Unstable excavation walls (0.01)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
			Bear Lake, ponded (5%)	Ponding (1.00)		
				Depth to saturated zone (1.00)		
				Dusty (0.17)		
				Unstable excavation walls (0.01)		
17	Bear Lake-Lago complex, 0 to 2 percent slopes	Very limited	Bear Lake (50%)	Depth to saturated zone (1.00)	627.8	3.8%
				Dusty (0.13)		
				Unstable excavation walls (0.01)		
			Lago (35%)	Depth to saturated zone (1.00)		
				Dusty (0.13)		
				Unstable excavation walls (0.01)		
			Bear Lake, ponded (5%)	Ponding (1.00)		
				Depth to saturated zone (1.00)		
				Dusty (0.13)		
				Unstable excavation walls (0.01)		
29	Brifox-Lizdale complex, 4 to 12 percent slopes	Very limited	Brifox (75%)	Unstable excavation walls (1.00)	18.9	0.1%
				Too clayey (0.41)		
				Dusty (0.13)		
30	Brifox-Niter complex, 4 to 12 percent slopes	Very limited	Brifox (45%)	Unstable excavation walls (1.00)	44.1	0.3%
				Too clayey (0.41)		
				Dusty (0.09)		
			Niter (35%)	Unstable excavation walls (1.00)		
				Too clayey (0.28)		
				Dusty (0.09)		
31	Brifox-Niter complex, 12 to	Very limited	Brifox (45%)	Unstable excavation walls (1.00)	4.7	0.0%

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
	25 percent slopes			Slope (1.00)		
				Too clayey (0.41)		
				Dusty (0.09)		
			Niter (35%)	Unstable excavation walls (1.00)		
				Slope (1.00)		
				Too clayey (0.28)		
				Dusty (0.09)		
41	Cedarhill gravelly silt loam, 5 to 25 percent slopes	Somewhat limited	Cedarhill (90%)	Slope (0.84)	152.9	0.9%
				Dusty (0.06)		
				Unstable excavation walls (0.01)		
47	Cedarhill-Clegg-Drage complex, 5 to 55 percent slopes	Very limited	Cedarhill (45%)	Slope (1.00)	37.2	0.2%
				Dusty (0.08)		
				Unstable excavation walls (0.01)		
			Clegg (30%)	Slope (1.00)		
				Dusty (0.10)		
				Unstable excavation walls (0.01)		
			Drage (20%)	Slope (1.00)		
				Dusty (0.11)		
				Unstable excavation walls (0.01)		
58	Clegg silt loam, 4 to 20 percent slopes	Somewhat limited	Clegg (90%)	Slope (0.63)	443.0	2.7%
				Dusty (0.07)		
				Unstable excavation walls (0.01)		
59	Clegg-Grecan complex, 4 to 20 percent slopes	Somewhat limited	Clegg (50%)	Slope (0.96)	2,355.2	14.4%
				Dusty (0.06)		
				Unstable excavation walls (0.01)		
			Grecan (35%)	Slope (0.96)		
				Dusty (0.04)		
				Unstable excavation walls (0.01)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
61	Crossley-Rock outcrop complex, 4 to 35 percent slopes	Very limited	Crossley (70%)	Depth to hard bedrock (1.00)	791.9	4.9%
				Large stones (1.00)		
				Slope (1.00)		
				Unstable excavation walls (0.14)		
				Dusty (0.01)		
63	Cupine-Dunford complex, 20 to 60 percent slopes	Very limited	Cupine (45%)	Depth to hard bedrock (1.00)	386.8	2.4%
				Slope (1.00)		
				Unstable excavation walls (0.01)		
				Dusty (0.00)		
			Dunford (25%)	Depth to hard bedrock (1.00)		
				Slope (1.00)		
				Dusty (0.04)		
				Unstable excavation walls (0.01)		
67	Dinswamp mucky peat, 0 to 2 percent slopes	Very limited	Dinswamp (75%)	Ponding (1.00)	143.0	0.9%
				Depth to saturated zone (1.00)		
				Dusty (0.28)		
				Unstable excavation walls (0.01)		
			Bear Lake, ponded (5%)	Ponding (1.00)		
				Depth to saturated zone (1.00)		
				Dusty (0.28)		
				Unstable excavation walls (0.01)		
			Chesbrook (5%)	Depth to saturated zone (1.00)		
				Dusty (0.28)		
				Unstable excavation walls (0.01)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
			Bloomington (5%)	Ponding (1.00)		
				Depth to saturated zone (1.00)		
				Dusty (0.28)		
				Unstable excavation walls (0.01)		
			Dingle (5%)	Ponding (1.00)		
				Depth to saturated zone (1.00)		
				Dusty (0.28)		
				Unstable excavation walls (0.01)		
77	Dranburn-Pontuge complex, 10 to 40 percent slopes	Very limited	Dranburn (60%)	Slope (1.00)	0.4	0.0%
				Unstable excavation walls (0.01)		
				Dusty (0.00)		
			Pontuge (30%)	Slope (1.00)		
				Unstable excavation walls (0.01)		
				Dusty (0.00)		
83	Dutchcanyon gravelly silt loam, 4 to 12 percent slopes	Somewhat limited	Dutchcanyon (85%)	Dusty (0.06)	634.9	3.9%
				Unstable excavation walls (0.01)		
84	Dutchcanyon-Frenchollow complex, 5 to 20 percent slopes	Somewhat limited	Dutchcanyon (45%)	Slope (0.16)	212.0	1.3%
				Dusty (0.06)		
				Unstable excavation walls (0.01)		
			Frenchollow (35%)	Unstable excavation walls (0.51)		
				Slope (0.16)		
				Too clayey (0.13)		
				Dusty (0.09)		
87	Fishaven-Dutchcanyon complex, 8 to 20 percent slopes	Very limited	Fishaven (70%)	Depth to hard bedrock (1.00)	210.1	1.3%
				Slope (0.96)		
				Dusty (0.05)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Unstable excavation walls (0.01)		
88	Frenchollow silty clay loam, 1 to 4 percent slopes	Somewhat limited	Frenchollow (85%)	Unstable excavation walls (0.51)	266.0	1.6%
				Too clayey (0.13)		
				Dusty (0.04)		
89	Frenchollow silty clay loam, 4 to 20 percent slopes	Somewhat limited	Frenchollow (85%)	Slope (0.63)	485.4	3.0%
				Unstable excavation walls (0.51)		
				Too clayey (0.13)		
				Dusty (0.03)		
105	Hutchley-Cupine-Vitale complex, 2 to 60 percent slopes	Very limited	Hutchley (30%)	Depth to hard bedrock (1.00)	1,052.6	6.4%
				Slope (1.00)		
				Unstable excavation walls (0.01)		
				Large stones (0.00)		
				Dusty (0.00)		
			Cupine (25%)	Depth to hard bedrock (1.00)		
				Slope (1.00)		
				Unstable excavation walls (0.01)		
				Dusty (0.00)		
			Vitale (20%)	Depth to hard bedrock (1.00)		
				Large stones (1.00)		
				Slope (1.00)		
				Unstable excavation walls (0.14)		
				Dusty (0.00)		
113	Jacanyon-Cleavage complex, 10 to 50 percent slopes	Very limited	Jacanyon (65%)	Depth to hard bedrock (1.00)	80.7	0.5%
				Slope (1.00)		
				Dusty (0.02)		
				Unstable excavation walls (0.01)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
			Cleavage (25%)	Depth to hard bedrock (1.00)		
				Slope (1.00)		
				Dusty (0.02)		
				Unstable excavation walls (0.01)		
119	Joes silt loam, 1 to 4 percent slopes	Somewhat limited	Joes (75%)	Dusty (0.11)	421.8	2.6%
				Unstable excavation walls (0.01)		
120	Joes silt loam, 4 to 15 percent slopes	Somewhat limited	Joes (75%)	Dusty (0.09)	161.9	1.0%
				Unstable excavation walls (0.01)		
125	Lag-Dollarhide-Rock outcrop complex, 5 to 60 percent slopes	Very limited	Lag (40%)	Slope (1.00)	9.2	0.1%
				Unstable excavation walls (0.04)		
				Dusty (0.00)		
			Dollarhide (35%)	Depth to hard bedrock (1.00)		
				Slope (1.00)		
				Unstable excavation walls (0.01)		
128	Lago-Bear Lake complex, 0 to 1 percent slopes	Very limited	Lago (65%)	Depth to saturated zone (1.00)	791.6	4.8%
				Dusty (0.13)		
				Unstable excavation walls (0.01)		
			Bear Lake (25%)	Depth to saturated zone (1.00)		
				Dusty (0.13)		
				Unstable excavation walls (0.01)		
129	Lago-Merkley complex, 0 to 2 percent slopes	Very limited	Lago (60%)	Depth to saturated zone (1.00)	361.6	2.2%
				Dusty (0.13)		
				Unstable excavation walls (0.01)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
			Bear Lake (5%)	Depth to saturated zone (1.00)		
				Dusty (0.13)		
				Unstable excavation walls (0.01)		
130	Lanoak silt loam, 1 to 4 percent slopes	Somewhat limited	Lanoak (80%)	Dusty (0.09)	173.5	1.1%
				Unstable excavation walls (0.01)		
136	Leftfork-Cleavage complex, 5 to 40 percent slopes	Very limited	Leftfork (60%)	Slope (1.00)	117.2	0.7%
				Depth to hard bedrock (0.84)		
				Too clayey (0.41)		
				Unstable excavation walls (0.39)		
				Dusty (0.07)		
			Cleavage (25%)	Depth to hard bedrock (1.00)		
				Slope (1.00)		
				Dusty (0.05)		
				Unstable excavation walls (0.01)		
137	Lilcan-Rock outcrop-Jacanyon complex, 2 to 50 percent slopes	Very limited	Lilcan (60%)	Depth to hard bedrock (1.00)	20.0	0.1%
				Slope (1.00)		
				Unstable excavation walls (0.51)		
				Large stones (0.30)		
				Dusty (0.02)		
			Jacanyon (15%)	Depth to hard bedrock (1.00)		
				Slope (1.00)		
				Dusty (0.02)		
				Unstable excavation walls (0.01)		
145	Marshdale, occasionally flooded-Bloomcreek complex, 0 to 3 percent slopes	Very limited	Marshdale, occasionally flooded (45%)	Depth to saturated zone (1.00)	133.3	0.8%
				Flooding (0.60)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Dusty (0.06)		
				Unstable excavation walls (0.01)		
			Bloomcreek (30%)	Depth to saturated zone (1.00)		
				Dusty (0.04)		
				Unstable excavation walls (0.01)		
			Bearbou (10%)	Depth to saturated zone (1.00)		
				Dusty (0.06)		
				Unstable excavation walls (0.01)		
			Thomasfork (5%)	Depth to saturated zone (1.00)		
				Dusty (0.06)		
				Too clayey (0.03)		
				Unstable excavation walls (0.01)		
146	Merkley silt loam, 0 to 2 percent slopes	Somewhat limited	Merkley (85%)	Depth to saturated zone (0.53)	4.4	0.0%
				Dense layer (0.50)		
				Dusty (0.13)		
				Unstable excavation walls (0.01)		
152	Nielsen-Dranburn-Hagenbarth complex, 5 to 40 percent slopes	Very limited	Nielsen (45%)	Depth to hard bedrock (1.00)	72.8	0.4%
				Slope (1.00)		
				Large stones (0.85)		
				Unstable excavation walls (0.04)		
			Dranburn (20%)	Slope (1.00)		
				Unstable excavation walls (0.01)		
			Hagenbarth (15%)	Slope (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Unstable excavation walls (0.01)		
184	Sadducee-Bearbeach complex, 0 to 2 percent slopes	Very limited	Sadducee (55%)	Depth to saturated zone (1.00)	479.2	2.9%
				Dusty (0.12)		
				Unstable excavation walls (0.01)		
			Bearbeach (45%)	Depth to saturated zone (1.00)		
				Unstable excavation walls (0.47)		
187	Springhollow-Arbone complex, 4 to 12 percent slopes	Somewhat limited	Springhollow (45%)	Dusty (0.08)	49.6	0.3%
				Depth to thin cemented pan (0.06)		
				Unstable excavation walls (0.01)		
			Arbone (40%)	Dusty (0.09)		
				Unstable excavation walls (0.01)		
202	Swanpeak-Cloudless complex, 1 to 15 percent slopes	Somewhat limited	Swanpeak (50%)	Unstable excavation walls (0.28)	5.8	0.0%
				Slope (0.16)		
				Too clayey (0.13)		
				Dusty (0.03)		
				Large stones (0.02)		
			Cloudless (30%)	Slope (0.16)		
				Dusty (0.04)		
				Unstable excavation walls (0.01)		
203	Swanpeak-Dutchcanyon complex, 20 to 35 percent slopes	Very limited	Swanpeak (70%)	Slope (1.00)	1,012.5	6.2%
				Unstable excavation walls (0.28)		
				Too clayey (0.13)		
				Dusty (0.05)		
				Large stones (0.02)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
			Dutchcanyon (20%)	Slope (1.00)		
				Dusty (0.04)		
				Unstable excavation walls (0.01)		
204	Swanpeak-Dutchcanyon-Ant Flat complex, 12 to 20 percent slopes	Very limited	Swanpeak (45%)	Slope (1.00)	2,169.5	13.3%
				Unstable excavation walls (0.28)		
				Too clayey (0.13)		
				Dusty (0.06)		
				Large stones (0.02)		
			Dutchcanyon (30%)	Slope (1.00)		
				Dusty (0.05)		
				Unstable excavation walls (0.01)		
			Ant Flat (25%)	Slope (1.00)		
				Too clayey (0.28)		
				Dusty (0.07)		
				Unstable excavation walls (0.01)		
205	Thatcher silt loam, 4 to 12 percent slopes	Somewhat limited	Thatcher (85%)	Dusty (0.11)	85.8	0.5%
				Unstable excavation walls (0.01)		
209	Thatcher-Joes complex, 1 to 4 percent slopes	Somewhat limited	Thatcher (60%)	Dusty (0.11)	188.3	1.2%
				Unstable excavation walls (0.01)		
			Joes (25%)	Dusty (0.11)		
				Unstable excavation walls (0.01)		
225	Water	Not rated	Water (100%)		741.7	4.5%
226	Water, miscellaneous	Not rated	Water, miscellaneous (100%)		19.1	0.1%
229	Wursten silt loam, 4 to 12 percent slopes	Somewhat limited	Wursten (80%)	Slope (0.16)	21.5	0.1%
				Dusty (0.05)		
				Unstable excavation walls (0.01)		
230	Wursten silt loam, 12 to 20	Very limited	Wursten (80%)	Slope (1.00)	4.3	0.0%

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
	percent slopes			Dusty (0.07)		
				Unstable excavation walls (0.01)		
1069	Ireland, extremely stony surface-Drage family, complex, 15 to 35 percent slopes	Very limited	Ireland, extremely stony surface (40%)	Depth to hard bedrock (1.00)	213.4	1.3%
				Slope (1.00)		
				Large stones (0.02)		
				Unstable excavation walls (0.01)		
				Dusty (0.01)		
			Drage (30%)	Slope (1.00)		
				Dusty (0.02)		
				Unstable excavation walls (0.01)		
1069b	Ezbin family-Cavemountain, bouldery surface-Starley family, very stony surface, complex, 15 to 45 percent slopes	Very limited	Ezbin (45%)	Slope (1.00)	49.8	0.3%
				Unstable excavation walls (0.01)		
			Cavemountain, bouldery surface (40%)	Depth to hard bedrock (1.00)		
				Slope (1.00)		
				Unstable excavation walls (0.01)		
			Starley, very stony surface (15%)	Depth to hard bedrock (1.00)		
				Slope (1.00)		
				Unstable excavation walls (0.01)		
38947	Spearhead family, very stony surface-Broad Canyon, very stony surface-Ezbin complex, 30 to 60 percent slopes, MLRA 47	Very limited	Spearhead, very stony surface (35%)	Slope (1.00)	48.4	0.3%
				Large stones (0.12)		
				Unstable excavation walls (0.01)		
			Broad Canyon, very stony surface (30%)	Slope (1.00)		
				Large stones (0.19)		
				Unstable excavation walls (0.01)		
			Ezbin (20%)	Slope (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Unstable excavation walls (0.01)		
Subtotals for Soil Survey Area					**16,165.3**	**99.0%**
Totals for Area of Interest					**16,321.7**	**100.0%**

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
152-BL	Nielsen-Dranburn-Hagenbarth complex, 5 to 40 percent slopes	Very limited	Nielsen (45%)	Depth to hard bedrock (1.00)	13.3	0.1%
				Slope (1.00)		
				Large stones (0.85)		
				Unstable excavation walls (0.04)		
			Dranburn (20%)	Slope (1.00)		
				Unstable excavation walls (0.01)		
			Hagenbarth (15%)	Slope (1.00)		
				Unstable excavation walls (0.01)		
1069	Ireland, extremely stony surface-Drage family, complex, 15 to 35 percent slopes	Very limited	Ireland, extremely stony surface (40%)	Depth to hard bedrock (1.00)	58.7	0.4%
				Slope (1.00)		
				Large stones (0.02)		
				Unstable excavation walls (0.01)		
				Dusty (0.01)		
			Drage (30%)	Slope (1.00)		
				Dusty (0.02)		
				Unstable excavation walls (0.01)		
			Sessions (10%)	Unstable excavation walls (1.00)		
				Slope (1.00)		
				Too clayey (0.41)		
			Ireland, extremely	Depth to hard bedrock (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
			stony surface, steep (10%)	Slope (1.00)		
				Large stones (0.02)		
				Unstable excavation walls (0.01)		
				Dusty (0.01)		
			Dranburn (10%)	Slope (1.00)		
				Dusty (0.02)		
				Unstable excavation walls (0.01)		
1069b	Ezbin family-Cavemountain, bouldery surface-Starley family, very stony surface, complex, 15 to 45 percent slopes	Very limited	Ezbin (45%)	Slope (1.00)	32.0	0.2%
				Unstable excavation walls (0.01)		
			Cavemountain, bouldery surface (40%)	Depth to hard bedrock (1.00)		
				Slope (1.00)		
				Unstable excavation walls (0.01)		
			Starley, very stony surface (15%)	Depth to hard bedrock (1.00)		
				Slope (1.00)		
				Unstable excavation walls (0.01)		
38947	Spearhead family, very stony surface-Broad Canyon, very stony surface-Ezbin complex, 30 to 60 percent slopes, MLRA 47	Very limited	Spearhead, very stony surface (35%)	Slope (1.00)	11.6	0.1%
				Large stones (0.12)		
				Unstable excavation walls (0.01)		
			Broad Canyon, very stony surface (30%)	Slope (1.00)		
				Large stones (0.19)		
				Unstable excavation walls (0.01)		
			Ezbin (20%)	Slope (1.00)		
				Unstable excavation walls (0.01)		
			Booneville (5%)	Slope (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Unstable excavation walls (0.01)		
			Hondoho (4%)	Slope (1.00)		
				Unstable excavation walls (0.01)		
				Large stones (0.01)		
				Dusty (0.00)		
			Starley (4%)	Depth to hard bedrock (1.00)		
				Slope (1.00)		
				Organic matter content (1.00)		
				Unstable excavation walls (0.01)		
Subtotals for Soil Survey Area					**115.6**	**0.7%**
Totals for Area of Interest					**16,321.7**	**100.0%**

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
47	Cedarhill-Clegg-Drage complex, 5 to 55 percent slopes	Very limited	Cedarhill (45%)	Slope (1.00)	2.0	0.0%
				Large stones (0.29)		
				Dusty (0.08)		
				Unstable excavation walls (0.01)		
			Clegg (30%)	Slope (1.00)		
				Dusty (0.10)		
				Unstable excavation walls (0.01)		
			Drage (20%)	Slope (1.00)		
				Dusty (0.10)		
				Unstable excavation walls (0.01)		
113	Jacanyon-Cleavage complex, 10 to 50 percent slopes	Very limited	Jacanyon (65%)	Depth to hard bedrock (1.00)	10.5	0.1%
				Slope (1.00)		
				Dusty (0.02)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Unstable excavation walls (0.01)		
			Cleavage (25%)	Depth to hard bedrock (1.00)		
				Slope (1.00)		
				Dusty (0.02)		
				Unstable excavation walls (0.01)		
			Dry Canyon (5%)	Slope (1.00)		
				Dusty (0.03)		
				Unstable excavation walls (0.01)		
125	Lag-Dollarhide-Rock outcrop complex, 5 to 60 percent slopes	Very limited	Lag (40%)	Slope (1.00)	2.2	0.0%
				Unstable excavation walls (0.04)		
				Dusty (0.00)		
			Dollarhide (35%)	Depth to hard bedrock (1.00)		
				Slope (1.00)		
				Unstable excavation walls (0.01)		
			Grunder (10%)	Depth to hard bedrock (1.00)		
				Slope (1.00)		
				Unstable excavation walls (0.01)		
				Dusty (0.01)		
204	Swanpeak-Dutchcanyon-Ant Flat complex, 12 to 20 percent slopes	Very limited	Swanpeak (45%)	Slope (1.00)	10.4	0.1%
				Unstable excavation walls (0.28)		
				Too clayey (0.13)		
				Dusty (0.06)		
				Large stones (0.02)		
			Dutchcanyon (30%)	Slope (1.00)		
				Dusty (0.05)		
				Unstable excavation walls (0.01)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
			Ant Flat (25%)	Slope (1.00)		
				Too clayey (0.28)		
				Dusty (0.07)		
				Unstable excavation walls (0.01)		
205	Thatcher silt loam, 4 to 12 percent slopes	Somewhat limited	Thatcher (85%)	Dusty (0.11)	14.5	0.1%
				Unstable excavation walls (0.01)		
			Buist (5%)	Dusty (0.08)		
				Unstable excavation walls (0.03)		
				Large stones (0.00)		
			Bezzant (5%)	Dusty (0.08)		
				Unstable excavation walls (0.01)		
			Vicking (5%)	Dusty (0.10)		
				Unstable excavation walls (0.01)		
TBD	Thatcher silt loam, warm, 10 to 25 percent slopes	Very limited	Thatcher (90%)	Slope (1.00)	0.9	0.0%
				Dusty (0.18)		
				Unstable excavation walls (0.01)		
W	Water	Not rated	Water (100%)		0.1	0.0%
Subtotals for Soil Survey Area					**40.6**	**0.2%**
Totals for Area of Interest					**16,321.7**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Very limited	9,760.9	59.8%
Somewhat limited	5,799.7	35.5%
Null or Not Rated	760.9	4.7%
Totals for Area of Interest	**16,321.7**	**100.0%**

Rating Options—Shallow Excavations

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

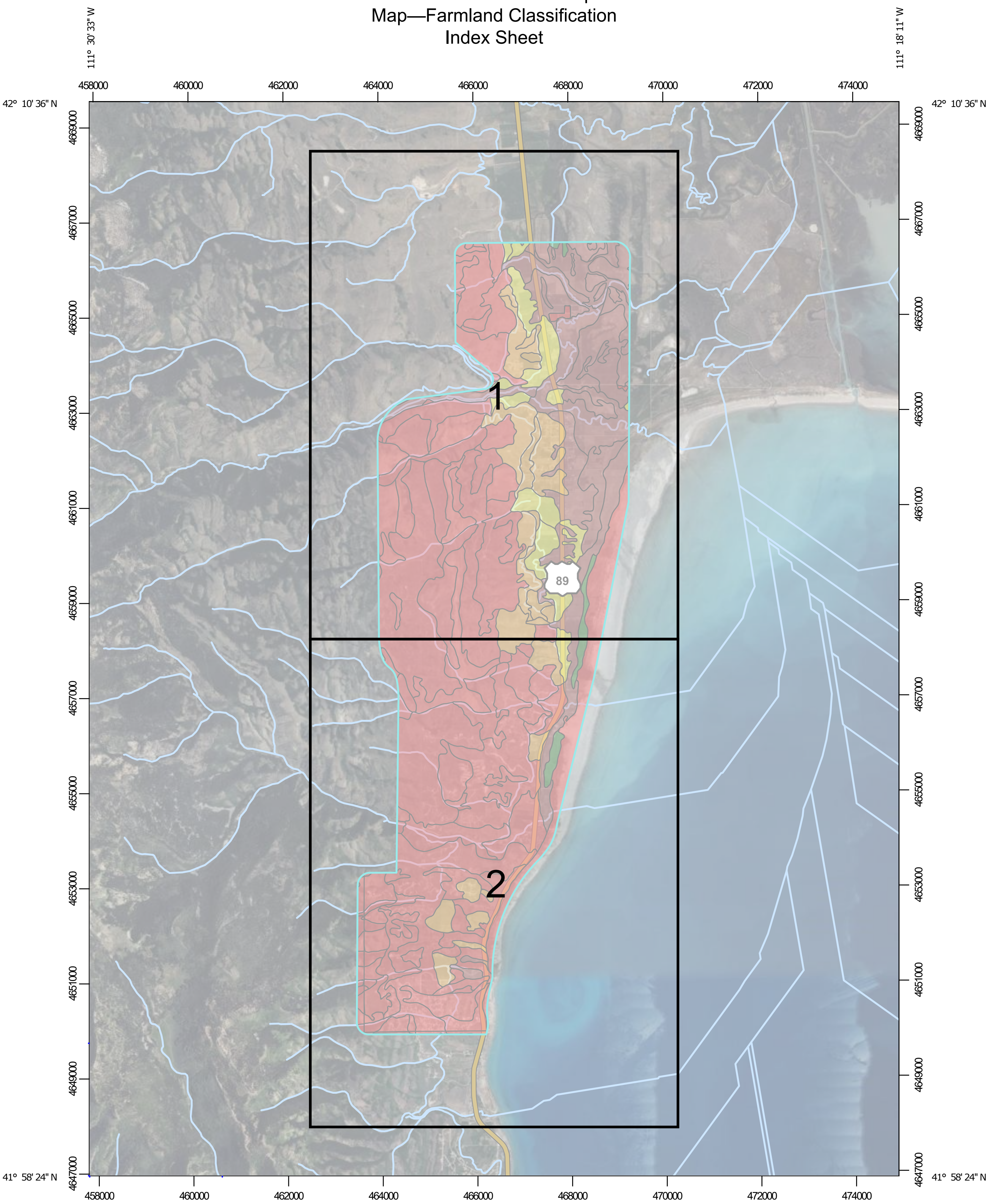
Land Classifications

Land Classifications are specified land use and management groupings that are assigned to soil areas because combinations of soil have similar behavior for specified practices. Most are based on soil properties and other factors that directly influence the specific use of the soil. Example classifications include ecological site classification, farmland classification, irrigated and nonirrigated land capability classification, and hydric rating.

Farmland Classification

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Custom Soil Resource Report
Map—Farmland Classification
Index Sheet



Map Scale: 1:110,000 if printed on A portrait (8.5" x 11") sheet.

Meters: 0 1500 3000 6000 9000

Feet: 0 5000 10000 20000 30000

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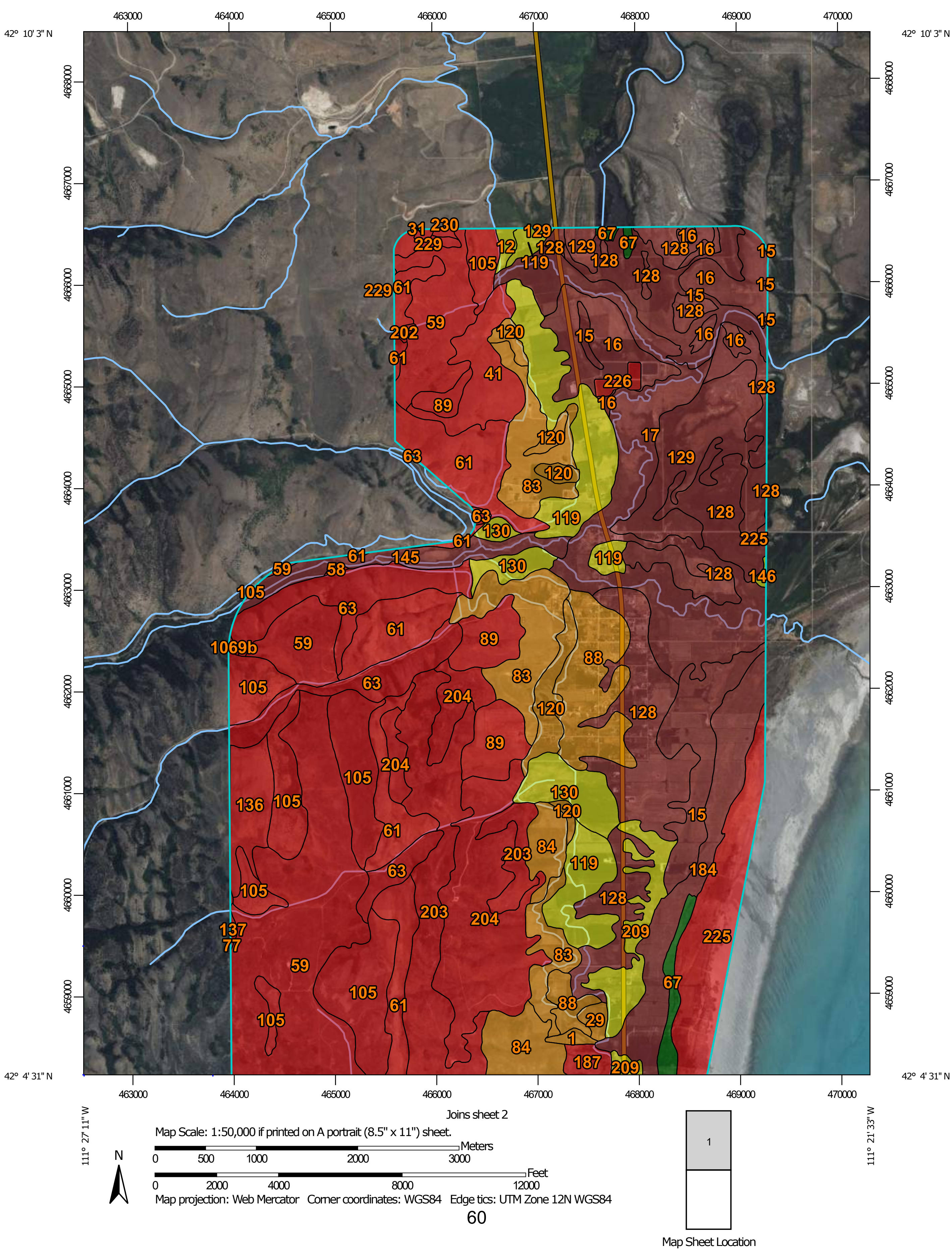
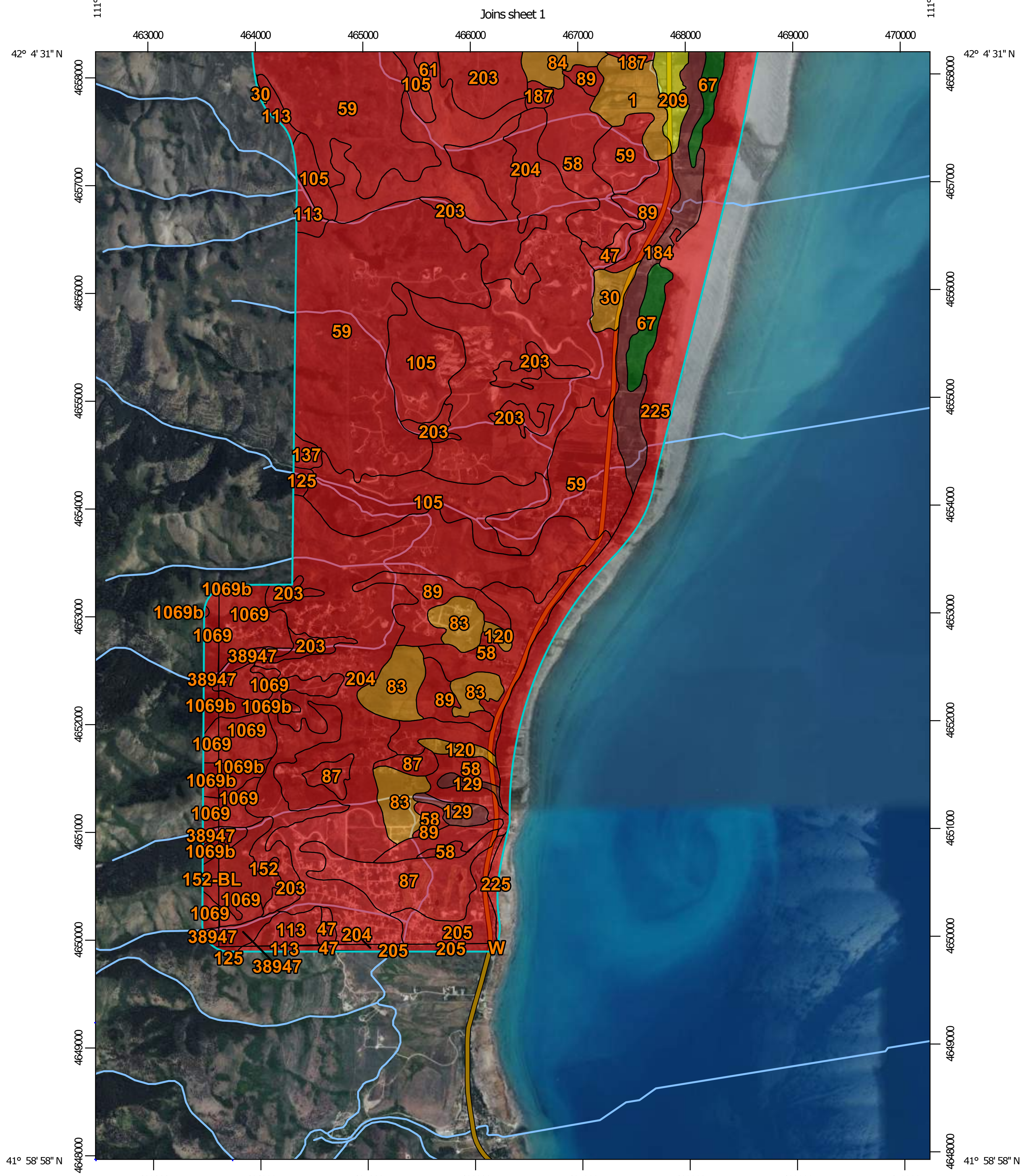
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

Map—Farmland Classification

Map sheet 1 of 2



Custom Soil Resource Report
Map—Farmland Classification
Map sheet 2 of 2



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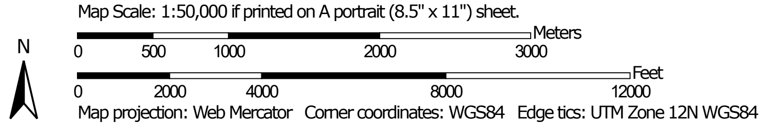
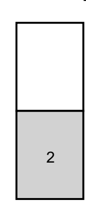


Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84



Map Sheet Location

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated
- Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated and drained
- Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough
- Farmland of statewide importance, if thawed
- Farmland of local importance
- Farmland of local importance, if irrigated
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated
- Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated and drained
- Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer
- Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if warm enough
- Farmland of statewide importance, if thawed
- Farmland of local importance
- Farmland of local importance, if irrigated
- Farmland of unique importance
- Not rated or not available

Soil Rating Points

- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of statewide importance, if drained
- Farmland of statewide importance, if protected from flooding or not frequently flooded during the growing season
- Farmland of statewide importance, if irrigated

Farmland of statewide importance, if drained and either protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if irrigated and drained

Farmland of statewide importance, if irrigated and either protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if subsoiled, completely removing the root inhibiting soil layer

Farmland of statewide importance, if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

Farmland of statewide importance, if irrigated and reclaimed of excess salts and sodium

Farmland of statewide importance, if drained or either protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if warm enough, and either drained or either protected from flooding or not frequently flooded during the growing season

Farmland of statewide importance, if warm enough

Farmland of statewide importance, if thawed

Farmland of local importance

Farmland of local importance, if irrigated

Farmland of unique importance

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Background

Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Bear Lake County Area, Idaho
Survey Area Data: Version 11, Sep 6, 2022

Soil Survey Area: Caribou National Forest, Idaho and Wyoming
Survey Area Data: Version 10, Sep 6, 2022

Soil Survey Area: Rich County, Utah
Survey Area Data: Version 17, Aug 25, 2022

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 22, 2022—Aug 8, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

	imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Ant Flat silty clay loam, 1 to 4 percent slopes	Farmland of statewide importance, if irrigated	108.7	0.7%
12	Bancroft silt loam, 1 to 4 percent slopes	Prime farmland if irrigated	14.3	0.1%
15	Bear Lake-Bear Lake, ponded complex, 0 to 1 percent slopes	Prime farmland if irrigated and drained	430.0	2.6%
16	Bear Lake-Chesbrook-La Roco complex, 0 to 2 percent slopes	Prime farmland if irrigated and drained	308.2	1.9%
17	Bear Lake-Lago complex, 0 to 2 percent slopes	Prime farmland if irrigated and drained	627.8	3.8%
29	Brifox-Lizdale complex, 4 to 12 percent slopes	Farmland of statewide importance, if irrigated	18.9	0.1%
30	Brifox-Niter complex, 4 to 12 percent slopes	Farmland of statewide importance, if irrigated	44.1	0.3%
31	Brifox-Niter complex, 12 to 25 percent slopes	Not prime farmland	4.7	0.0%
41	Cedarhill gravelly silt loam, 5 to 25 percent slopes	Not prime farmland	152.9	0.9%
47	Cedarhill-Clegg-Drage complex, 5 to 55 percent slopes	Not prime farmland	37.2	0.2%
58	Clegg silt loam, 4 to 20 percent slopes	Not prime farmland	443.0	2.7%
59	Clegg-Grecan complex, 4 to 20 percent slopes	Not prime farmland	2,355.2	14.4%
61	Crossley-Rock outcrop complex, 4 to 35 percent slopes	Not prime farmland	791.9	4.9%
63	Cupine-Dunford complex, 20 to 60 percent slopes	Not prime farmland	386.8	2.4%
67	Dinswamp mucky peat, 0 to 2 percent slopes	Farmland of statewide importance, if irrigated and drained	143.0	0.9%
77	Dranburn-Pontuge complex, 10 to 40 percent slopes	Not prime farmland	0.4	0.0%
83	Dutchcanyon gravelly silt loam, 4 to 12 percent slopes	Farmland of statewide importance, if irrigated	634.9	3.9%
84	Dutchcanyon-Frenchollow complex, 5 to 20 percent slopes	Farmland of statewide importance, if irrigated	212.0	1.3%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
87	Fishaven-Dutchcanyon complex, 8 to 20 percent slopes	Not prime farmland	210.1	1.3%
88	Frenchollow silty clay loam, 1 to 4 percent slopes	Farmland of statewide importance, if irrigated	266.0	1.6%
89	Frenchollow silty clay loam, 4 to 20 percent slopes	Not prime farmland	485.4	3.0%
105	Hutchley-Cupine-Vitale complex, 2 to 60 percent slopes	Not prime farmland	1,052.6	6.4%
113	Jacanyon-Cleavage complex, 10 to 50 percent slopes	Not prime farmland	80.7	0.5%
119	Joes silt loam, 1 to 4 percent slopes	Prime farmland if irrigated	421.8	2.6%
120	Joes silt loam, 4 to 15 percent slopes	Farmland of statewide importance, if irrigated	161.9	1.0%
125	Lag-Dollarhide-Rock outcrop complex, 5 to 60 percent slopes	Not prime farmland	9.2	0.1%
128	Lago-Bear Lake complex, 0 to 1 percent slopes	Prime farmland if irrigated and drained	791.6	4.8%
129	Lago-Merkley complex, 0 to 2 percent slopes	Prime farmland if irrigated and drained	361.6	2.2%
130	Lanoak silt loam, 1 to 4 percent slopes	Prime farmland if irrigated	173.5	1.1%
136	Leftfork-Cleavage complex, 5 to 40 percent slopes	Not prime farmland	117.2	0.7%
137	Lilcan-Rock outcrop-Jacanyon complex, 2 to 50 percent slopes	Not prime farmland	20.0	0.1%
145	Marshdale, occasionally flooded-Bloomcreek complex, 0 to 3 percent slopes	Prime farmland if irrigated and drained	133.3	0.8%
146	Merkley silt loam, 0 to 2 percent slopes	Prime farmland if irrigated	4.4	0.0%
152	Nielsen-Dranburn-Hagenbarth complex, 5 to 40 percent slopes	Not prime farmland	72.8	0.4%
184	Sadducee-Bearbeach complex, 0 to 2 percent slopes	Prime farmland if irrigated and drained	479.2	2.9%
187	Springhollow-Arbone complex, 4 to 12 percent slopes	Not prime farmland	49.6	0.3%
202	Swanpeak-Cloudless complex, 1 to 15 percent slopes	Not prime farmland	5.8	0.0%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
203	Swanpeak-Dutchcanyon complex, 20 to 35 percent slopes	Not prime farmland	1,012.5	6.2%
204	Swanpeak-Dutchcanyon-Ant Flat complex, 12 to 20 percent slopes	Not prime farmland	2,169.5	13.3%
205	Thatcher silt loam, 4 to 12 percent slopes	Not prime farmland	85.8	0.5%
209	Thatcher-Joes complex, 1 to 4 percent slopes	Prime farmland if irrigated	188.3	1.2%
225	Water	Not prime farmland	741.7	4.5%
226	Water, miscellaneous	Not prime farmland	19.1	0.1%
229	Wursten silt loam, 4 to 12 percent slopes	Not prime farmland	21.5	0.1%
230	Wursten silt loam, 12 to 20 percent slopes	Not prime farmland	4.3	0.0%
1069	Ireland, extremely stony surface-Drage family, complex, 15 to 35 percent slopes	Not prime farmland	213.4	1.3%
1069b	Ezbin family-Cavemountain, bouldery surface-Starley family, very stony surface, complex, 15 to 45 percent slopes	Not prime farmland	49.8	0.3%
38947	Spearhead family, very stony surface-Broad Canyon, very stony surface-Ezbin complex, 30 to 60 percent slopes, MLRA 47	Not prime farmland	48.4	0.3%
Subtotals for Soil Survey Area			**16,165.3**	**99.0%**
Totals for Area of Interest			**16,321.7**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
152-BL	Nielsen-Dranburn-Hagenbarth complex, 5 to 40 percent slopes	Not prime farmland	13.3	0.1%
1069	Ireland, extremely stony surface-Drage family, complex, 15 to 35 percent slopes	Not prime farmland	58.7	0.4%
1069b	Ezbin family-Cavemountain, bouldery surface-Starley family, very stony surface, complex, 15 to 45 percent slopes	Not prime farmland	32.0	0.2%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
38947	Spearhead family, very stony surface-Broad Canyon, very stony surface-Ezbin complex, 30 to 60 percent slopes, MLRA 47	Not prime farmland	11.6	0.1%
Subtotals for Soil Survey Area			**115.6**	**0.7%**
Totals for Area of Interest			**16,321.7**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
47	Cedarhill-Clegg-Drage complex, 5 to 55 percent slopes	Not prime farmland	2.0	0.0%
113	Jacanyon-Cleavage complex, 10 to 50 percent slopes	Not prime farmland	10.5	0.1%
125	Lag-Dollarhide-Rock outcrop complex, 5 to 60 percent slopes	Not prime farmland	2.2	0.0%
204	Swanpeak-Dutchcanyon-Ant Flat complex, 12 to 20 percent slopes	Not prime farmland	10.4	0.1%
205	Thatcher silt loam, 4 to 12 percent slopes	Not prime farmland	14.5	0.1%
TBD	Thatcher silt loam, warm, 10 to 25 percent slopes	Not prime farmland	0.9	0.0%
W	Water	Not prime farmland	0.1	0.0%
Subtotals for Soil Survey Area			**40.6**	**0.2%**
Totals for Area of Interest			**16,321.7**	**100.0%**

Rating Options—Farmland Classification

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Waste Management

Waste Management interpretations are tools designed to guide the user in evaluating soils for use of organic wastes and wastewater as productive resources. Example interpretations include land application of manure, food processing waste, and municipal sewage sludge, and disposal of wastewater by irrigation or overland flow process.

Disposal of Wastewater by Irrigation

Wastewater includes municipal and food-processing wastewater and effluent from lagoons or storage ponds. Municipal wastewater is the waste stream from a municipality. It contains domestic waste and may contain industrial waste. It may have received primary or secondary treatment. It is rarely untreated sewage. Food-processing wastewater results from the preparation of fruits, vegetables, milk, cheese, and meats for public consumption. In places it is high in content of sodium and chloride. The effluent in lagoons and storage ponds is from facilities used to treat or store food-processing wastewater or domestic or animal waste. Domestic and food-processing wastewater is very dilute, and the effluent from the facilities that treat or store it commonly is very low in content of carbonaceous and nitrogenous material; the content of nitrogen commonly ranges from 10 to 30 milligrams per liter. The wastewater from animal waste treatment lagoons or storage ponds, however, has much higher concentrations of these materials, mainly because the manure has not been diluted as much as the domestic waste. The content of nitrogen in this wastewater generally ranges from 50 to 2,000 milligrams per liter. When wastewater is applied, checks should be made to ensure that nitrogen, heavy metals, and salts are not added in excessive amounts.

Disposal of wastewater by irrigation not only disposes of municipal wastewater and wastewater from food-processing plants, lagoons, and storage ponds but also can improve crop production by increasing the amount of water available to crops. The ratings are based on the soil properties that affect the design, construction, management, and performance of the irrigation system. The properties that affect design and management include the sodium adsorption ratio, depth to a water table, ponding, available water capacity, saturated hydraulic conductivity (Ksat), slope, and flooding. The properties that affect construction include stones, cobbles, depth to bedrock or a cemented pan, depth to a water table, and ponding. The properties that affect performance include depth to bedrock or a cemented pan, bulk density, the sodium adsorption ratio, salinity, reaction, and the cation-exchange capacity, which is used to estimate the capacity of a soil to adsorb heavy metals. Permanently frozen soils are not suitable for disposal of wastewater by irrigation.

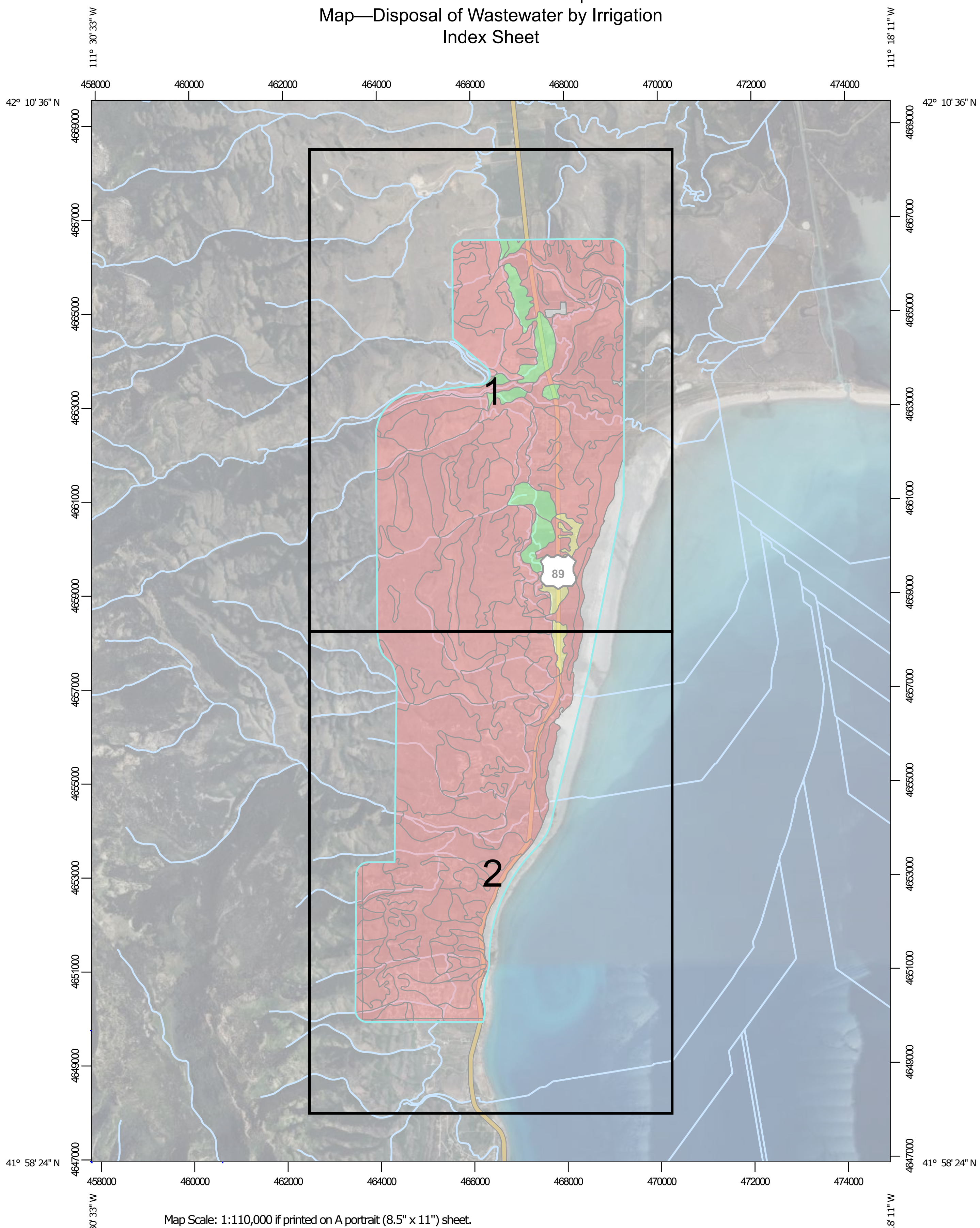
The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect agricultural waste management. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Custom Soil Resource Report
Map—Disposal of Wastewater by Irrigation
Index Sheet



Map Scale: 1:110,000 if printed on A portrait (8.5" x 11") sheet.

N

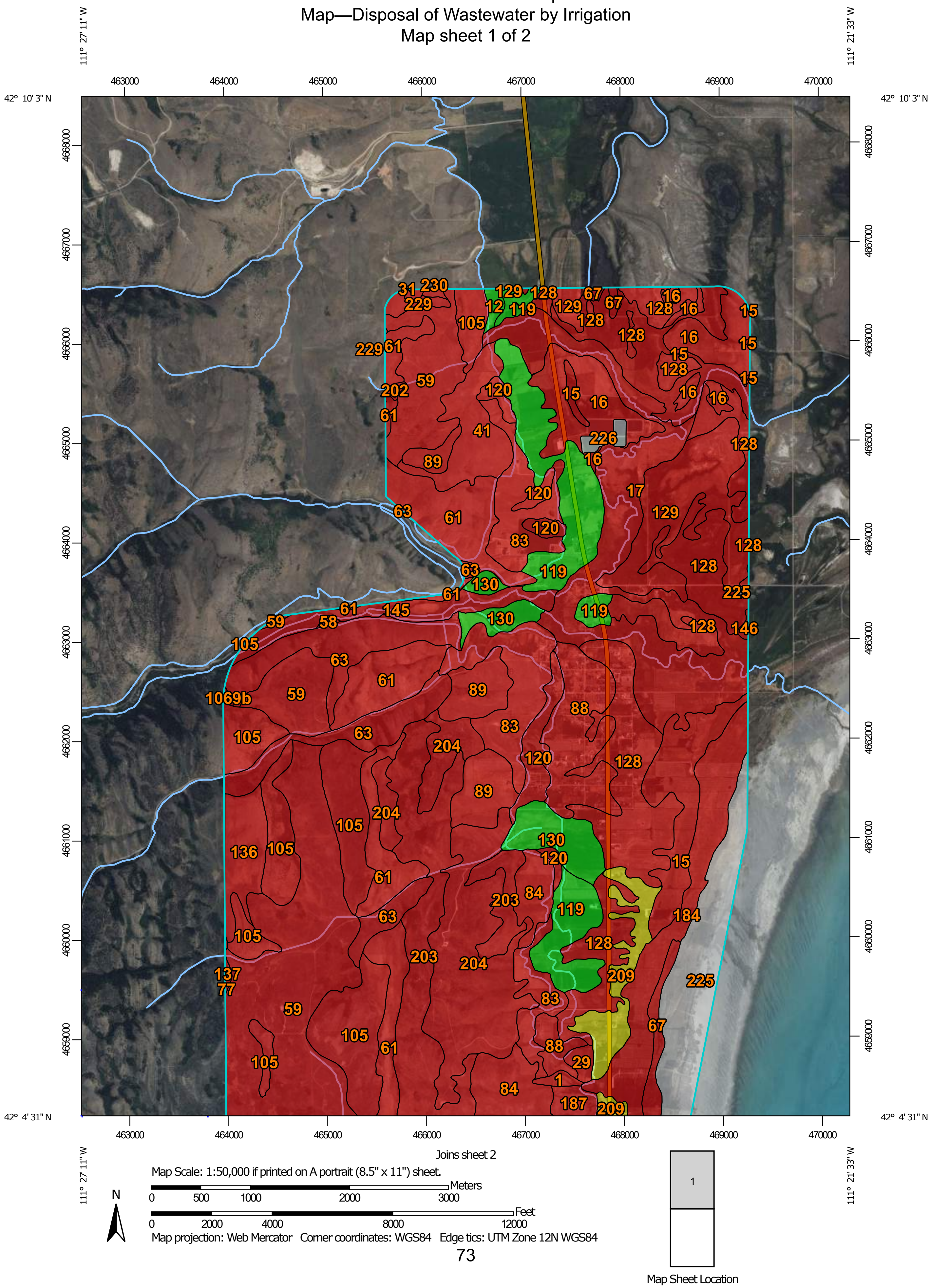
Meters: 0, 1500, 3000, 6000, 9000

Feet: 0, 5000, 10000, 20000, 30000

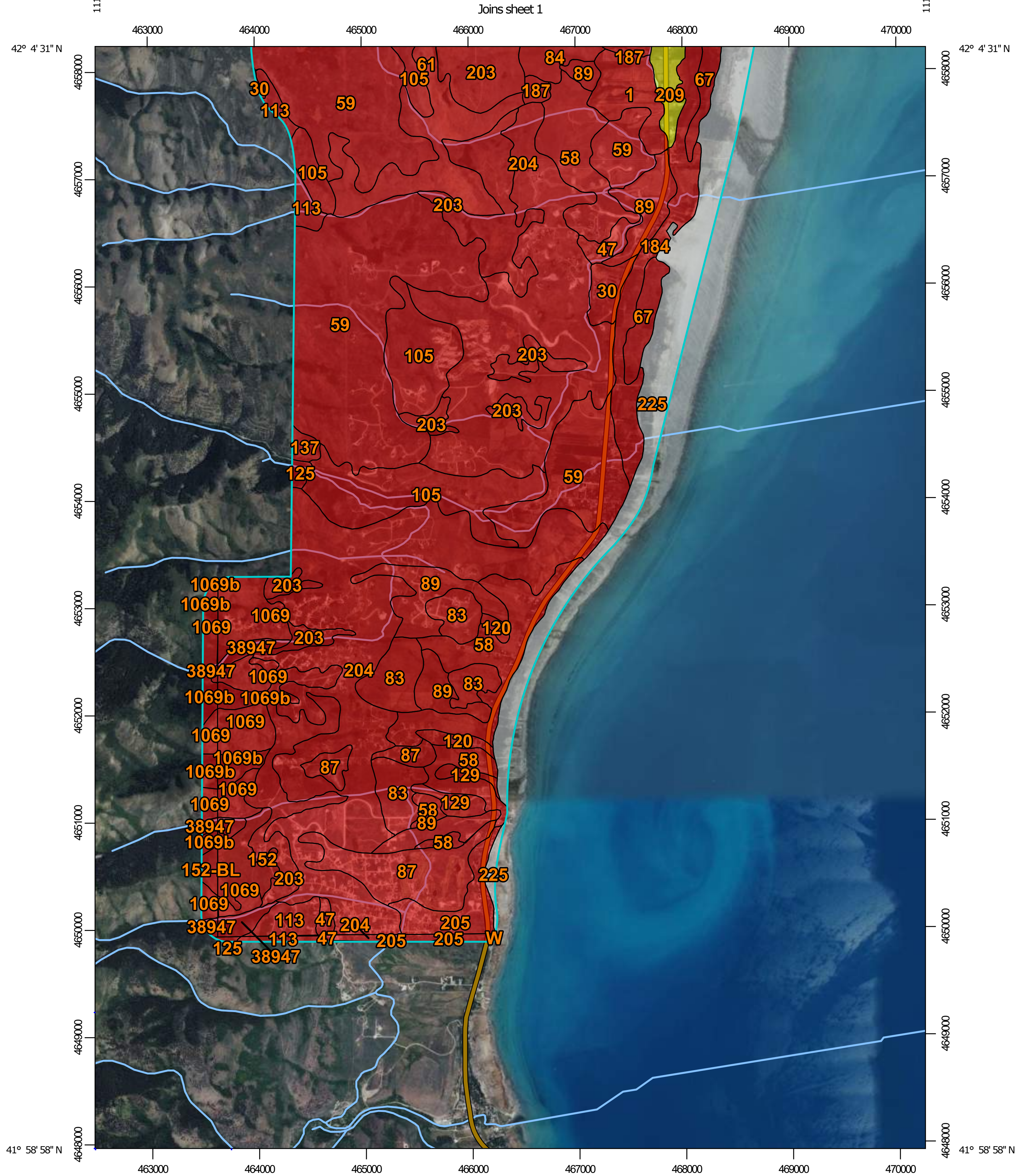
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

Map—Disposal of Wastewater by Irrigation

Map sheet 1 of 2



Custom Soil Resource Report
Map—Disposal of Wastewater by Irrigation
Map sheet 2 of 2



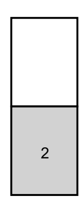
Map Scale: 1:50,000 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 500, 1000, 2000, 3000

Feet: 0, 2000, 4000, 8000, 12000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84



Map Sheet Location

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Soil Rating Lines

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Soil Rating Points

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Bear Lake County Area, Idaho
Survey Area Data: Version 11, Sep 6, 2022

Soil Survey Area: Caribou National Forest, Idaho and Wyoming
Survey Area Data: Version 10, Sep 6, 2022

Soil Survey Area: Rich County, Utah
Survey Area Data: Version 17, Aug 25, 2022

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 22, 2022—Aug 8, 2022

MAP LEGEND	MAP INFORMATION
	The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables—Disposal of Wastewater by Irrigation

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
1	Ant Flat silty clay loam, 1 to 4 percent slopes	Very limited	Ant Flat (75%)	Slow water movement (1.00)	108.7	0.7%
12	Bancroft silt loam, 1 to 4 percent slopes	Not limited	Bancroft (80%)		14.3	0.1%
15	Bear Lake-Bear Lake, ponded complex, 0 to 1 percent slopes	Very limited	Bear Lake (55%)	Depth to saturated zone (1.00)	430.0	2.6%
				Too acid (1.00)		
				Slow water movement (0.37)		
			Bear Lake, ponded (25%)	Ponding (1.00)		
				Depth to saturated zone (1.00)		
				Slow water movement (0.37)		
16	Bear Lake-Chesbrook-La Roco complex, 0 to 2 percent slopes	Very limited	Bear Lake (40%)	Depth to saturated zone (1.00)	308.2	1.9%
				Too acid (1.00)		
				Slow water movement (0.37)		
			Chesbrook (25%)	Depth to saturated zone (1.00)		
				Too acid (1.00)		
				Slow water movement (0.37)		
			La Roco (15%)	Filtering capacity (1.00)		
				Depth to saturated zone (0.86)		
				Slow water movement (0.37)		
			Bear Lake, ponded (5%)	Ponding (1.00)		
				Depth to saturated zone (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Slow water movement (0.37)		
17	Bear Lake-Lago complex, 0 to 2 percent slopes	Very limited	Bear Lake (50%)	Depth to saturated zone (1.00)	627.8	3.8%
				Too acid (1.00)		
				Slow water movement (0.37)		
			Lago (35%)	Depth to saturated zone (1.00)		
				Slow water movement (0.37)		
			Bear Lake, ponded (5%)	Ponding (1.00)		
				Depth to saturated zone (1.00)		
				Slow water movement (0.37)		
29	Brifox-Lizdale complex, 4 to 12 percent slopes	Very limited	Brifox (75%)	Slow water movement (1.00)	18.9	0.1%
				Too steep for surface application (1.00)		
				Too steep for sprinkler application (0.10)		
			Lizdale (20%)	Filtering capacity (1.00)		
				Too steep for surface application (1.00)		
				Droughty (0.32)		
				Seepage, porous bedrock (0.30)		
				Too steep for sprinkler application (0.10)		
30	Brifox-Niter complex, 4 to 12 percent slopes	Very limited	Brifox (45%)	Slow water movement (1.00)	44.1	0.3%

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Too steep for surface application (1.00)		
				Too steep for sprinkler application (0.10)		
			Niter (35%)	Slow water movement (1.00)		
				Too steep for surface application (1.00)		
				Too steep for sprinkler application (0.10)		
31	Brifox-Niter complex, 12 to 25 percent slopes	Very limited	Brifox (45%)	Slow water movement (1.00)	4.7	0.0%
				Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
			Niter (35%)	Slow water movement (1.00)		
				Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
41	Cedarhill gravelly silt loam, 5 to 25 percent slopes	Very limited	Cedarhill (90%)	Too steep for surface application (1.00)	152.9	0.9%
				Too steep for sprinkler application (0.90)		
				Droughty (0.75)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
47	Cedarhill-Clegg-Drage complex, 5 to 55 percent slopes	Very limited	Cedarhill (45%)	Too steep for surface application (1.00)	37.2	0.2%
				Too steep for sprinkler application (1.00)		
				Droughty (0.75)		
			Clegg (30%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Slow water movement (0.22)		
			Drage (20%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Slow water movement (0.22)		
				Droughty (0.02)		
58	Clegg silt loam, 4 to 20 percent slopes	Very limited	Clegg (90%)	Too steep for surface application (1.00)	443.0	2.7%
				Too steep for sprinkler application (0.78)		
				Slow water movement (0.22)		
59	Clegg-Grecan complex, 4 to 20 percent slopes	Very limited	Clegg (50%)	Too steep for surface application (1.00)	2,355.2	14.4%
				Too steep for sprinkler application (0.98)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Slow water movement (0.37)		
			Grecan (35%)	Slow water movement (1.00)		
				Too steep for surface application (1.00)		
				Too steep for sprinkler application (0.98)		
				Too acid (0.08)		
61	Crossley-Rock outcrop complex, 4 to 35 percent slopes	Very limited	Crossley (70%)	Low adsorption (1.00)	791.9	4.9%
				Large stones on the surface (1.00)		
				Droughty (1.00)		
				Depth to bedrock (1.00)		
				Too steep for surface application (1.00)		
63	Cupine-Dunford complex, 20 to 60 percent slopes	Very limited	Cupine (45%)	Droughty (1.00)	386.8	2.4%
				Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Depth to bedrock (0.95)		
			Dunford (25%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Depth to bedrock (0.71)		
				Droughty (0.41)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Large stones on the surface (0.34)		
67	Dinswamp mucky peat, 0 to 2 percent slopes	Very limited	Dinswamp (75%)	Ponding (1.00)	143.0	0.9%
				Depth to saturated zone (1.00)		
				Sodium content (1.00)		
				Slow water movement (0.37)		
			Bear Lake, ponded (5%)	Ponding (1.00)		
				Depth to saturated zone (1.00)		
				Slow water movement (0.37)		
			Chesbrook (5%)	Depth to saturated zone (1.00)		
				Too acid (1.00)		
				Slow water movement (0.37)		
			Bloomington (5%)	Ponding (1.00)		
				Depth to saturated zone (1.00)		
				Slow water movement (0.37)		
			Dingle (5%)	Ponding (1.00)		
				Depth to saturated zone (1.00)		
				Slow water movement (0.37)		
77	Dranburn-Pontuge complex, 10 to 40 percent slopes	Very limited	Dranburn (60%)	Too steep for surface application (1.00)	0.4	0.0%
				Too acid (1.00)		
				Too steep for sprinkler application (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Slow water movement (0.22)		
			Pontuge (30%)	Filtering capacity (1.00)		
				Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Droughty (0.25)		
83	Dutchcanyon gravelly silt loam, 4 to 12 percent slopes	Very limited	Dutchcanyon (85%)	Too steep for surface application (1.00)	634.9	3.9%
				Too steep for sprinkler application (0.10)		
84	Dutchcanyon-Frenchollow complex, 5 to 20 percent slopes	Very limited	Dutchcanyon (45%)	Too steep for surface application (1.00)	212.0	1.3%
				Too steep for sprinkler application (0.40)		
			Frenchollow (35%)	Slow water movement (1.00)		
				Too steep for surface application (1.00)		
				Too steep for sprinkler application (0.40)		
87	Fishaven-Dutchcanyon complex, 8 to 20 percent slopes	Very limited	Fishaven (70%)	Too steep for surface application (1.00)	210.1	1.3%
				Too steep for sprinkler application (0.98)		
				Droughty (0.91)		
				Depth to bedrock (0.71)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
			Dutchcanyon (20%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (0.98)		
88	Frenchollow silty clay loam, 1 to 4 percent slopes	Very limited	Frenchollow (85%)	Slow water movement (1.00)	266.0	1.6%
89	Frenchollow silty clay loam, 4 to 20 percent slopes	Very limited	Frenchollow (85%)	Slow water movement (1.00)	485.4	3.0%
				Too steep for surface application (1.00)		
				Too steep for sprinkler application (0.78)		
105	Hutchley-Cupine-Vitale complex, 2 to 60 percent slopes	Very limited	Hutchley (30%)	Droughty (1.00)	1,052.6	6.4%
				Depth to bedrock (1.00)		
				Slow water movement (1.00)		
				Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
			Cupine (25%)	Droughty (1.00)		
				Too steep for surface application (1.00)		
				Slow water movement (1.00)		
				Too steep for sprinkler application (1.00)		
				Depth to bedrock (0.95)		
			Vitale (20%)	Droughty (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Slow water movement (1.00)		
				Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Depth to bedrock (0.46)		
113	Jacanyon-Cleavage complex, 10 to 50 percent slopes	Very limited	Jacanyon (65%)	Too steep for surface application (1.00)	80.7	0.5%
				Too steep for sprinkler application (1.00)		
				Slow water movement (0.31)		
				Depth to bedrock (0.10)		
				Droughty (0.03)		
			Cleavage (25%)	Droughty (1.00)		
				Too steep for surface application (1.00)		
				Depth to bedrock (1.00)		
				Too steep for sprinkler application (1.00)		
				Slow water movement (0.37)		
119	Joes silt loam, 1 to 4 percent slopes	Not limited	Joes (75%)		421.8	2.6%
120	Joes silt loam, 4 to 15 percent slopes	Very limited	Joes (75%)	Too steep for surface application (1.00)	161.9	1.0%
				Too steep for sprinkler application (0.10)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
125	Lag-Dollarhide-Rock outcrop complex, 5 to 60 percent slopes	Very limited	Lag (40%)	Too acid (1.00)	9.2	0.1%
				Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Droughty (0.40)		
			Dollarhide (35%)	Droughty (1.00)		
				Depth to bedrock (1.00)		
				Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Cobble content (0.05)		
128	Lago-Bear Lake complex, 0 to 1 percent slopes	Very limited	Lago (65%)	Depth to saturated zone (1.00)	791.6	4.8%
				Slow water movement (0.37)		
			Bear Lake (25%)	Depth to saturated zone (1.00)		
				Too acid (1.00)		
				Slow water movement (0.37)		
129	Lago-Merkley complex, 0 to 2 percent slopes	Very limited	Lago (60%)	Depth to saturated zone (1.00)	361.6	2.2%
				Slow water movement (0.37)		
			Merkley (30%)	Filtering capacity (1.00)		
			Bear Lake (5%)	Depth to saturated zone (1.00)		
				Too acid (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Slow water movement (0.37)		
130	Lanoak silt loam, 1 to 4 percent slopes	Not limited	Lanoak (80%)		173.5	1.1%
136	Leftfork-Cleavage complex, 5 to 40 percent slopes	Very limited	Leftfork (60%)	Slow water movement (1.00)	117.2	0.7%
				Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Droughty (0.23)		
				Too acid (0.08)		
			Cleavage (25%)	Droughty (1.00)		
				Depth to bedrock (1.00)		
				Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Slow water movement (0.37)		
137	Lilcan-Rock outcrop-Jacanyon complex, 2 to 50 percent slopes	Very limited	Lilcan (60%)	Droughty (1.00)	20.0	0.1%
				Depth to bedrock (1.00)		
				Slow water movement (1.00)		
				Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
			Jacanyon (15%)	Too steep for surface application (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Too steep for sprinkler application (1.00)		
				Slow water movement (1.00)		
				Droughty (0.10)		
				Depth to bedrock (0.10)		
145	Marshdale, occasionally flooded-Bloomcreek complex, 0 to 3 percent slopes	Very limited	Marshdale, occasionally flooded (45%)	Filtering capacity (1.00)	133.3	0.8%
				Depth to saturated zone (1.00)		
				Too acid (1.00)		
				Flooding (0.60)		
				Slow water movement (0.22)		
			Bloomcreek (30%)	Depth to saturated zone (1.00)		
				Too acid (0.21)		
				No filtering capacity limitation (0.00)		
			Bearbou (10%)	Depth to saturated zone (1.00)		
				Slow water movement (1.00)		
			Thomasfork (5%)	Depth to saturated zone (1.00)		
				Slow water movement (1.00)		
146	Merkley silt loam, 0 to 2 percent slopes	Very limited	Merkley (85%)	Filtering capacity (1.00)	4.4	0.0%
152	Nielsen-Dranburn-Hagenbarth complex, 5 to 40 percent slopes	Very limited	Nielsen (45%)	Droughty (1.00)	72.8	0.4%
				Depth to bedrock (1.00)		
				Too steep for surface application (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Slow water movement (1.00)		
				Too steep for sprinkler application (1.00)		
			Dranburn (20%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Too acid (1.00)		
				Slow water movement (0.22)		
			Hagenbarth (15%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Slow water movement (0.22)		
184	Sadducee-Bearbeach complex, 0 to 2 percent slopes	Very limited	Sadducee (55%)	Filtering capacity (1.00)	479.2	2.9%
				Depth to saturated zone (1.00)		
			Bearbeach (45%)	Filtering capacity (1.00)		
				Depth to saturated zone (1.00)		
				Droughty (1.00)		
187	Springhollow-Arbone complex, 4 to 12 percent slopes	Very limited	Springhollow (45%)	Slow water movement (1.00)	49.6	0.3%
				Too steep for surface application (0.92)		
				Droughty (0.12)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Depth to cemented pan (0.06)		
				Too steep for sprinkler application (0.03)		
			Arbone (40%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (0.10)		
202	Swanpeak-Cloudless complex, 1 to 15 percent slopes	Very limited	Swanpeak (50%)	Slow water movement (1.00)	5.8	0.0%
				Too steep for surface application (1.00)		
				Too steep for sprinkler application (0.40)		
				Cobble content (0.08)		
			Cloudless (30%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (0.40)		
				Slow water movement (0.37)		
203	Swanpeak-Dutchcanyon complex, 20 to 35 percent slopes	Very limited	Swanpeak (70%)	Too steep for surface application (1.00)	1,012.5	6.2%
				Too steep for sprinkler application (1.00)		
				Slow water movement (1.00)		
				Cobble content (0.08)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
			Dutchcanyon (20%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
204	Swanpeak-Dutchcanyon-Ant Flat complex, 12 to 20 percent slopes	Very limited	Swanpeak (45%)	Too steep for surface application (1.00)	2,169.5	13.3%
				Slow water movement (1.00)		
				Too steep for sprinkler application (1.00)		
				Cobble content (0.08)		
			Dutchcanyon (30%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
			Ant Flat (25%)	Too steep for surface application (1.00)		
				Slow water movement (1.00)		
				Too steep for sprinkler application (1.00)		
205	Thatcher silt loam, 4 to 12 percent slopes	Very limited	Thatcher (85%)	Too steep for surface application (1.00)	85.8	0.5%
				Slow water movement (0.37)		
				Too steep for sprinkler application (0.10)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
209	Thatcher-Joes complex, 1 to 4 percent slopes	Somewhat limited	Thatcher (60%)	Slow water movement (0.37)	188.3	1.2%
225	Water	Not rated	Water (100%)		741.7	4.5%
226	Water, miscellaneous	Not rated	Water, miscellaneous (100%)		19.1	0.1%
229	Wursten silt loam, 4 to 12 percent slopes	Very limited	Wursten (80%)	Too steep for surface application (1.00)	21.5	0.1%
				Too steep for sprinkler application (0.40)		
230	Wursten silt loam, 12 to 20 percent slopes	Very limited	Wursten (80%)	Too steep for surface application (1.00)	4.3	0.0%
				Too steep for sprinkler application (1.00)		
1069	Ireland, extremely stony surface-Drage family, complex, 15 to 35 percent slopes	Very limited	Ireland, extremely stony surface (40%)	Too steep for surface application (1.00)	213.4	1.3%
				Too steep for sprinkler application (1.00)		
				Droughty (1.00)		
				Too acid (1.00)		
				Slow water movement (1.00)		
			Drage (30%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Slow water movement (0.22)		
				Droughty (0.02)		
1069b	Ezbin family-Cavemountain, bouldery surface-Starley	Very limited	Ezbin (45%)	Too steep for surface application (1.00)	49.8	0.3%

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
	family, very stony surface, complex, 15 to 45 percent slopes			Too steep for sprinkler application (1.00)		
				Too acid (1.00)		
				Slow water movement (0.22)		
				Droughty (0.01)		
			Cavemountain, bouldery surface (40%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Slow water movement (1.00)		
				Droughty (0.67)		
				Depth to bedrock (0.03)		
			Starley, very stony surface (15%)	Depth to bedrock (1.00)		
				Droughty (1.00)		
				Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Too acid (1.00)		
38947	Spearhead family, very stony surface-Broad Canyon, very stony surface-Ezbin complex, 30 to 60 percent slopes, MLRA 47	Very limited	Spearhead, very stony surface (35%)	Too steep for surface application (1.00)	48.4	0.3%
				Too steep for sprinkler application (1.00)		
				Too acid (1.00)		
				Seepage, porous bedrock (0.30)		
			Broad Canyon, very stony surface (30%)	Too steep for surface application (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Too steep for sprinkler application (1.00)		
				Too acid (1.00)		
				No filtering capacity limitation (0.00)		
			Ezbin (20%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Too acid (1.00)		
				Slow water movement (0.22)		
				Droughty (0.01)		
Subtotals for Soil Survey Area					**16,165.3**	**99.0%**
Totals for Area of Interest					**16,321.7**	**100.0%**

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
152-BL	Nielsen-Dranburn-Hagenbarth complex, 5 to 40 percent slopes	Very limited	Nielsen (45%)	Droughty (1.00)	13.3	0.1%
				Depth to bedrock (1.00)		
				Too steep for surface application (1.00)		
				Slow water movement (1.00)		
				Too steep for sprinkler application (1.00)		
			Dranburn (20%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Too acid (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Slow water movement (0.22)		
			Hagenbarth (15%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Slow water movement (0.22)		
1069	Ireland, extremely stony surface-Drage family, complex, 15 to 35 percent slopes	Very limited	Ireland, extremely stony surface (40%)	Too steep for surface application (1.00)	58.7	0.4%
				Too steep for sprinkler application (1.00)		
				Droughty (1.00)		
				Too acid (1.00)		
				Slow water movement (1.00)		
			Drage (30%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Slow water movement (0.22)		
				Droughty (0.02)		
			Sessions (10%)	Slow water movement (1.00)		
				Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Seepage, porous bedrock (0.30)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
			Ireland, extremely stony surface, steep (10%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Droughty (1.00)		
				Too acid (1.00)		
				Slow water movement (1.00)		
			Dranburn (10%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Too acid (1.00)		
				Seepage, porous bedrock (0.30)		
				Slow water movement (0.22)		
1069b	Ezbin family-Cavemountain, bouldery surface-Starley family, very stony surface, complex, 15 to 45 percent slopes	Very limited	Ezbin (45%)	Too steep for surface application (1.00)	32.0	0.2%
				Too steep for sprinkler application (1.00)		
				Too acid (1.00)		
				Slow water movement (0.22)		
				Droughty (0.01)		
			Cavemountain, bouldery surface (40%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Slow water movement (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Droughty (0.67)		
				Depth to bedrock (0.03)		
			Starley, very stony surface (15%)	Depth to bedrock (1.00)		
				Droughty (1.00)		
				Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Too acid (1.00)		
38947	Spearhead family, very stony surface-Broad Canyon, very stony surface-Ezbin complex, 30 to 60 percent slopes, MLRA 47	Very limited	Spearhead, very stony surface (35%)	Too steep for surface application (1.00)	11.6	0.1%
				Too steep for sprinkler application (1.00)		
				Too acid (1.00)		
				Seepage, porous bedrock (0.30)		
			Broad Canyon, very stony surface (30%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Too acid (1.00)		
				No filtering capacity limitation (0.00)		
			Ezbin (20%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Too acid (1.00)		
				Slow water movement (0.22)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Droughty (0.01)		
			Booneville (5%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Too acid (1.00)		
				Slow water movement (0.22)		
			Hondoho (4%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
			Starley (4%)	Depth to bedrock (1.00)		
				Droughty (1.00)		
				Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Too acid (1.00)		
Subtotals for Soil Survey Area					**115.6**	**0.7%**
Totals for Area of Interest					**16,321.7**	**100.0%**

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
47	Cedarhill-Clegg-Drage complex, 5 to 55 percent slopes	Very limited	Cedarhill (45%)	Too steep for surface application (1.00)	2.0	0.0%
				Too steep for sprinkler application (1.00)		
				Seepage, porous bedrock (0.30)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Large stones on the surface (0.07)		
				Droughty (0.06)		
			Clegg (30%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Slow water movement (0.37)		
			Drage (20%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Slow water movement (0.37)		
			Cloudless (5%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (0.40)		
				Slow water movement (0.37)		
113	Jacanyon-Cleavage complex, 10 to 50 percent slopes	Very limited	Jacanyon (65%)	Too steep for surface application (1.00)	10.5	0.1%
				Too steep for sprinkler application (1.00)		
				Slow water movement (0.31)		
				Depth to bedrock (0.10)		
				Droughty (0.03)		
			Cleavage (25%)	Droughty (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Too steep for surface application (1.00)		
				Depth to bedrock (1.00)		
				Too steep for sprinkler application (1.00)		
				Slow water movement (0.37)		
			Dry Canyon (5%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Slow water movement (0.32)		
				Too acid (0.21)		
125	Lag-Dollarhide-Rock outcrop complex, 5 to 60 percent slopes	Very limited	Lag (40%)	Too acid (1.00)	2.2	0.0%
				Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Droughty (0.40)		
			Dollarhide (35%)	Droughty (1.00)		
				Depth to bedrock (1.00)		
				Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
				Cobble content (0.05)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
			Grunder (10%)	Too steep for surface application (1.00)		
				Too acid (1.00)		
				Too steep for sprinkler application (1.00)		
				Depth to bedrock (0.80)		
				Slow water movement (0.32)		
204	Swanpeak-Dutchcanyon-Ant Flat complex, 12 to 20 percent slopes	Very limited	Swanpeak (45%)	Too steep for surface application (1.00)	10.4	0.1%
				Slow water movement (1.00)		
				Too steep for sprinkler application (1.00)		
				Cobble content (0.08)		
			Dutchcanyon (30%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (1.00)		
			Ant Flat (25%)	Too steep for surface application (1.00)		
				Slow water movement (1.00)		
				Too steep for sprinkler application (1.00)		
205	Thatcher silt loam, 4 to 12 percent slopes	Very limited	Thatcher (85%)	Too steep for surface application (1.00)	14.5	0.1%
				Slow water movement (0.37)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Too steep for sprinkler application (0.10)		
			Buist (5%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (0.10)		
				Droughty (0.08)		
			Bezzant (5%)	Too steep for surface application (1.00)		
				Too steep for sprinkler application (0.10)		
			Vicking (5%)	Too steep for surface application (1.00)		
				Slow water movement (0.37)		
				Too steep for sprinkler application (0.10)		
TBD	Thatcher silt loam, warm, 10 to 25 percent slopes	Very limited	Thatcher (90%)	Too steep for surface application (1.00)	0.9	0.0%
				Too steep for sprinkler application (1.00)		
				Slow water movement (0.31)		
W	Water	Not rated	Water (100%)		0.1	0.0%
Subtotals for Soil Survey Area					**40.6**	**0.2%**
Totals for Area of Interest					**16,321.7**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Very limited	14,762.7	90.4%
Not limited	609.6	3.7%

Rating	Acres in AOI	Percent of AOI
Somewhat limited	188.3	1.2%
Null or Not Rated	760.9	4.7%
Totals for Area of Interest	**16,321.7**	**100.0%**

Rating Options—Disposal of Wastewater by Irrigation

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Land Application of Municipal Sewage Sludge

Application of sewage sludge not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. Sewage sludge is the residual product of the treatment of municipal sewage. The solid component consists mainly of cell mass, primarily bacteria cells that developed during secondary treatment and have incorporated soluble organics into their own bodies. The sludge has small amounts of sand, silt, and other solid debris. The content of nitrogen varies. Some sludge has constituents that are toxic to plants or hazardous to the food chain, such as heavy metals and exotic organic compounds, and should be analyzed chemically prior to use.

The content of water in the sludge ranges from about 98 percent to less than 40 percent. The sludge is considered liquid if it is more than about 90 percent water, slurry if it is about 50 to 90 percent water, and solid if it is less than about 50 percent water.

The ratings are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the sludge is applied, and the method by which the sludge is applied. The properties that affect absorption, plant growth, and microbial activity include saturated hydraulic conductivity (Ksat), depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, available water capacity, reaction, salinity, and bulk density. The wind erodibility group, soil erosion factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of sludge. Permanently frozen soils are unsuitable for waste treatment.

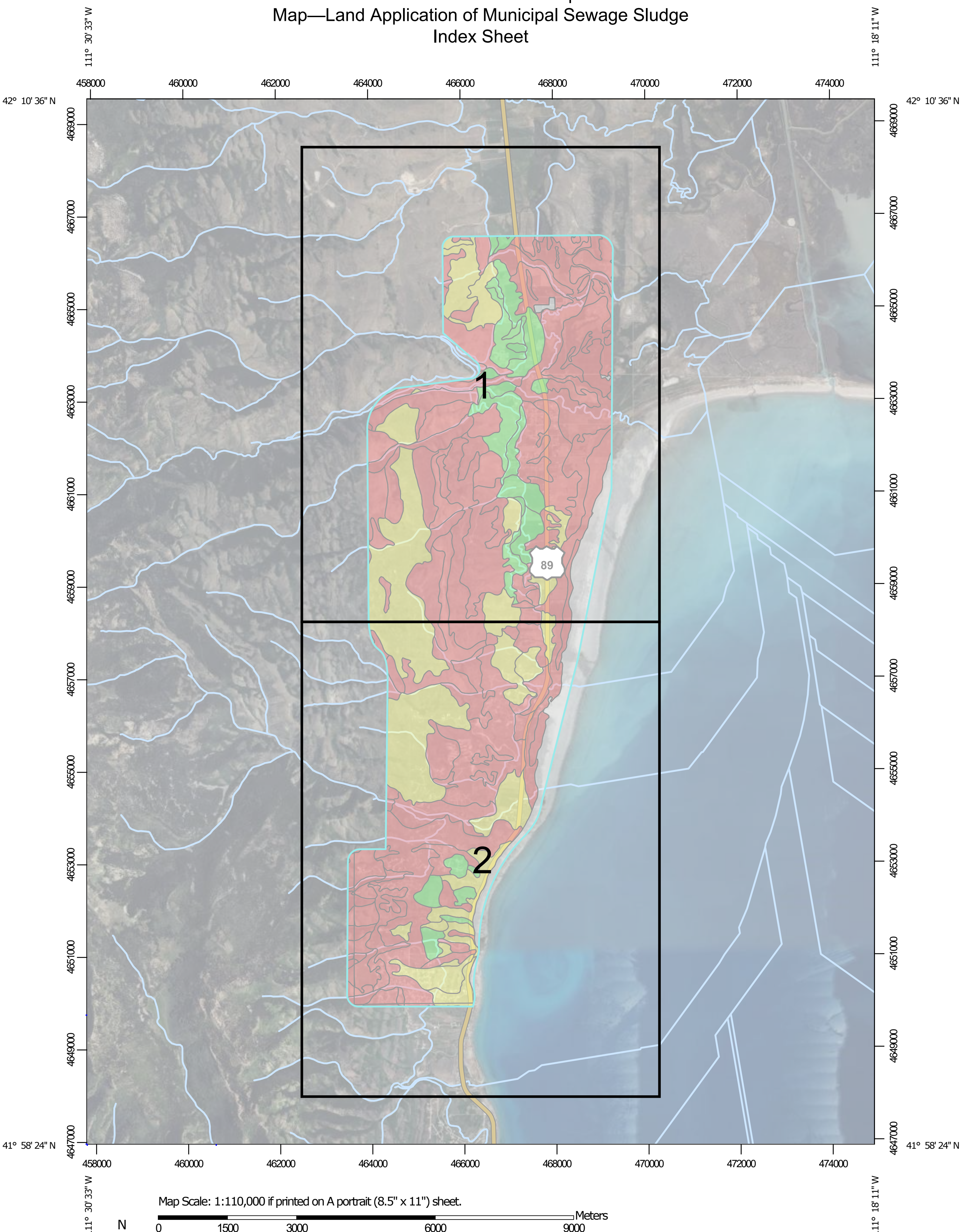
The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect agricultural waste management. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Map—Land Application of Municipal Sewage Sludge
Index Sheet



Map Scale: 1:110,000 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 1500, 3000, 6000, 9000

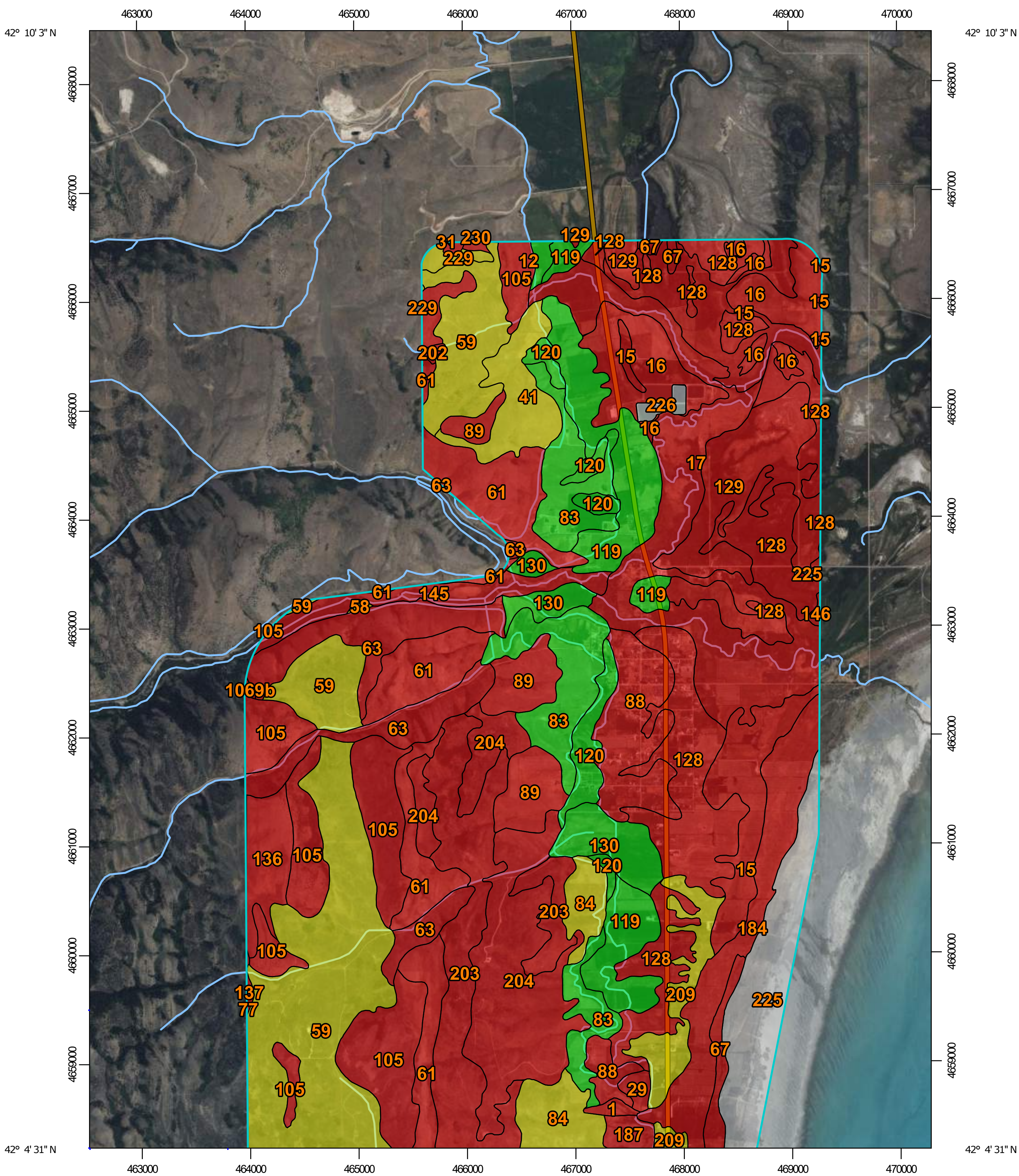
Feet: 0, 5000, 10000, 20000, 30000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

Map—Land Application of Municipal Sewage Sludge

Map sheet 1 of 2



Joins sheet 2

Map Scale: 1:50,000 if printed on A portrait (8.5" x 11") sheet.

0 500 1000 2000 3000 Meters

0 2000 4000 8000 12000 Feet

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

1

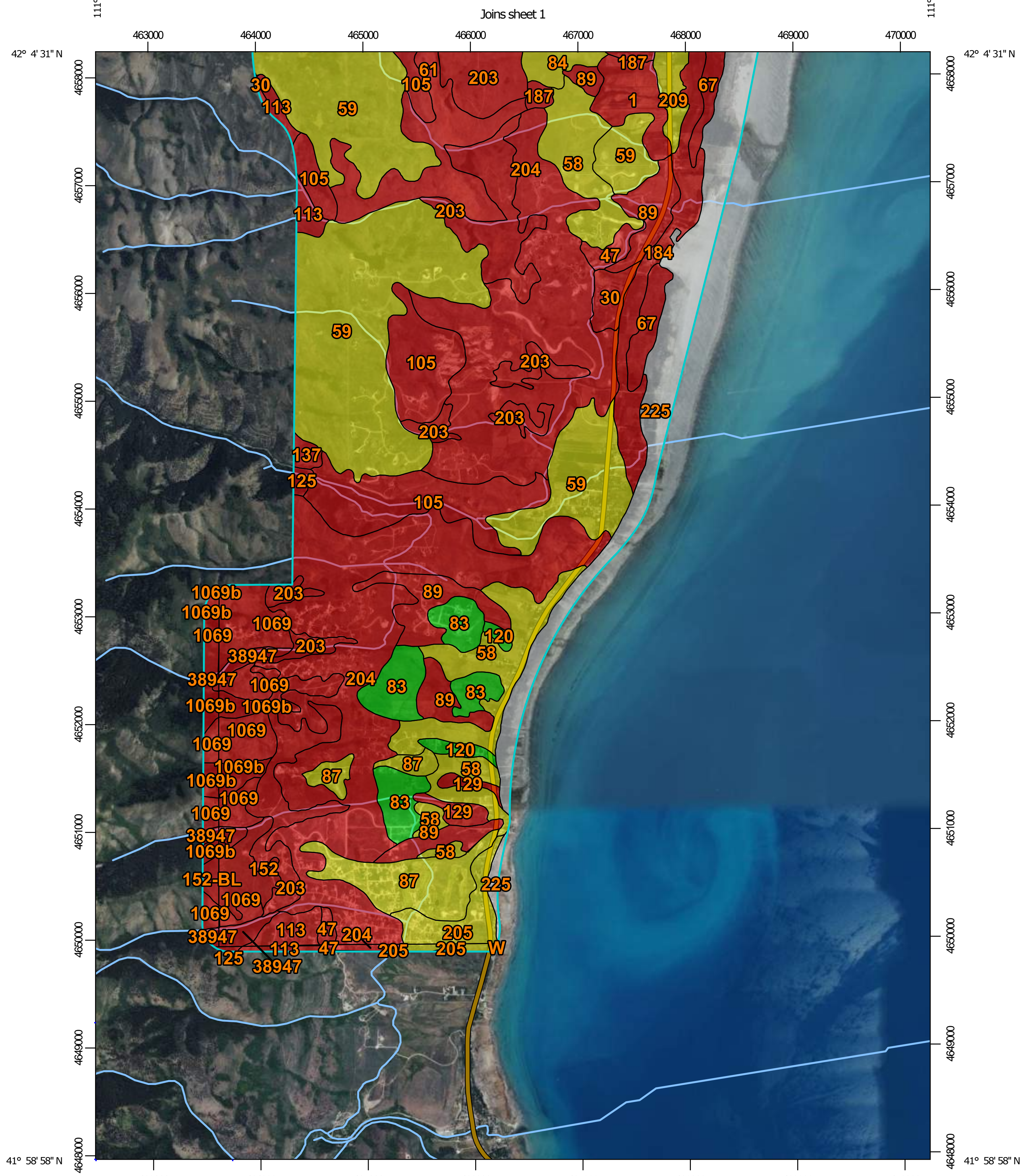
Map Sheet Location

111° 27' 11" W

111° 21' 33" W

Map—Land Application of Municipal Sewage Sludge

Map sheet 2 of 2

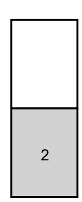


Map Scale: 1:50,000 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 500, 1000, 2000, 3000

Feet: 0, 2000, 4000, 8000, 12000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84



Map Sheet Location

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Soil Rating Lines

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Soil Rating Points

- Very limited
- Somewhat limited
- Not limited
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Bear Lake County Area, Idaho
Survey Area Data: Version 11, Sep 6, 2022

Soil Survey Area: Caribou National Forest, Idaho and Wyoming
Survey Area Data: Version 10, Sep 6, 2022

Soil Survey Area: Rich County, Utah
Survey Area Data: Version 17, Aug 25, 2022

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 22, 2022—Aug 8, 2022

MAP LEGEND	MAP INFORMATION
	The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables—Land Application of Municipal Sewage Sludge

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
1	Ant Flat silty clay loam, 1 to 4 percent slopes	Very limited	Ant Flat (75%)	Slow water movement (1.00)	108.7	0.7%
12	Bancroft silt loam, 1 to 4 percent slopes	Not limited	Bancroft (80%)		14.3	0.1%
15	Bear Lake-Bear Lake, ponded complex, 0 to 1 percent slopes	Very limited	Bear Lake (55%)	Depth to saturated zone (1.00)	430.0	2.6%
				Too acid (1.00)		
				Flooding (0.40)		
				Slow water movement (0.37)		
			Bear Lake, ponded (25%)	Ponding (1.00)		
				Depth to saturated zone (1.00)		
				Flooding (0.40)		
				Slow water movement (0.37)		
16	Bear Lake-Chesbrook-La Roco complex, 0 to 2 percent slopes	Very limited	Bear Lake (40%)	Depth to saturated zone (1.00)	308.2	1.9%
				Too acid (1.00)		
				Flooding (0.40)		
				Slow water movement (0.37)		
			Chesbrook (25%)	Depth to saturated zone (1.00)		
				Too acid (1.00)		
				Flooding (0.40)		
				Slow water movement (0.37)		
			La Roco (15%)	Filtering capacity (1.00)		
				Depth to saturated zone (0.86)		
				Flooding (0.40)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Slow water movement (0.37)		
			Bear Lake, ponded (5%)	Ponding (1.00)		
				Depth to saturated zone (1.00)		
				Flooding (0.40)		
				Slow water movement (0.37)		
17	Bear Lake-Lago complex, 0 to 2 percent slopes	Very limited	Bear Lake (50%)	Depth to saturated zone (1.00)	627.8	3.8%
				Too acid (1.00)		
				Flooding (0.40)		
				Slow water movement (0.37)		
			Lago (35%)	Depth to saturated zone (1.00)		
				Flooding (0.40)		
				Slow water movement (0.37)		
			Bear Lake, ponded (5%)	Ponding (1.00)		
				Depth to saturated zone (1.00)		
				Flooding (0.40)		
				Slow water movement (0.37)		
29	Brifox-Lizdale complex, 4 to 12 percent slopes	Very limited	Brifox (75%)	Slow water movement (1.00)	18.9	0.1%
			Lizdale (20%)	Filtering capacity (1.00)		
				Droughty (0.32)		
30	Brifox-Niter complex, 4 to 12 percent slopes	Very limited	Brifox (45%)	Slow water movement (1.00)	44.1	0.3%
			Niter (35%)	Slow water movement (1.00)		
31	Brifox-Niter complex, 12 to	Very limited	Brifox (45%)	Slow water movement (1.00)	4.7	0.0%

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
	25 percent slopes			Slope (1.00)		
			Niter (35%)	Slow water movement (1.00)		
				Slope (1.00)		
41	Cedarhill gravelly silt loam, 5 to 25 percent slopes	Somewhat limited	Cedarhill (90%)	Slope (0.84)	152.9	0.9%
				Droughty (0.75)		
47	Cedarhill-Clegg-Drage complex, 5 to 55 percent slopes	Very limited	Cedarhill (45%)	Slope (1.00)	37.2	0.2%
				Droughty (0.75)		
			Clegg (30%)	Slope (1.00)		
				Slow water movement (0.22)		
			Drage (20%)	Slope (1.00)		
				Slow water movement (0.22)		
				Droughty (0.02)		
58	Clegg silt loam, 4 to 20 percent slopes	Somewhat limited	Clegg (90%)	Slope (0.63)	443.0	2.7%
				Slow water movement (0.22)		
59	Clegg-Grecan complex, 4 to 20 percent slopes	Somewhat limited	Clegg (50%)	Slope (0.96)	2,355.2	14.4%
				Slow water movement (0.37)		
61	Crossley-Rock outcrop complex, 4 to 35 percent slopes	Very limited	Crossley (70%)	Limiting adsorption (1.00)	791.9	4.9%
				Large stones on the surface (1.00)		
				Droughty (1.00)		
				Depth to bedrock (1.00)		
				Slope (1.00)		
63	Cupine-Dunford complex, 20 to 60 percent slopes	Very limited	Cupine (45%)	Droughty (1.00)	386.8	2.4%
				Slope (1.00)		
				Depth to bedrock (0.95)		
			Dunford (25%)	Slope (1.00)		
				Depth to bedrock (0.71)		
				Droughty (0.41)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Large stones on the surface (0.34)		
				Slow water movement (0.32)		
67	Dinswamp mucky peat, 0 to 2 percent slopes	Very limited	Dinswamp (75%)	Ponding (1.00)	143.0	0.9%
				Depth to saturated zone (1.00)		
				Sodium content (1.00)		
				Slow water movement (0.37)		
			Bear Lake, ponded (5%)	Ponding (1.00)		
				Depth to saturated zone (1.00)		
				Flooding (0.40)		
				Slow water movement (0.37)		
			Chesbrook (5%)	Depth to saturated zone (1.00)		
				Too acid (1.00)		
				Flooding (0.40)		
				Slow water movement (0.37)		
			Bloomington (5%)	Ponding (1.00)		
				Depth to saturated zone (1.00)		
				Slow water movement (0.37)		
			Dingle (5%)	Ponding (1.00)		
				Depth to saturated zone (1.00)		
				Slow water movement (0.37)		
77	Dranburn-Pontuge complex, 10 to 40 percent slopes	Very limited	Dranburn (60%)	Too acid (1.00)	0.4	0.0%
				Slope (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Slow water movement (0.22)		
			Pontuge (30%)	Filtering capacity (1.00)		
				Slope (1.00)		
				Droughty (0.25)		
83	Dutchcanyon gravelly silt loam, 4 to 12 percent slopes	Not limited	Dutchcanyon (85%)		634.9	3.9%
84	Dutchcanyon-Frenchollow complex, 5 to 20 percent slopes	Somewhat limited	Dutchcanyon (45%)	Slope (0.16)	212.0	1.3%
87	Fishaven-Dutchcanyon complex, 8 to 20 percent slopes	Somewhat limited	Fishaven (70%)	Slope (0.96)	210.1	1.3%
				Droughty (0.91)		
				Depth to bedrock (0.71)		
			Dutchcanyon (20%)	Slope (0.96)		
88	Frenchollow silty clay loam, 1 to 4 percent slopes	Very limited	Frenchollow (85%)	Slow water movement (1.00)	266.0	1.6%
89	Frenchollow silty clay loam, 4 to 20 percent slopes	Very limited	Frenchollow (85%)	Slow water movement (1.00)	485.4	3.0%
				Slope (0.63)		
105	Hutchley-Cupine-Vitale complex, 2 to 60 percent slopes	Very limited	Hutchley (30%)	Droughty (1.00)	1,052.6	6.4%
				Depth to bedrock (1.00)		
				Slow water movement (1.00)		
				Slope (1.00)		
				Cobble content (0.18)		
			Cupine (25%)	Droughty (1.00)		
				Slow water movement (1.00)		
				Slope (1.00)		
				Depth to bedrock (0.95)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				No filtering capacity limitation (0.00)		
			Vitale (20%)	Droughty (1.00)		
				Slow water movement (1.00)		
				Slope (1.00)		
				Depth to bedrock (0.46)		
				Large stones on the surface (0.02)		
113	Jacanyon-Cleavage complex, 10 to 50 percent slopes	Very limited	Jacanyon (65%)	Slope (1.00)	80.7	0.5%
				Slow water movement (0.31)		
				Depth to bedrock (0.10)		
				Droughty (0.03)		
			Cleavage (25%)	Droughty (1.00)		
				Depth to bedrock (1.00)		
				Slope (1.00)		
				Slow water movement (0.37)		
119	Joes silt loam, 1 to 4 percent slopes	Not limited	Joes (75%)		421.8	2.6%
120	Joes silt loam, 4 to 15 percent slopes	Not limited	Joes (75%)		161.9	1.0%
125	Lag-Dollarhide-Rock outcrop complex, 5 to 60 percent slopes	Very limited	Lag (40%)	Too acid (1.00)	9.2	0.1%
				Slope (1.00)		
				Droughty (0.40)		
			Dollarhide (35%)	Droughty (1.00)		
				Depth to bedrock (1.00)		
				Slope (1.00)		
				Cobble content (0.05)		
128	Lago-Bear Lake complex, 0 to 1 percent slopes	Very limited	Lago (65%)	Depth to saturated zone (1.00)	791.6	4.8%
				Flooding (0.40)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Slow water movement (0.37)		
			Bear Lake (25%)	Depth to saturated zone (1.00)		
				Too acid (1.00)		
				Flooding (0.40)		
				Slow water movement (0.37)		
129	Lago-Merkley complex, 0 to 2 percent slopes	Very limited	Lago (60%)	Depth to saturated zone (1.00)	361.6	2.2%
				Flooding (0.40)		
				Slow water movement (0.37)		
			Merkley (30%)	Filtering capacity (1.00)		
			Bear Lake (5%)	Depth to saturated zone (1.00)		
				Too acid (1.00)		
				Flooding (0.40)		
				Slow water movement (0.37)		
130	Lanoak silt loam, 1 to 4 percent slopes	Not limited	Lanoak (80%)		173.5	1.1%
136	Leftfork-Cleavage complex, 5 to 40 percent slopes	Very limited	Leftfork (60%)	Slow water movement (1.00)	117.2	0.7%
				Slope (1.00)		
				Droughty (0.23)		
				Too acid (0.08)		
			Cleavage (25%)	Droughty (1.00)		
				Depth to bedrock (1.00)		
				Slope (1.00)		
				Slow water movement (0.37)		
137	Lilcan-Rock outcrop-Jacanyon complex, 2 to	Very limited	Lilcan (60%)	Droughty (1.00)	20.0	0.1%
				Depth to bedrock (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
	50 percent slopes			Slow water movement (1.00)		
				Slope (1.00)		
			Jacanyon (15%)	Slope (1.00)		
				Slow water movement (1.00)		
				Droughty (0.10)		
				Depth to bedrock (0.10)		
145	Marshdale, occasionally flooded-Bloomcreek complex, 0 to 3 percent slopes	Very limited	Marshdale, occasionally flooded (45%)	Filtering capacity (1.00)	133.3	0.8%
				Depth to saturated zone (1.00)		
				Flooding (1.00)		
				Too acid (1.00)		
				Slow water movement (0.22)		
			Bloomcreek (30%)	Depth to saturated zone (1.00)		
				Flooding (0.40)		
				Too acid (0.21)		
				No filtering capacity limitation (0.00)		
			Bearbou (10%)	Depth to saturated zone (1.00)		
				Slow water movement (1.00)		
				Flooding (0.40)		
			Thomasfork (5%)	Depth to saturated zone (1.00)		
				Slow water movement (1.00)		
				Flooding (0.40)		
146	Merkley silt loam, 0 to 2 percent slopes	Very limited	Merkley (85%)	Filtering capacity (1.00)	4.4	0.0%
152	Nielsen-Dranburn-Hagenbarth	Very limited	Nielsen (45%)	Droughty (1.00)	72.8	0.4%

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
	complex, 5 to 40 percent slopes			Depth to bedrock (1.00)		
				Slow water movement (1.00)		
				Slope (1.00)		
			Dranburn (20%)	Slope (1.00)		
				Too acid (1.00)		
				Slow water movement (0.22)		
			Hagenbarth (15%)	Slope (1.00)		
				Slow water movement (0.22)		
184	Sadducee-Bearbeach complex, 0 to 2 percent slopes	Very limited	Sadducee (55%)	Filtering capacity (1.00)	479.2	2.9%
				Depth to saturated zone (1.00)		
			Bearbeach (45%)	Filtering capacity (1.00)		
				Depth to saturated zone (1.00)		
				Droughty (1.00)		
187	Springhollow-Arbone complex, 4 to 12 percent slopes	Very limited	Springhollow (45%)	Slow water movement (1.00)	49.6	0.3%
				Droughty (0.12)		
				Depth to cemented pan (0.06)		
202	Swanpeak-Cloudless complex, 1 to 15 percent slopes	Very limited	Swanpeak (50%)	Slow water movement (1.00)	5.8	0.0%
				Slope (0.16)		
				Cobble content (0.08)		
203	Swanpeak-Dutchcanyon complex, 20 to 35 percent slopes	Very limited	Swanpeak (70%)	Slope (1.00)	1,012.5	6.2%
				Slow water movement (1.00)		
				Cobble content (0.08)		
			Dutchcanyon (20%)	Slope (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
204	Swanpeak-Dutchcanyon-Ant Flat complex, 12 to 20 percent slopes	Very limited	Swanpeak (45%)	Slow water movement (1.00)	2,169.5	13.3%
				Slope (1.00)		
				Cobble content (0.08)		
			Dutchcanyon (30%)	Slope (1.00)		
			Ant Flat (25%)	Slow water movement (1.00)		
				Slope (1.00)		
205	Thatcher silt loam, 4 to 12 percent slopes	Somewhat limited	Thatcher (85%)	Slow water movement (0.37)	85.8	0.5%
209	Thatcher-Joes complex, 1 to 4 percent slopes	Somewhat limited	Thatcher (60%)	Slow water movement (0.37)	188.3	1.2%
225	Water	Not rated	Water (100%)		741.7	4.5%
226	Water, miscellaneous	Not rated	Water, miscellaneous (100%)		19.1	0.1%
229	Wursten silt loam, 4 to 12 percent slopes	Somewhat limited	Wursten (80%)	Slope (0.16)	21.5	0.1%
230	Wursten silt loam, 12 to 20 percent slopes	Very limited	Wursten (80%)	Slope (1.00)	4.3	0.0%
1069	Ireland, extremely stony surface-Drage family, complex, 15 to 35 percent slopes	Very limited	Ireland, extremely stony surface (40%)	Slope (1.00)	213.4	1.3%
				Droughty (1.00)		
				Too acid (1.00)		
				Slow water movement (1.00)		
				Depth to bedrock (0.84)		
			Drage (30%)	Slope (1.00)		
				Slow water movement (0.22)		
				Droughty (0.02)		
1069b	Ezbin family-Cavemountain, bouldery surface-Starley family, very stony surface, complex, 15 to 45 percent slopes	Very limited	Ezbin (45%)	Slope (1.00)	49.8	0.3%
				Too acid (1.00)		
				Slow water movement (0.22)		
				Droughty (0.01)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
			Cavemountain, bouldery surface (40%)	Slope (1.00)		
				Slow water movement (1.00)		
				Droughty (0.67)		
				Depth to bedrock (0.03)		
			Starley, very stony surface (15%)	Depth to bedrock (1.00)		
				Droughty (1.00)		
				Slope (1.00)		
				Too acid (1.00)		
				Slow water movement (1.00)		
38947	Spearhead family, very stony surface-Broad Canyon, very stony surface-Ezbin complex, 30 to 60 percent slopes, MLRA 47	Very limited	Spearhead, very stony surface (35%)	Slope (1.00)	48.4	0.3%
				Too acid (1.00)		
			Broad Canyon, very stony surface (30%)	Slope (1.00)		
				Too acid (1.00)		
				No filtering capacity limitation (0.00)		
			Ezbin (20%)	Slope (1.00)		
				Too acid (1.00)		
				Slow water movement (0.22)		
				Droughty (0.01)		
Subtotals for Soil Survey Area					**16,165.3**	**99.0%**
Totals for Area of Interest					**16,321.7**	**100.0%**

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
152-BL	Nielsen-Dranburn-Hagenbarth complex, 5 to 40 percent slopes	Very limited	Nielsen (45%)	Droughty (1.00)	13.3	0.1%
				Depth to bedrock (1.00)		
				Slow water movement (1.00)		
				Slope (1.00)		
			Dranburn (20%)	Slope (1.00)		
				Too acid (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Slow water movement (0.22)		
			Hagenbarth (15%)	Slope (1.00)		
				Slow water movement (0.22)		
1069	Ireland, extremely stony surface-Drage family, complex, 15 to 35 percent slopes	Very limited	Ireland, extremely stony surface (40%)	Slope (1.00)	58.7	0.4%
				Droughty (1.00)		
				Too acid (1.00)		
				Slow water movement (1.00)		
				Depth to bedrock (0.84)		
			Drage (30%)	Slope (1.00)		
				Slow water movement (0.22)		
				Droughty (0.02)		
			Sessions (10%)	Strongly contrasting textural stratification (1.00)		
				Slow water movement (1.00)		
				Slope (1.00)		
			Ireland, extremely stony surface, steep (10%)	Slope (1.00)		
				Droughty (1.00)		
				Too acid (1.00)		
				Slow water movement (1.00)		
				Depth to bedrock (0.84)		
			Dranburn (10%)	Slope (1.00)		
				Too acid (1.00)		
				Slow water movement (0.22)		
1069b	Ezbin family-Cavemountain, bouldery surface-Starley family, very stony surface, complex, 15 to	Very limited	Ezbin (45%)	Slope (1.00)	32.0	0.2%
				Too acid (1.00)		
				Slow water movement (0.22)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
	45 percent slopes			Droughty (0.01)		
			Cavemountain, bouldery surface (40%)	Slope (1.00)		
				Slow water movement (1.00)		
				Droughty (0.67)		
				Depth to bedrock (0.03)		
			Starley, very stony surface (15%)	Depth to bedrock (1.00)		
				Droughty (1.00)		
				Slope (1.00)		
				Too acid (1.00)		
				Slow water movement (1.00)		
38947	Spearhead family, very stony surface-Broad Canyon, very stony surface-Ezbin complex, 30 to 60 percent slopes, MLRA 47	Very limited	Spearhead, very stony surface (35%)	Slope (1.00)	11.6	0.1%
				Too acid (1.00)		
			Broad Canyon, very stony surface (30%)	Slope (1.00)		
				Too acid (1.00)		
				No filtering capacity limitation (0.00)		
			Ezbin (20%)	Slope (1.00)		
				Too acid (1.00)		
				Slow water movement (0.22)		
				Droughty (0.01)		
			Booneville (5%)	Slope (1.00)		
				Too acid (1.00)		
				Slow water movement (0.22)		
			Hondoho (4%)	Slope (1.00)		
			Starley (4%)	Depth to bedrock (1.00)		
				Droughty (1.00)		
				Slope (1.00)		
				Too acid (1.00)		
				Slow water movement (1.00)		
Subtotals for Soil Survey Area					**115.6**	**0.7%**

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
Totals for Area of Interest					16,321.7	100.0%

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
47	Cedarhill-Clegg-Drage complex, 5 to 55 percent slopes	Very limited	Cedarhill (45%)	Slope (1.00)	2.0	0.0%
				Large stones on the surface (0.07)		
				Droughty (0.06)		
			Clegg (30%)	Slope (1.00)		
				Slow water movement (0.37)		
			Drage (20%)	Slope (1.00)		
				Slow water movement (0.37)		
113	Jacanyon-Cleavage complex, 10 to 50 percent slopes	Very limited	Jacanyon (65%)	Slope (1.00)	10.5	0.1%
				Slow water movement (0.31)		
				Depth to bedrock (0.10)		
				Droughty (0.03)		
			Cleavage (25%)	Droughty (1.00)		
				Depth to bedrock (1.00)		
				Slope (1.00)		
				Slow water movement (0.37)		
			Dry Canyon (5%)	Slope (1.00)		
				Slow water movement (0.32)		
				Too acid (0.21)		
125	Lag-Dollarhide-Rock outcrop complex, 5 to 60 percent slopes	Very limited	Lag (40%)	Too acid (1.00)	2.2	0.0%
				Slope (1.00)		
				Droughty (0.40)		
			Dollarhide (35%)	Droughty (1.00)		
				Depth to bedrock (1.00)		
				Slope (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Cobble content (0.05)		
			Grunder (10%)	Too acid (1.00)		
				Slope (1.00)		
				Depth to bedrock (0.80)		
				Slow water movement (0.32)		
				Droughty (0.06)		
204	Swanpeak-Dutchcanyon-Ant Flat complex, 12 to 20 percent slopes	Very limited	Swanpeak (45%)	Slow water movement (1.00)	10.4	0.1%
				Slope (1.00)		
				Cobble content (0.08)		
			Dutchcanyon (30%)	Slope (1.00)		
			Ant Flat (25%)	Slow water movement (1.00)		
				Slope (1.00)		
205	Thatcher silt loam, 4 to 12 percent slopes	Somewhat limited	Thatcher (85%)	Slow water movement (0.37)	14.5	0.1%
			Buist (5%)	Droughty (0.08)		
			Vicking (5%)	Slow water movement (0.37)		
TBD	Thatcher silt loam, warm, 10 to 25 percent slopes	Very limited	Thatcher (90%)	Slope (1.00)	0.9	0.0%
				Slow water movement (0.31)		
W	Water	Not rated	Water (100%)		0.1	0.0%
Subtotals for Soil Survey Area					**40.6**	**0.2%**
Totals for Area of Interest					**16,321.7**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Very limited	10,470.7	64.2%
Somewhat limited	3,683.5	22.6%
Not limited	1,406.5	8.6%
Null or Not Rated	760.9	4.7%
Totals for Area of Interest	**16,321.7**	**100.0%**

Rating Options—Land Application of Municipal Sewage Sludge

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Disposal of Wastewater by Rapid Infiltration

Rapid infiltration of wastewater is a process in which wastewater applied in a level basin at a rate of 4 to 120 inches per week percolates through the soil. The wastewater may eventually reach the ground water. The application rate commonly exceeds the rate needed for irrigation of cropland. Vegetation is not a necessary part of the treatment; thus, the basins may or may not be vegetated. The thickness of the soil material needed for proper treatment of the wastewater is more than 72 inches. As a result, geologic and hydrologic investigation is needed to ensure proper design and performance and to determine the risk of ground-water pollution.

Soil properties are important considerations in areas where soils are used as sites for the treatment and disposal of organic waste and wastewater. Selection of soils with properties that favor waste management can help to prevent environmental damage.

Municipal wastewater is the waste stream from a municipality. It contains domestic waste and may contain industrial waste. It may have received primary or secondary treatment. It is rarely untreated sewage. Food-processing wastewater results from the preparation of fruits, vegetables, milk, cheese, and meats for public consumption. In places it is high in content of sodium and chloride. The effluent in lagoons and storage ponds is from facilities used to treat or store food-processing wastewater or domestic or animal waste. Domestic and food-processing wastewater is very dilute, and the effluent from the facilities that treat or store it commonly is very low in content of carbonaceous and nitrogenous material; the content of nitrogen commonly ranges from 10 to 30 milligrams per liter. The wastewater from animal waste treatment lagoons or storage ponds, however, has much higher concentrations of these materials, mainly because the manure has not been diluted as much as the domestic waste. The content of nitrogen in this wastewater generally ranges from 50 to 2,000 milligrams per liter. When wastewater is applied, checks should be made to ensure that nitrogen, heavy metals, and salts are not added in excessive amounts.

The ratings are based on the soil properties that affect the risk of pollution and the design, construction, and performance of the system. Depth to a water table, ponding, flooding, and depth to bedrock or a cemented pan affect the risk of pollution and the design and construction of the system. Slope, stones, and cobbles also affect design and construction. Saturated hydraulic conductivity (Ksat) and reaction affect performance. Permanently frozen soils are unsuitable for waste treatment.

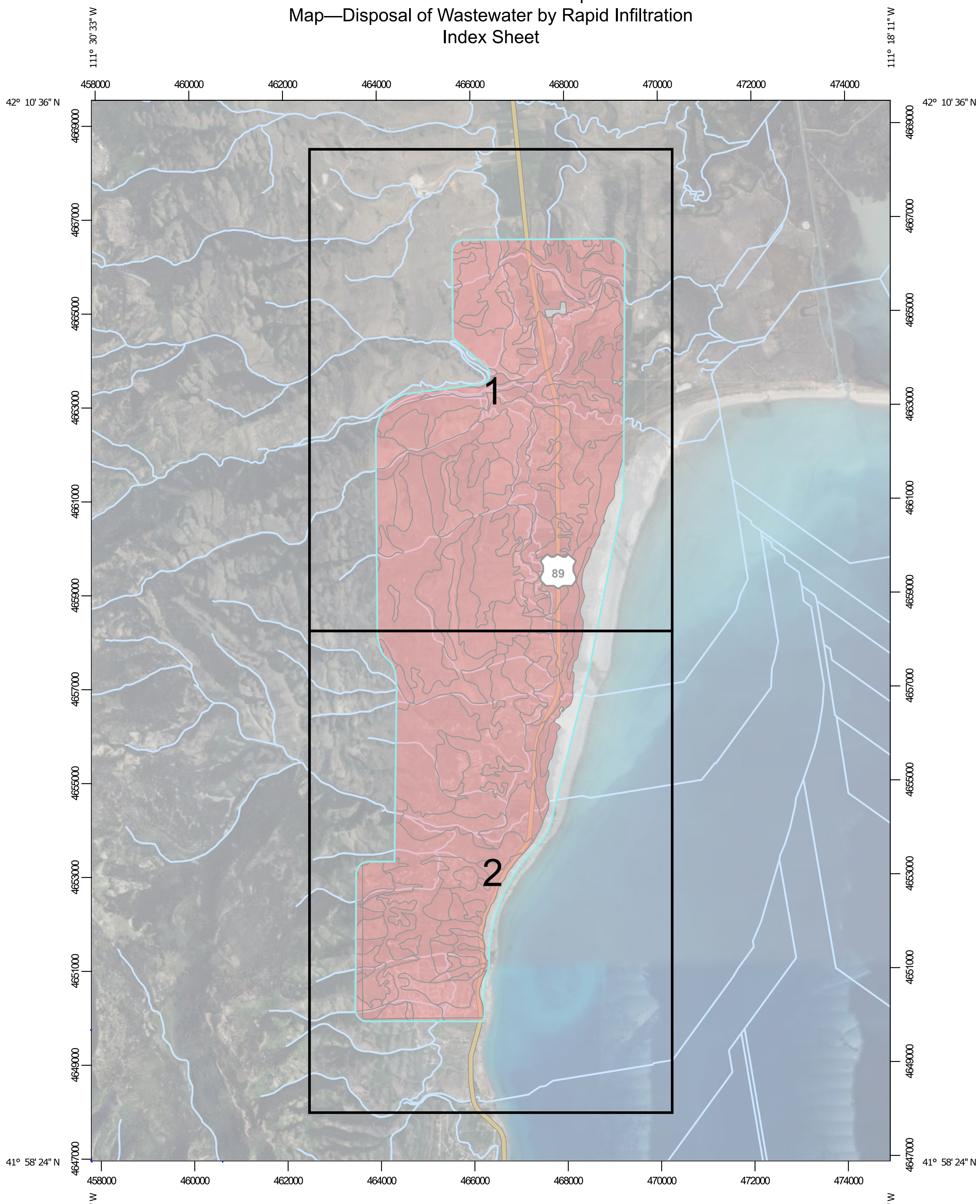
The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect agricultural waste management. "Not limited" indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. "Very limited" indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The map unit components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as listed for the map unit. The percent composition of each component in a particular map unit is presented to help the user better understand the percentage of each map unit that has the rating presented.

Other components with different ratings may be present in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the equivalent report from the Soil Reports tab in Web Soil Survey or from the Soil Data Mart site. Onsite investigation may be needed to validate these interpretations and to confirm the identity of the soil on a given site.

Map—Disposal of Wastewater by Rapid Infiltration
Index Sheet



Map Scale: 1:110,000 if printed on A portrait (8.5" x 11") sheet.

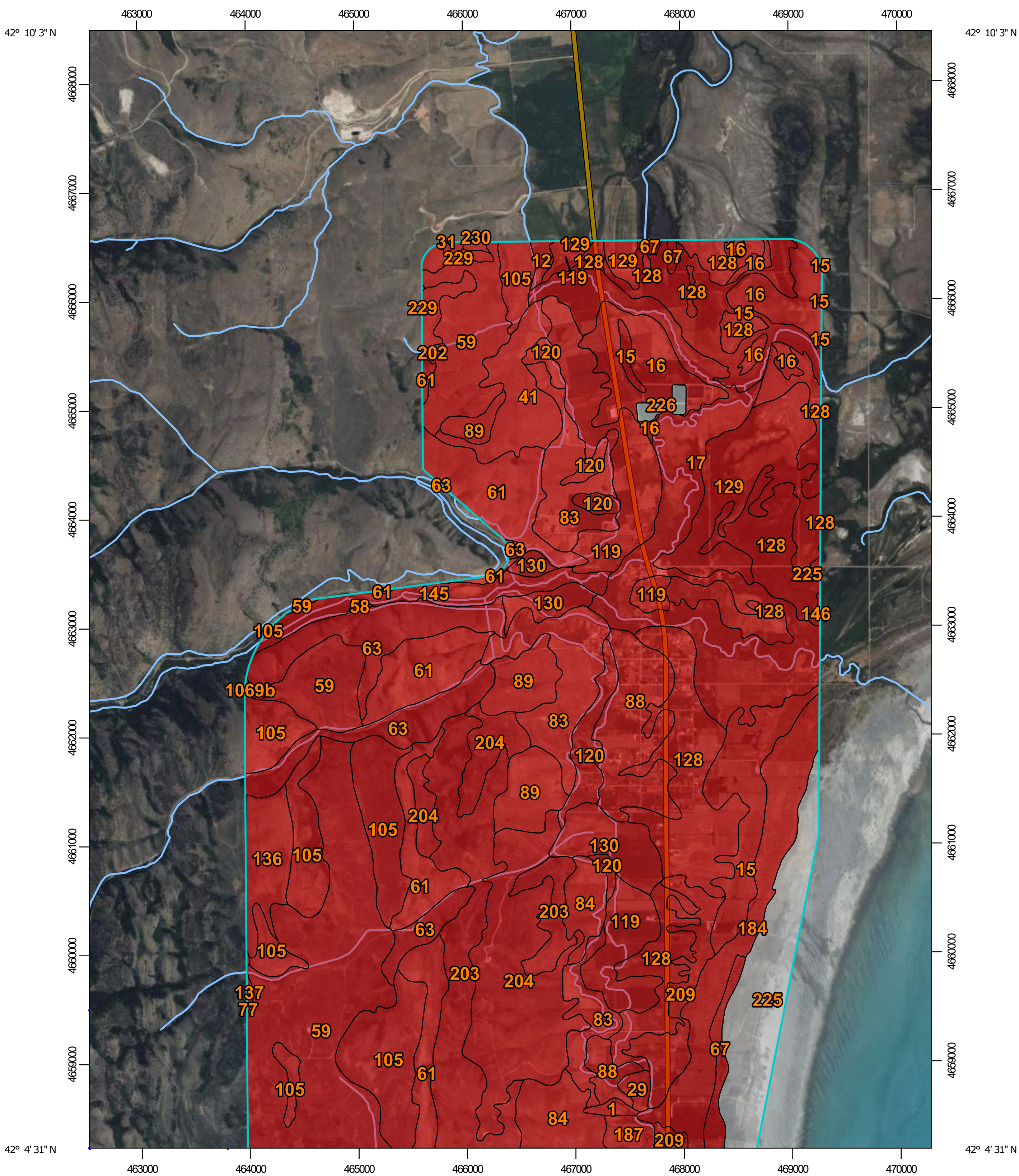
Meters: 0, 1500, 3000, 6000, 9000

Feet: 0, 5000, 10000, 20000, 30000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

Map—Disposal of Wastewater by Rapid Infiltration
Map sheet 1 of 2



Joins sheet 2

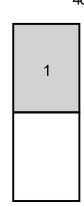
Map Scale: 1:50,000 if printed on A portrait (8.5" x 11") sheet.

0 500 1000 2000 3000 Meters

0 2000 4000 8000 12000 Feet

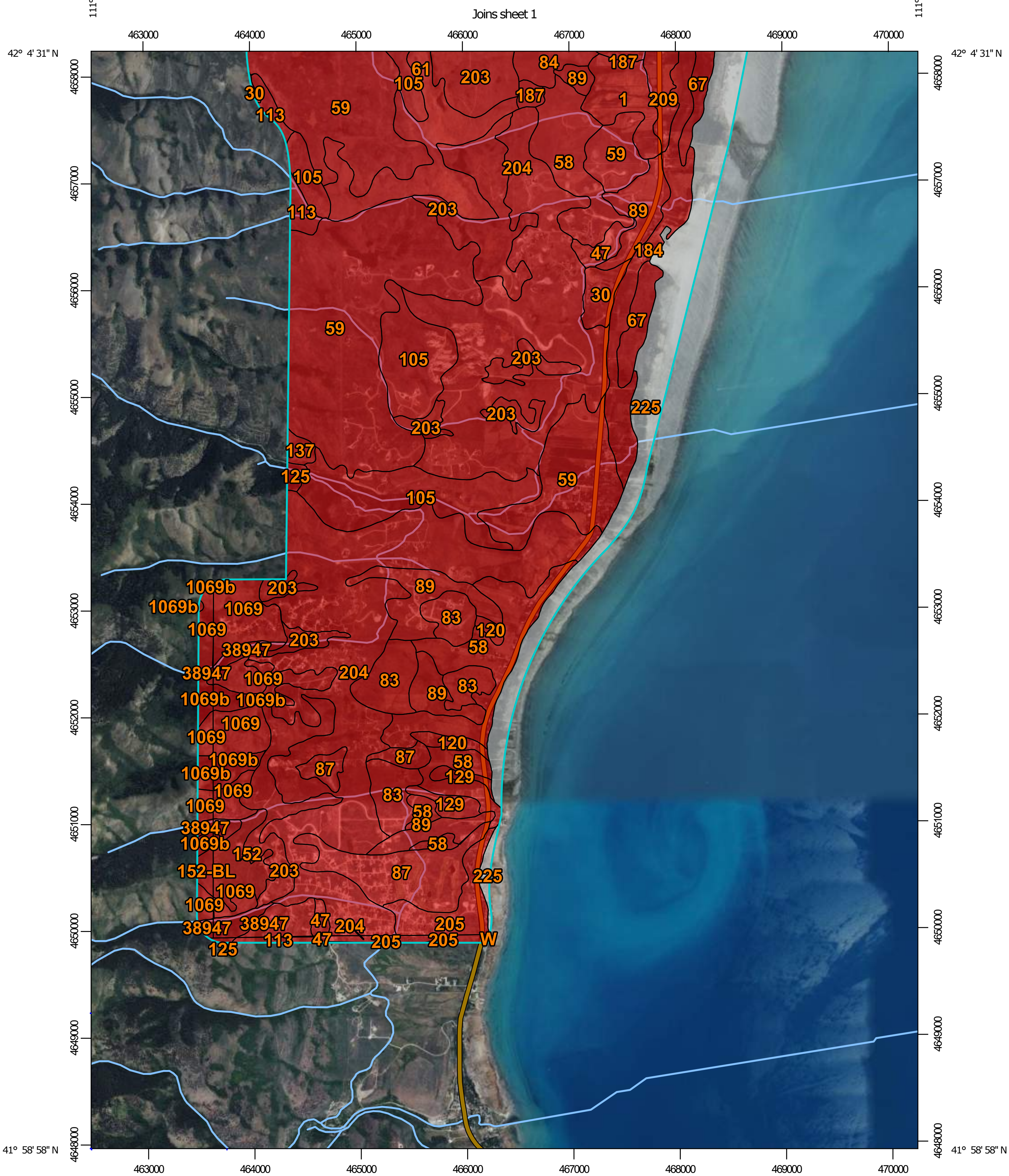
N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84



Map Sheet Location

Map—Disposal of Wastewater by Rapid Infiltration
Map sheet 2 of 2



Map Scale: 1:50,000 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 500, 1000, 2000, 3000

Feet: 0, 2000, 4000, 8000, 12000

N

Map projection: Web Mercator   Corner coordinates: WGS84   Edge tics: UTM Zone 12N WGS84

2

Map Sheet Location

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

Very limited

Somewhat limited

Not limited

Not rated or not available

Soil Rating Lines

Very limited

Somewhat limited

Not limited

Not rated or not available

Soil Rating Points

Very limited

Somewhat limited

Not limited

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Bear Lake County Area, Idaho
Survey Area Data: Version 11, Sep 6, 2022

Soil Survey Area: Caribou National Forest, Idaho and Wyoming
Survey Area Data: Version 10, Sep 6, 2022

Soil Survey Area: Rich County, Utah
Survey Area Data: Version 17, Aug 25, 2022

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 22, 2022—Aug 8, 2022

MAP LEGEND	MAP INFORMATION
	The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Tables—Disposal of Wastewater by Rapid Infiltration

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
1	Ant Flat silty clay loam, 1 to 4 percent slopes	Very limited	Ant Flat (75%)	Slow water movement (1.00)	108.7	0.7%
12	Bancroft silt loam, 1 to 4 percent slopes	Very limited	Bancroft (80%)	Slow water movement (1.00)	14.3	0.1%
15	Bear Lake-Bear Lake, ponded complex, 0 to 1 percent slopes	Very limited	Bear Lake (55%)	Slow water movement (1.00)	430.0	2.6%
				Depth to saturated zone (1.00)		
			Bear Lake, ponded (25%)	Ponding (1.00)		
				Slow water movement (1.00)		
				Depth to saturated zone (1.00)		
16	Bear Lake-Chesbrook-La Roco complex, 0 to 2 percent slopes	Very limited	Bear Lake (40%)	Slow water movement (1.00)	308.2	1.9%
				Depth to saturated zone (1.00)		
			Chesbrook (25%)	Slow water movement (1.00)		
				Depth to saturated zone (1.00)		
			La Roco (15%)	Slow water movement (1.00)		
				Depth to saturated zone (1.00)		
			Bear Lake, ponded (5%)	Ponding (1.00)		
				Slow water movement (1.00)		
				Depth to saturated zone (1.00)		
17	Bear Lake-Lago complex, 0 to 2 percent slopes	Very limited	Bear Lake (50%)	Slow water movement (1.00)	627.8	3.8%

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Depth to saturated zone (1.00)		
			Lago (35%)	Slow water movement (1.00)		
				Depth to saturated zone (1.00)		
			Bear Lake, ponded (5%)	Ponding (1.00)		
				Slow water movement (1.00)		
				Depth to saturated zone (1.00)		
29	Brifox-Lizdale complex, 4 to 12 percent slopes	Very limited	Brifox (75%)	Slow water movement (1.00)	18.9	0.1%
				Slope (1.00)		
			Lizdale (20%)	Slow water movement (1.00)		
				Slope (1.00)		
				Seepage, porous bedrock (0.30)		
30	Brifox-Niter complex, 4 to 12 percent slopes	Very limited	Brifox (45%)	Slow water movement (1.00)	44.1	0.3%
				Slope (1.00)		
			Niter (35%)	Slow water movement (1.00)		
				Slope (1.00)		
31	Brifox-Niter complex, 12 to 25 percent slopes	Very limited	Brifox (45%)	Slope (1.00)	4.7	0.0%
				Slow water movement (1.00)		
			Niter (35%)	Slope (1.00)		
				Slow water movement (1.00)		
41	Cedarhill gravelly silt loam, 5 to 25 percent slopes	Very limited	Cedarhill (90%)	Slow water movement (1.00)	152.9	0.9%
				Slope (1.00)		
				Stone content (0.75)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
47	Cedarhill-Clegg-Drage complex, 5 to 55 percent slopes	Very limited	Cedarhill (45%)	Slow water movement (1.00)	37.2	0.2%
				Slope (1.00)		
				Stone content (0.75)		
			Clegg (30%)	Slow water movement (1.00)		
				Slope (1.00)		
			Drage (20%)	Slow water movement (1.00)		
				Slope (1.00)		
				Cobble content (0.70)		
58	Clegg silt loam, 4 to 20 percent slopes	Very limited	Clegg (90%)	Slow water movement (1.00)	443.0	2.7%
				Slope (1.00)		
59	Clegg-Grecan complex, 4 to 20 percent slopes	Very limited	Clegg (50%)	Slow water movement (1.00)	2,355.2	14.4%
				Slope (1.00)		
			Grecan (35%)	Slow water movement (1.00)		
				Slope (1.00)		
61	Crossley-Rock outcrop complex, 4 to 35 percent slopes	Very limited	Crossley (70%)	Depth to bedrock (1.00)	791.9	4.9%
				Stone content (1.00)		
				Slope (1.00)		
				Cobble content (0.78)		
				Seepage, porous bedrock (0.50)		
63	Cupine-Dunford complex, 20 to 60 percent slopes	Very limited	Cupine (45%)	Slope (1.00)	386.8	2.4%
				Depth to bedrock (1.00)		
				Slow water movement (1.00)		
				Cobble content (0.08)		
			Dunford (25%)	Slope (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Slow water movement (1.00)		
				Depth to bedrock (1.00)		
67	Dinswamp mucky peat, 0 to 2 percent slopes	Very limited	Dinswamp (75%)	Ponding (1.00)	143.0	0.9%
				Slow water movement (1.00)		
				Depth to saturated zone (1.00)		
			Bear Lake, ponded (5%)	Ponding (1.00)		
				Slow water movement (1.00)		
				Depth to saturated zone (1.00)		
			Chesbrook (5%)	Slow water movement (1.00)		
				Depth to saturated zone (1.00)		
			Bloomington (5%)	Ponding (1.00)		
				Slow water movement (1.00)		
				Depth to saturated zone (1.00)		
			Dingle (5%)	Ponding (1.00)		
				Slow water movement (1.00)		
				Depth to saturated zone (1.00)		
77	Dranburn-Pontuge complex, 10 to 40 percent slopes	Very limited	Dranburn (60%)	Slope (1.00)	0.4	0.0%
				Slow water movement (1.00)		
			Pontuge (30%)	Slope (1.00)		
				Slow water movement (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
83	Dutchcanyon gravelly silt loam, 4 to 12 percent slopes	Very limited	Dutchcanyon (85%)	Slow water movement (1.00)	634.9	3.9%
				Slope (1.00)		
84	Dutchcanyon-Frenchollow complex, 5 to 20 percent slopes	Very limited	Dutchcanyon (45%)	Slow water movement (1.00)	212.0	1.3%
				Slope (1.00)		
			Frenchollow (35%)	Slow water movement (1.00)		
				Slope (1.00)		
87	Fishaven-Dutchcanyon complex, 8 to 20 percent slopes	Very limited	Fishaven (70%)	Slope (1.00)	210.1	1.3%
				Depth to bedrock (1.00)		
				Slow water movement (1.00)		
			Dutchcanyon (20%)	Slope (1.00)		
				Slow water movement (1.00)		
88	Frenchollow silty clay loam, 1 to 4 percent slopes	Very limited	Frenchollow (85%)	Slow water movement (1.00)	266.0	1.6%
89	Frenchollow silty clay loam, 4 to 20 percent slopes	Very limited	Frenchollow (85%)	Slow water movement (1.00)	485.4	3.0%
				Slope (1.00)		
105	Hutchley-Cupine-Vitale complex, 2 to 60 percent slopes	Very limited	Hutchley (30%)	Slow water movement (1.00)	1,052.6	6.4%
				Depth to bedrock (1.00)		
				Slope (1.00)		
				Cobble content (0.23)		
			Cupine (25%)	Slow water movement (1.00)		
				Depth to bedrock (1.00)		
				Slope (1.00)		
				Cobble content (0.08)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
			Vitale (20%)	Slow water movement (1.00)		
				Depth to bedrock (1.00)		
				Cobble content (1.00)		
				Slope (1.00)		
				Stone content (0.05)		
113	Jacanyon-Cleavage complex, 10 to 50 percent slopes	Very limited	Jacanyon (65%)	Slope (1.00)	80.7	0.5%
				Slow water movement (1.00)		
				Depth to bedrock (1.00)		
			Cleavage (25%)	Slope (1.00)		
				Slow water movement (1.00)		
				Depth to bedrock (1.00)		
119	Joes silt loam, 1 to 4 percent slopes	Very limited	Joes (75%)	Slow water movement (1.00)	421.8	2.6%
120	Joes silt loam, 4 to 15 percent slopes	Very limited	Joes (75%)	Slow water movement (1.00)	161.9	1.0%
				Slope (1.00)		
125	Lag-Dollarhide-Rock outcrop complex, 5 to 60 percent slopes	Very limited	Lag (40%)	Slow water movement (1.00)	9.2	0.1%
				Slope (1.00)		
				Cobble content (0.01)		
			Dollarhide (35%)	Depth to bedrock (1.00)		
				Slow water movement (1.00)		
				Slope (1.00)		
				Cobble content (0.02)		
128	Lago-Bear Lake complex, 0 to 1 percent slopes	Very limited	Lago (65%)	Slow water movement (1.00)	791.6	4.8%

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Depth to saturated zone (1.00)		
			Bear Lake (25%)	Slow water movement (1.00)		
				Depth to saturated zone (1.00)		
129	Lago-Merkley complex, 0 to 2 percent slopes	Very limited	Lago (60%)	Slow water movement (1.00)	361.6	2.2%
				Depth to saturated zone (1.00)		
			Merkley (30%)	Depth to saturated zone (1.00)		
				Slow water movement (1.00)		
			Bear Lake (5%)	Slow water movement (1.00)		
				Depth to saturated zone (1.00)		
130	Lanoak silt loam, 1 to 4 percent slopes	Very limited	Lanoak (80%)	Slow water movement (1.00)	173.5	1.1%
136	Leftfork-Cleavage complex, 5 to 40 percent slopes	Very limited	Leftfork (60%)	Slow water movement (1.00)	117.2	0.7%
				Depth to bedrock (1.00)		
				Slope (1.00)		
				Stone content (0.48)		
			Cleavage (25%)	Slow water movement (1.00)		
				Depth to bedrock (1.00)		
				Slope (1.00)		
137	Lilcan-Rock outcrop-Jacanyon complex, 2 to 50 percent slopes	Very limited	Lilcan (60%)	Slow water movement (1.00)	20.0	0.1%
				Depth to bedrock (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Cobble content (1.00)		
				Slope (1.00)		
			Jacanyon (15%)	Slope (1.00)		
				Slow water movement (1.00)		
				Depth to bedrock (1.00)		
145	Marshdale, occasionally flooded-Bloomcreek complex, 0 to 3 percent slopes	Very limited	Marshdale, occasionally flooded (45%)	Slow water movement (1.00)	133.3	0.8%
				Depth to saturated zone (1.00)		
				Flooding (0.60)		
			Bloomcreek (30%)	Depth to saturated zone (1.00)		
				Slow water movement (1.00)		
			Bearbou (10%)	Slow water movement (1.00)		
				Depth to saturated zone (1.00)		
			Thomasfork (5%)	Slow water movement (1.00)		
				Depth to saturated zone (1.00)		
146	Merkley silt loam, 0 to 2 percent slopes	Very limited	Merkley (85%)	Depth to saturated zone (1.00)	4.4	0.0%
				Slow water movement (1.00)		
152	Nielsen-Dranburn-Hagenbarth complex, 5 to 40 percent slopes	Very limited	Nielsen (45%)	Slow water movement (1.00)	72.8	0.4%
				Depth to bedrock (1.00)		
				Slope (1.00)		
				Cobble content (1.00)		
			Dranburn (20%)	Slope (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Slow water movement (1.00)		
			Hagenbarth (15%)	Slow water movement (1.00)		
				Slope (1.00)		
184	Sadducee-Bearbeach complex, 0 to 2 percent slopes	Very limited	Sadducee (55%)	Depth to saturated zone (1.00)	479.2	2.9%
				Slow water movement (1.00)		
			Bearbeach (45%)	Depth to saturated zone (1.00)		
				Slow water movement (1.00)		
187	Springhollow-Arbone complex, 4 to 12 percent slopes	Very limited	Springhollow (45%)	Slow water movement (1.00)	49.6	0.3%
				Depth to cemented pan (1.00)		
				Slope (0.88)		
			Arbone (40%)	Slow water movement (1.00)		
				Slope (1.00)		
202	Swanpeak-Cloudless complex, 1 to 15 percent slopes	Very limited	Swanpeak (50%)	Slow water movement (1.00)	5.8	0.0%
				Slope (1.00)		
				Cobble content (0.96)		
				Stone content (0.19)		
			Cloudless (30%)	Slow water movement (1.00)		
				Slope (1.00)		
203	Swanpeak-Dutchcanyon complex, 20 to 35 percent slopes	Very limited	Swanpeak (70%)	Slope (1.00)	1,012.5	6.2%
				Slow water movement (1.00)		
				Cobble content (0.96)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Stone content (0.19)		
			Dutchcanyon (20%)	Slope (1.00)		
				Slow water movement (1.00)		
204	Swanpeak-Dutchcanyon-Ant Flat complex, 12 to 20 percent slopes	Very limited	Swanpeak (45%)	Slope (1.00)	2,169.5	13.3%
				Slow water movement (1.00)		
				Cobble content (0.96)		
				Stone content (0.19)		
			Dutchcanyon (30%)	Slope (1.00)		
				Slow water movement (1.00)		
			Ant Flat (25%)	Slope (1.00)		
				Slow water movement (1.00)		
205	Thatcher silt loam, 4 to 12 percent slopes	Very limited	Thatcher (85%)	Slow water movement (1.00)	85.8	0.5%
				Slope (1.00)		
209	Thatcher-Joes complex, 1 to 4 percent slopes	Very limited	Thatcher (60%)	Slow water movement (1.00)	188.3	1.2%
			Joes (25%)	Slow water movement (1.00)		
225	Water	Not rated	Water (100%)		741.7	4.5%
226	Water, miscellaneous	Not rated	Water, miscellaneous (100%)		19.1	0.1%
229	Wursten silt loam, 4 to 12 percent slopes	Very limited	Wursten (80%)	Slow water movement (1.00)	21.5	0.1%
				Slope (1.00)		
230	Wursten silt loam, 12 to 20 percent slopes	Very limited	Wursten (80%)	Slope (1.00)	4.3	0.0%
				Slow water movement (1.00)		
1069	Ireland, extremely stony surface-Drage family, complex, 15 to	Very limited	Ireland, extremely stony surface (40%)	Slope (1.00)	213.4	1.3%
				Slow water movement (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
	35 percent slopes			Depth to bedrock (1.00)		
				Stone content (0.33)		
				Cobble content (0.05)		
			Drage (30%)	Slope (1.00)		
				Slow water movement (1.00)		
				Cobble content (0.70)		
1069b	Ezbin family-Cavemountain, bouldery surface-Starley family, very stony surface, complex, 15 to 45 percent slopes	Very limited	Ezbin (45%)	Slope (1.00)	49.8	0.3%
				Slow water movement (1.00)		
			Cavemountain, bouldery surface (40%)	Slope (1.00)		
				Slow water movement (1.00)		
				Depth to bedrock (1.00)		
			Starley, very stony surface (15%)	Slope (1.00)		
				Slow water movement (1.00)		
				Depth to bedrock (1.00)		
				Seepage, porous bedrock (0.50)		
				Cobble content (0.02)		
38947	Spearhead family, very stony surface-Broad Canyon, very stony surface-Ezbin complex, 30 to 60 percent slopes, MLRA 47	Very limited	Spearhead, very stony surface (35%)	Slope (1.00)	48.4	0.3%
				Slow water movement (1.00)		
				Cobble content (1.00)		
				Seepage, porous bedrock (0.30)		
			Broad Canyon, very stony surface (30%)	Slope (1.00)		
				Slow water movement (1.00)		
				Stone content (1.00)		
				Cobble content (0.29)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
			Ezbin (20%)	Slope (1.00)		
				Slow water movement (1.00)		
Subtotals for Soil Survey Area					**16,165.3**	**99.0%**
Totals for Area of Interest					**16,321.7**	**100.0%**

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
152-BL	Nielsen-Dranburn-Hagenbarth complex, 5 to 40 percent slopes	Very limited	Nielsen (45%)	Slow water movement (1.00)	13.3	0.1%
				Depth to bedrock (1.00)		
				Slope (1.00)		
				Cobble content (1.00)		
			Dranburn (20%)	Slope (1.00)		
				Slow water movement (1.00)		
			Hagenbarth (15%)	Slow water movement (1.00)		
				Slope (1.00)		
1069	Ireland, extremely stony surface-Drage family, complex, 15 to 35 percent slopes	Very limited	Ireland, extremely stony surface (40%)	Slope (1.00)	58.7	0.4%
				Slow water movement (1.00)		
				Depth to bedrock (1.00)		
				Stone content (0.33)		
				Cobble content (0.05)		
			Drage (30%)	Slope (1.00)		
				Slow water movement (1.00)		
				Cobble content (0.70)		
			Sessions (10%)	Slow water movement (1.00)		
				Slope (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Seepage, porous bedrock (0.30)		
			Ireland, extremely stony surface, steep (10%)	Slope (1.00)		
				Slow water movement (1.00)		
				Depth to bedrock (1.00)		
				Stone content (0.33)		
				Cobble content (0.05)		
			Dranburn (10%)	Slope (1.00)		
				Slow water movement (1.00)		
				Seepage, porous bedrock (0.30)		
1069b	Ezbin family-Cavemountain, bouldery surface-Starley family, very stony surface, complex, 15 to 45 percent slopes	Very limited	Ezbin (45%)	Slope (1.00)	32.0	0.2%
				Slow water movement (1.00)		
			Cavemountain, bouldery surface (40%)	Slope (1.00)		
				Slow water movement (1.00)		
				Depth to bedrock (1.00)		
			Starley, very stony surface (15%)	Slope (1.00)		
				Slow water movement (1.00)		
				Depth to bedrock (1.00)		
				Seepage, porous bedrock (0.50)		
				Cobble content (0.02)		
38947	Spearhead family, very stony surface-Broad Canyon, very stony surface-Ezbin complex, 30 to 60 percent slopes, MLRA 47	Very limited	Spearhead, very stony surface (35%)	Slope (1.00)	11.6	0.1%
				Slow water movement (1.00)		
				Cobble content (1.00)		
				Seepage, porous bedrock (0.30)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
			Broad Canyon, very stony surface (30%)	Slope (1.00)		
				Slow water movement (1.00)		
				Stone content (1.00)		
				Cobble content (0.29)		
			Ezbin (20%)	Slope (1.00)		
				Slow water movement (1.00)		
			Booneville (5%)	Slope (1.00)		
				Slow water movement (1.00)		
				Cobble content (0.42)		
			Hondoho (4%)	Slope (1.00)		
				Slow water movement (1.00)		
				Cobble content (0.79)		
			Starley (4%)	Slope (1.00)		
				Slow water movement (1.00)		
				Depth to bedrock (1.00)		
				Cobble content (0.02)		
Subtotals for Soil Survey Area					**115.6**	**0.7%**
Totals for Area of Interest					**16,321.7**	**100.0%**

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
47	Cedarhill-Clegg-Drage complex, 5 to 55 percent slopes	Very limited	Cedarhill (45%)	Slow water movement (1.00)	2.0	0.0%
				Slope (1.00)		
				Stone content (1.00)		
				Cobble content (0.33)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Seepage, porous bedrock (0.30)		
			Clegg (30%)	Slow water movement (1.00)		
				Slope (1.00)		
			Drage (20%)	Slow water movement (1.00)		
				Slope (1.00)		
				Cobble content (0.97)		
			Cloudless (5%)	Slow water movement (1.00)		
				Slope (1.00)		
113	Jacanyon-Cleavage complex, 10 to 50 percent slopes	Very limited	Jacanyon (65%)	Slope (1.00)	10.5	0.1%
				Slow water movement (1.00)		
				Depth to bedrock (1.00)		
			Cleavage (25%)	Slope (1.00)		
				Slow water movement (1.00)		
				Depth to bedrock (1.00)		
			Dry Canyon (5%)	Slope (1.00)		
				Slow water movement (1.00)		
				Depth to bedrock (1.00)		
125	Lag-Dollarhide-Rock outcrop complex, 5 to 60 percent slopes	Very limited	Lag (40%)	Slow water movement (1.00)	2.2	0.0%
				Slope (1.00)		
				Cobble content (0.01)		
			Dollarhide (35%)	Depth to bedrock (1.00)		
				Slow water movement (1.00)		
				Slope (1.00)		
				Cobble content (0.02)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
			Grunder (10%)	Slope (1.00)		
				Slow water movement (1.00)		
				Depth to bedrock (1.00)		
204	Swanpeak-Dutchcanyon-Ant Flat complex, 12 to 20 percent slopes	Very limited	Swanpeak (45%)	Slope (1.00)	10.4	0.1%
				Slow water movement (1.00)		
				Cobble content (0.96)		
				Stone content (0.19)		
			Dutchcanyon (30%)	Slope (1.00)		
				Slow water movement (1.00)		
			Ant Flat (25%)	Slope (1.00)		
				Slow water movement (1.00)		
205	Thatcher silt loam, 4 to 12 percent slopes	Very limited	Thatcher (85%)	Slow water movement (1.00)	14.5	0.1%
				Slope (1.00)		
			Buist (5%)	Slow water movement (1.00)		
				Slope (1.00)		
				Cobble content (0.76)		
			Bezzant (5%)	Slow water movement (1.00)		
				Slope (1.00)		
			Vicking (5%)	Slow water movement (1.00)		
				Slope (1.00)		
TBD	Thatcher silt loam, warm, 10 to 25 percent slopes	Very limited	Thatcher (90%)	Slope (1.00)	0.9	0.0%
				Slow water movement (1.00)		
W	Water	Not rated	Water (100%)		0.1	0.0%
Subtotals for Soil Survey Area					**40.6**	**0.2%**
Totals for Area of Interest					**16,321.7**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Very limited	15,560.6	95.3%
Null or Not Rated	760.9	4.7%
Totals for Area of Interest	**16,321.7**	**100.0%**

Rating Options—Disposal of Wastewater by Rapid Infiltration

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Water Features

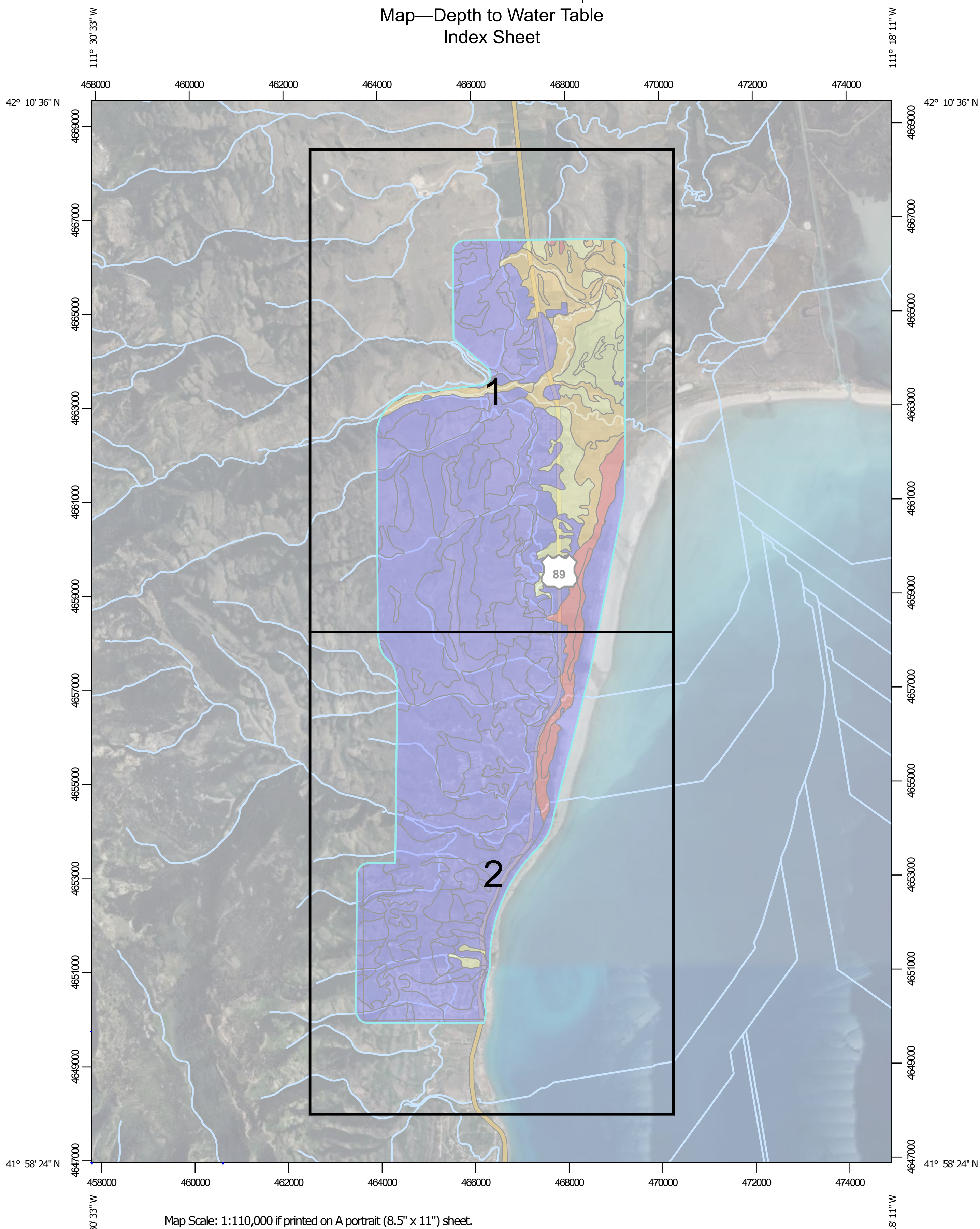
Water Features include ponding frequency, flooding frequency, and depth to water table.

Depth to Water Table

"Water table" refers to a saturated zone in the soil. It occurs during specified months. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

This attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

Map—Depth to Water Table
Index Sheet



Map Scale: 1:110,000 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 1500, 3000, 6000, 9000

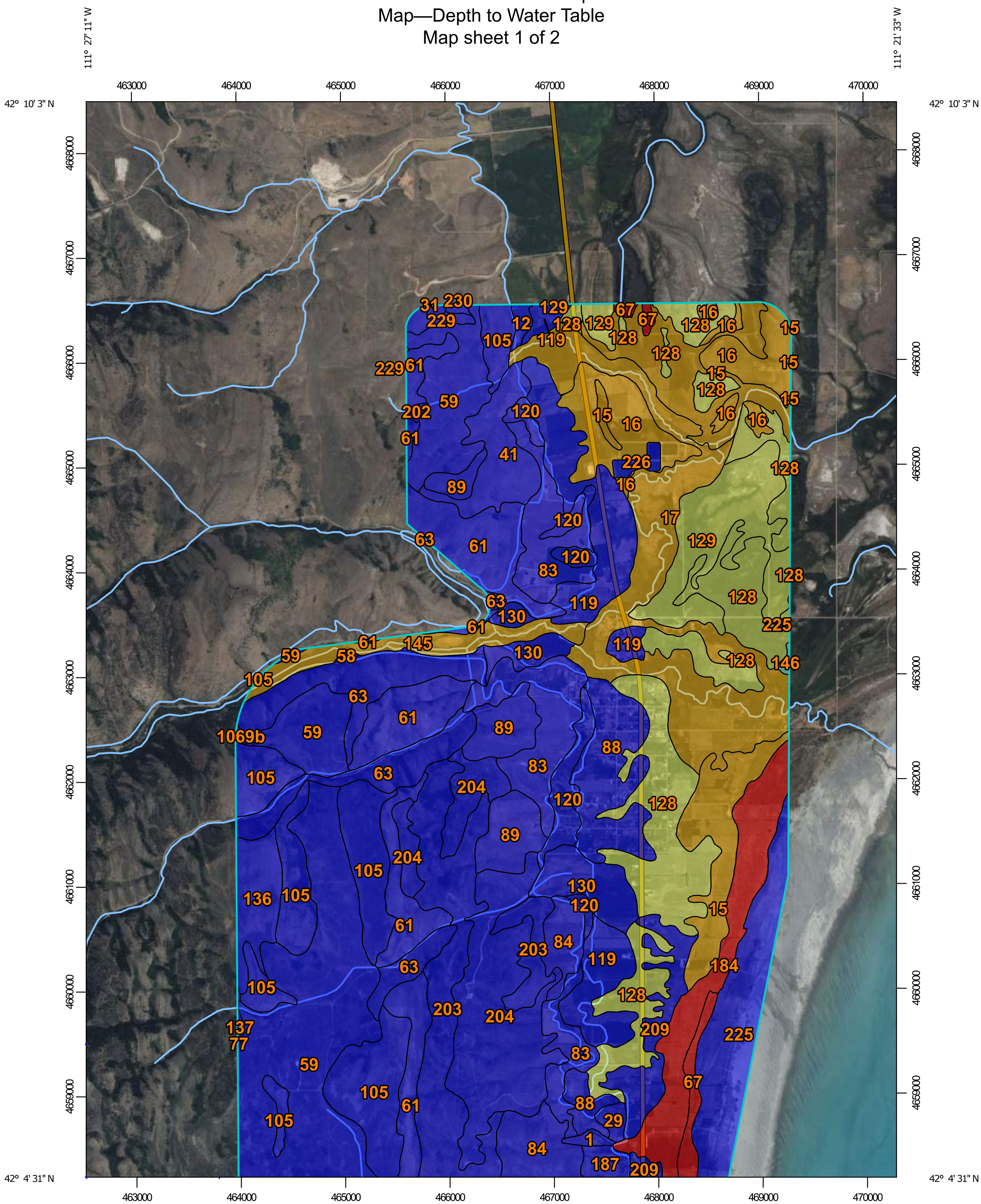
Feet: 0, 5000, 10000, 20000, 30000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

Map—Depth to Water Table

Map sheet 1 of 2



Joins sheet 2

Map Scale: 1:50,000 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 500, 1000, 2000, 3000

Feet: 0, 2000, 4000, 8000, 12000

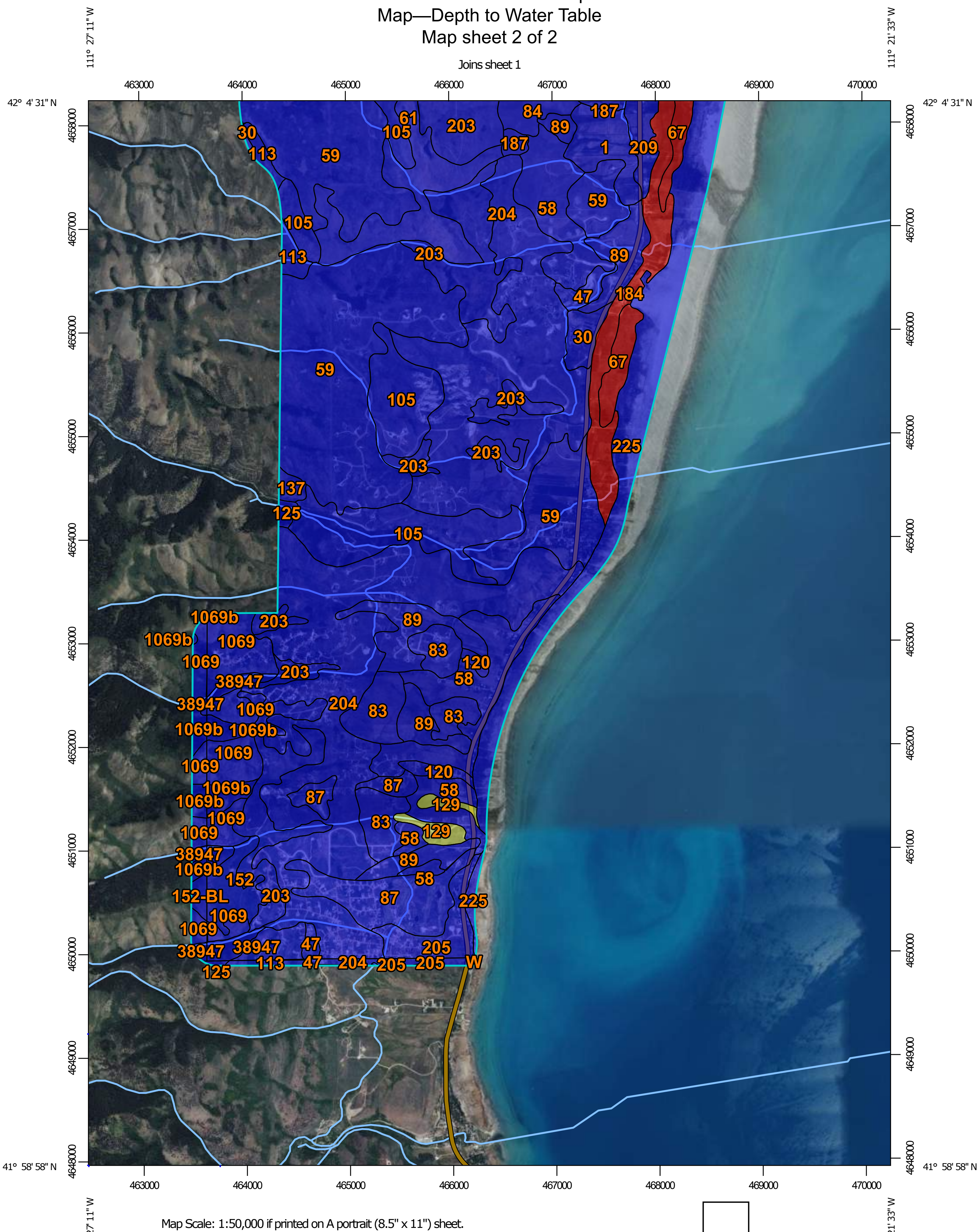
N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

1

Map Sheet Location

Map—Depth to Water Table
Map sheet 2 of 2



Map Scale: 1:50,000 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 500, 1000, 2000, 3000

Feet: 0, 2000, 4000, 8000, 12000

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

2

Map Sheet Location

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200
- Not rated or not available

Soil Rating Lines

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200
- Not rated or not available

Soil Rating Points

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 150
- 150 - 200
- > 200
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Bear Lake County Area, Idaho
Survey Area Data: Version 11, Sep 6, 2022

Soil Survey Area: Caribou National Forest, Idaho and Wyoming
Survey Area Data: Version 10, Sep 6, 2022

Soil Survey Area: Rich County, Utah
Survey Area Data: Version 17, Aug 25, 2022

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 22, 2022—Aug 8, 2022

MAP LEGEND	MAP INFORMATION
	The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Depth to Water Table

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
1	Ant Flat silty clay loam, 1 to 4 percent slopes	>200	108.7	0.7%
12	Bancroft silt loam, 1 to 4 percent slopes	>200	14.3	0.1%
15	Bear Lake-Bear Lake, ponded complex, 0 to 1 percent slopes	36	430.0	2.6%
16	Bear Lake-Chesbrook-La Roco complex, 0 to 2 percent slopes	36	308.2	1.9%
17	Bear Lake-Lago complex, 0 to 2 percent slopes	36	627.8	3.8%
29	Brifox-Lizdale complex, 4 to 12 percent slopes	>200	18.9	0.1%
30	Brifox-Niter complex, 4 to 12 percent slopes	>200	44.1	0.3%
31	Brifox-Niter complex, 12 to 25 percent slopes	>200	4.7	0.0%
41	Cedarhill gravelly silt loam, 5 to 25 percent slopes	>200	152.9	0.9%
47	Cedarhill-Clegg-Drage complex, 5 to 55 percent slopes	>200	37.2	0.2%
58	Clegg silt loam, 4 to 20 percent slopes	>200	443.0	2.7%
59	Clegg-Grecan complex, 4 to 20 percent slopes	>200	2,355.2	14.4%
61	Crossley-Rock outcrop complex, 4 to 35 percent slopes	>200	791.9	4.9%
63	Cupine-Dunford complex, 20 to 60 percent slopes	>200	386.8	2.4%
67	Dinswamp mucky peat, 0 to 2 percent slopes	15	143.0	0.9%
77	Dranburn-Pontuge complex, 10 to 40 percent slopes	>200	0.4	0.0%
83	Dutchcanyon gravelly silt loam, 4 to 12 percent slopes	>200	634.9	3.9%
84	Dutchcanyon-Frenchollow complex, 5 to 20 percent slopes	>200	212.0	1.3%

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
87	Fishaven-Dutchcanyon complex, 8 to 20 percent slopes	>200	210.1	1.3%
88	Frenchollow silty clay loam, 1 to 4 percent slopes	>200	266.0	1.6%
89	Frenchollow silty clay loam, 4 to 20 percent slopes	>200	485.4	3.0%
105	Hutchley-Cupine-Vitale complex, 2 to 60 percent slopes	>200	1,052.6	6.4%
113	Jacanyon-Cleavage complex, 10 to 50 percent slopes	>200	80.7	0.5%
119	Joes silt loam, 1 to 4 percent slopes	>200	421.8	2.6%
120	Joes silt loam, 4 to 15 percent slopes	>200	161.9	1.0%
125	Lag-Dollarhide-Rock outcrop complex, 5 to 60 percent slopes	>200	9.2	0.1%
128	Lago-Bear Lake complex, 0 to 1 percent slopes	51	791.6	4.8%
129	Lago-Merkley complex, 0 to 2 percent slopes	51	361.6	2.2%
130	Lanoak silt loam, 1 to 4 percent slopes	>200	173.5	1.1%
136	Leftfork-Cleavage complex, 5 to 40 percent slopes	>200	117.2	0.7%
137	Lilcan-Rock outcrop-Jacanyon complex, 2 to 50 percent slopes	>200	20.0	0.1%
145	Marshdale, occasionally flooded-Bloomcreek complex, 0 to 3 percent slopes	30	133.3	0.8%
146	Merkley silt loam, 0 to 2 percent slopes	127	4.4	0.0%
152	Nielsen-Dranburn-Hagenbarth complex, 5 to 40 percent slopes	>200	72.8	0.4%
184	Sadducee-Bearbeach complex, 0 to 2 percent slopes	0	479.2	2.9%
187	Springhollow-Arbone complex, 4 to 12 percent slopes	>200	49.6	0.3%
202	Swanpeak-Cloudless complex, 1 to 15 percent slopes	>200	5.8	0.0%

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
203	Swanpeak-Dutchcanyon complex, 20 to 35 percent slopes	>200	1,012.5	6.2%
204	Swanpeak-Dutchcanyon-Ant Flat complex, 12 to 20 percent slopes	>200	2,169.5	13.3%
205	Thatcher silt loam, 4 to 12 percent slopes	>200	85.8	0.5%
209	Thatcher-Joes complex, 1 to 4 percent slopes	>200	188.3	1.2%
225	Water	>200	741.7	4.5%
226	Water, miscellaneous	>200	19.1	0.1%
229	Wursten silt loam, 4 to 12 percent slopes	>200	21.5	0.1%
230	Wursten silt loam, 12 to 20 percent slopes	>200	4.3	0.0%
1069	Ireland, extremely stony surface-Drage family, complex, 15 to 35 percent slopes	>200	213.4	1.3%
1069b	Ezbin family-Cavemountain, bouldery surface-Starley family, very stony surface, complex, 15 to 45 percent slopes	>200	49.8	0.3%
38947	Spearhead family, very stony surface-Broad Canyon, very stony surface-Ezbin complex, 30 to 60 percent slopes, MLRA 47	>200	48.4	0.3%
Subtotals for Soil Survey Area			**16,165.3**	**99.0%**
Totals for Area of Interest			**16,321.7**	**100.0%**

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
152-BL	Nielsen-Dranburn-Hagenbarth complex, 5 to 40 percent slopes	>200	13.3	0.1%
1069	Ireland, extremely stony surface-Drage family, complex, 15 to 35 percent slopes	>200	58.7	0.4%
1069b	Ezbin family-Cavemountain, bouldery surface-Starley family, very stony surface, complex, 15 to 45 percent slopes	>200	32.0	0.2%

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
38947	Spearhead family, very stony surface-Broad Canyon, very stony surface-Ezbin complex, 30 to 60 percent slopes, MLRA 47	>200	11.6	0.1%
Subtotals for Soil Survey Area			**115.6**	**0.7%**
Totals for Area of Interest			**16,321.7**	**100.0%**

Map unit symbol	Map unit name	Rating (centimeters)	Acres in AOI	Percent of AOI
47	Cedarhill-Clegg-Drage complex, 5 to 55 percent slopes	>200	2.0	0.0%
113	Jacanyon-Cleavage complex, 10 to 50 percent slopes	>200	10.5	0.1%
125	Lag-Dollarhide-Rock outcrop complex, 5 to 60 percent slopes	>200	2.2	0.0%
204	Swanpeak-Dutchcanyon-Ant Flat complex, 12 to 20 percent slopes	>200	10.4	0.1%
205	Thatcher silt loam, 4 to 12 percent slopes	>200	14.5	0.1%
TBD	Thatcher silt loam, warm, 10 to 25 percent slopes	>200	0.9	0.0%
W	Water	>200	0.1	0.0%
Subtotals for Soil Survey Area			**40.6**	**0.2%**
Totals for Area of Interest			**16,321.7**	**100.0%**

Rating Options—Depth to Water Table

Units of Measure: centimeters

Aggregation Method: Dominant Component

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Interpret Nulls as Zero: No

Beginning Month: January

Ending Month: December

References

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IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Idaho and Utah

Local offices

Utah Ecological Services Field Office

- (801) 975-3330
- (801) 975-3331

2369 West Orton Circle, Suite 50
West Valley City, UT 84119-7603

Idaho Fish And Wildlife Office

(208) 378-5243
(208) 378-5262

1387 South Vinnell Way, Suite 368
Boise, ID 83709-1657

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

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1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Canada Lynx Lynx canadensis There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/3652	Threatened
North American Wolverine Gulo gulo luscus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/5123	Proposed Threatened

Birds

NAME	STATUS
Yellow-billed Cuckoo Coccyzus americanus There is **final** critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/3911	Threatened

Insects

NAME	STATUS
Monarch Butterfly Danaus plexippus Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9743	Candidate

Flowering Plants

NAME	STATUS
Ute Ladies'-tresses Spiranthes diluvialis Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/2159	Threatened

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

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1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern https://www.fws.gov/program/migratory-birds/species
- Measures for avoiding and minimizing impacts to birds https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds
- Nationwide conservation measures for birds https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Jan 1 to Aug 31
California Gull *Larus californicus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 1 to Jul 31
Cassin's Finch *Carpodacus cassinii* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9462	Breeds May 15 to Jul 15
Clark's Grebe *Aechmophorus clarkii* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Jun 1 to Aug 31
Evening Grosbeak *Coccothraustes vespertinus* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 15 to Aug 10
Franklin's Gull *Leucophaeus pipixcan* This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Golden Eagle *Aquila chrysaetos* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Jan 1 to Aug 31

Olive-sided Flycatcher Contopus cooperi — Breeds May 20 to Aug 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/3914

Rufous Hummingbird selasphorus rufus — Breeds Apr 15 to Jul 15

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/8002

Western Grebe aechmophorus occidentalis — Breeds Jun 1 to Aug 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.
https://ecos.fws.gov/ecp/species/6743

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.

3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

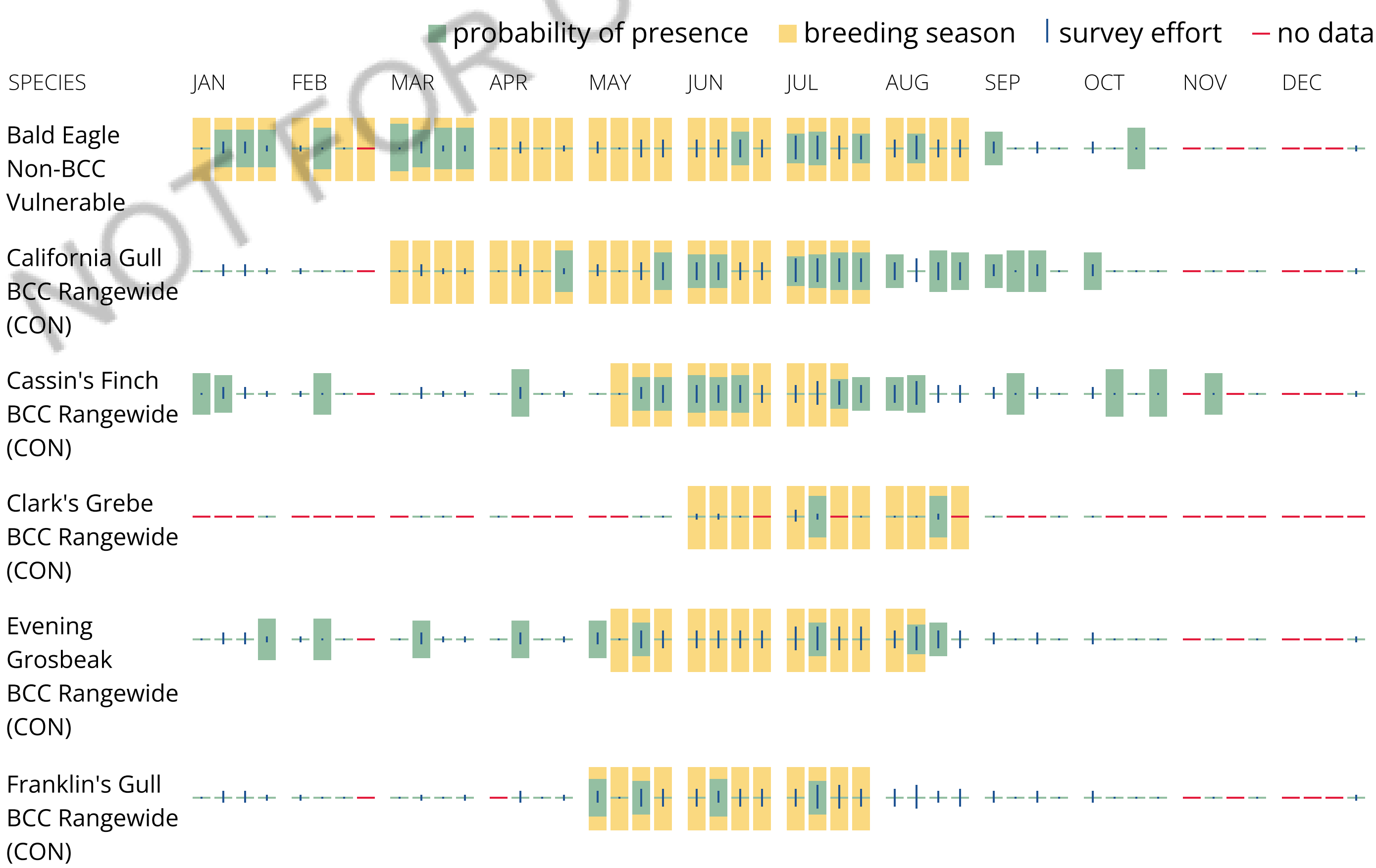
Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

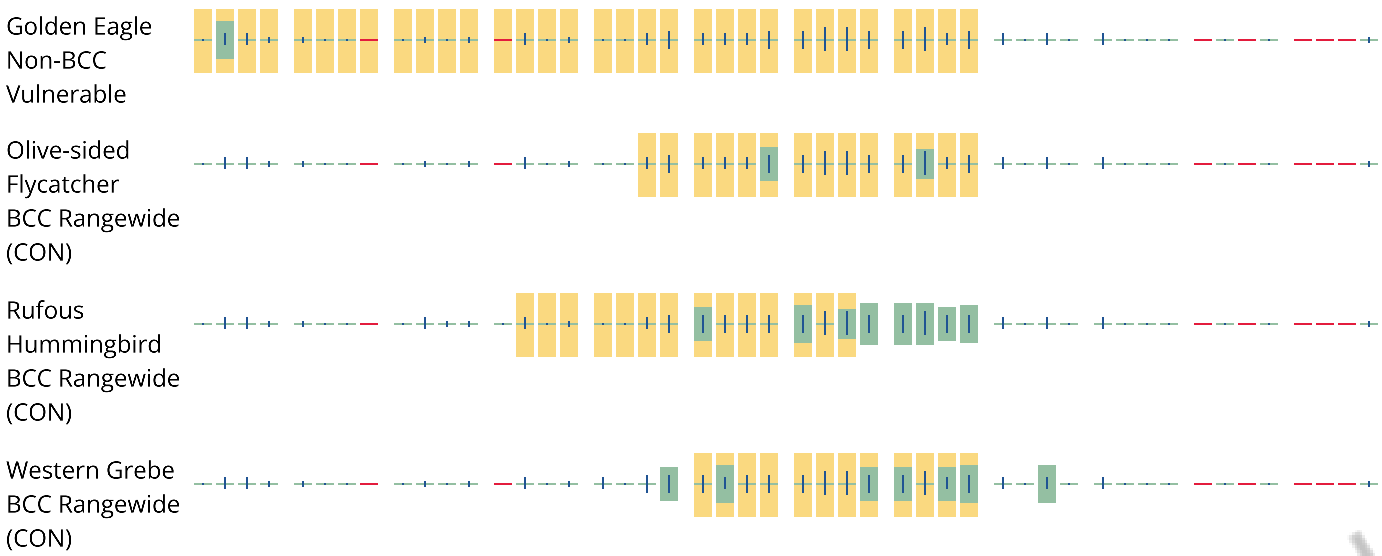
Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.





Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the Rapid Avian Information Locator (RAIL) Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets.

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the RAIL Tool and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

Please note that the NWI data being shown may be out of date. We are currently working to update our NWI data set. We recommend you verify these results with a site visit to determine the actual extent of wetlands on site.

This location overlaps the following wetlands:

FRESHWATER EMERGENT WETLAND
- PEM1C
- PEM1Fh
- PEM1A
- PEM1F
- PEM1/SS1C
- PEM1Cx
- PEM1B

FRESHWATER FORESTED/SHRUB WETLAND
- PSS1C
- PSS1A
- PSS1F

FRESHWATER POND
- PUSCx
- PUBFx

LAKE
- L1UBH
- L2AB3Hh
- L2RS2Cr

RIVERINE
- R4SBC
- R2UBH
- R5UBFx
- R5UBH

A full description for each wetland code can be found at the National Wetlands Inventory website

NOTE: This initial screening does **not** replace an on-site delineation to determine whether wetlands occur. Additional information on the NWI data is provided below.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

NPS Form 10-900
(Revised Feb. 1993)

OMB No. 10024-0018

United States Department of the Interior
National Park Service

RECEIVED 2280
MAR - 3 1999
NAT. REGISTER OF HISTORIC PLACES
NATIONAL PARK SERVICE

417

National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations of eligibility for individual properties or districts. See instructions in *How to Complete the National Register of Historic Places Form* (National Register Bulletin 16A). Complete each item by marking "x" in the appropriate box or by entering the information requested. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, architectural classification, materials, and areas of significance, enter only categories and subcategories from the instructions. Place additional entries and narrative items on continuation sheets (NPS Form 10-900a). Use a typewriter, word processor, or computer to complete all items.

1. Name of Property

historic name **SCOFIELD, ANNA NIELSEN, HOUSE**

other names/site number Watts House/ISHS #07-17887

2. Location

street & number 2788 U.S. Highway 89 — N/A not for publication

city or town Fish Haven — N/A vicinity

state Idaho code ID county Bear Lake code 007 zip code 83287

3. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act, as amended, I hereby certify that this X nomination ___request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property X meets ___does not meet the National Register criteria. I recommend that this property be considered significant ___nationally ___statewide X locally. (___ See continuation sheet for additional comments.)

Robert M. Yohe II — 2/2/99

Signature of certifying official/Title — Date
ROBERT M. YOHE, II, State Historic Preservation Officer

State or Federal agency and bureau

In my opinion, the property ___meets ___does not meet the National Register criteria. (___ See continuation sheet for additional comments.)

Signature of certifying official/Title — Date

State or Federal agency and bureau

4. National Park Service Certification

I hereby certify that this property is:

✓ entered in the National Register.
___ See continuation sheet.
___ determined eligible for the National Register.
___ See continuation sheet.
___ determined not eligible for the National Register.
___ removed from the National Register.
___ other, (explain:)

Signature of the Keeper — Date of Action

for Edson H. Beall 4-1-99

5. Classification

Ownership of Property
(Check as many boxes as apply)

x private
___ public-local
___ public-State
___ public-Federal

Category of Property
(Check only one box)

x building(s)
___ district
___ site
___ structure
___ object

Number of Resources within Property
(Do not include previously listed resources in the count.)

Contributing	Noncontributing	
1	0	buildings
		sites
		structures
		objects
1	0	Total

Name of related multiple property listing
(Enter "N/A" if property is not part of a multiple property listing.)

N/A

Number of contributing resources previously listed in the National Register

N/A

6. Function or Use

Historic Functions
(Enter categories from instructions)

DOMESTIC/single dwelling

Current Functions
(Enter categories from instructions)

DOMESTIC/hotel

7. Description

Architectural Classification
(Enter categories from instructions)

LATE VICTORIAN/Queen Anne

Materials
(Enter categories from instructions)

foundation STONE
walls WOOD/weatherboard

roof ASPHALT
other

Narrative Description

(Describe the historic and current condition of the property on one or more continuation sheets.)

X See continuation sheet(s) for Section No. 7

NARRATIVE DESCRIPTION

The Anna Nielson Scofield House is located at 2788 US Highway 89 in the small community of Fish Haven in Bear Lake County, Idaho. The house sits on a large parcel on the east side of the highway which reaches to the shore of nearby Bear Lake. It is an irregular-plan balloon-frame Folk Victorian dwelling which rests on a brick foundation. The building is clad in beaded weatherboard and has an asphalt shingle roof. The majority of window sash in the building are one-over-one double-hung wood sash. Windows and doors are trimmed with flat board casements and there is flat board trim at the corners, sills and cornices.

The building is organized into several sections which evolved over time. The southern portion of the house consists of a one-and-one-half story, side-gabled, hall-and-parlor core with a one-and-one-half story rear kitchen ell. The front of this portion of the house features a wide porch and has a central entry door flanked by a large picture window (likely dating from a late 1930s renovation) to the south and a standard sash window to the north. The porch features typical mass produced trim including turned spindles, posts and jig-sawn brackets. The south side-gable end features another picture window on the first floor and a single standard sash window. A large chimney and fireplace are located between the two rooms of the main core of this house.

The kitchen ell projects approximately from the center of the original core of the house and is contemporaneous. On the south side of the ell there is a porch similar in dimension and decorative treatment to the front porch. This porch leads to a kitchen door and standard sash window which flank a modern concrete block kitchen vent stack. The rear (east) of the kitchen ell features a gable-end with a single standard sash and an offset standard sash on the first floor. This represents the original extent of the house as built in 1896.

A substantial northern wing was added to the building circa 1910. This wing, placed perpendicular to the original side-gable core of the house, is also one-and-one-half stories in height and is two rooms deep. This wing presents its narrow end to the street and has an unusual angled three-sided window bay on the street elevation. This projection is part of the primary wall and roof system rather than a separate decorative element. It is capped with a three-sided roof which emerges uninterrupted from the north wing's main roof plain. This wing projects out from the front wall of the older south portion of the house and has a secondary entry door located at the end of the main porch where it intersects the new wing. The north wall of this wing is almost completely bare--featuring only a pair of standard sash windows at the north east corner of the building. The rear (east) of this wing features an unadorned gable-end with a standard sash gable window. There is a small, plain porch located on the first floor rear of the north wing. It serves to shelter two doors which enter into the north wing and to connect the north wing with the 1930s bathroom addition.

The final addition to the house consists of a small one-story bathroom which was added between the north side of the kitchen ell and the south side of the north wing during a remodeling in the late 1930s. It features a shallow hipped roof, a small fixed window and a door which exits directly outside to the north.

Scofield, Anna Nielsen, House
Name of Property

Fish Haven, Bear Lake, Idaho
City, County, and State

8. Statement of Significance

Applicable National Register Criteria
(Mark "x" on one or more lines for the criteria qualifying the property for National Register listing.)

___ **A** Property is associated with events that have made a significant contribution to the broad patterns of our history.

___ **B** Property is associated with the lives of persons significant in our past.

_x_ **C** Property embodies the distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.

___ **D** Property has yielded, or is likely to yield, information important in prehistory or history.

Criteria Considerations
(Mark "x" on all that apply.)

Property is:

___ **A** owned by a religious institution or used for religious purposes.

___ **B** removed from its original location.

___ **C** a birthplace or grave.

___ **D** a cemetery.

___ **E** a reconstructed building, object, or structure.

___ **F** a commemorative property.

___ **G** less than 50 years of age or achieved significance within the past 50 years.

Areas of Significance
(Enter categories from instructions)

ARCHITECTURE

Period of Significance

1896-1941

Significant Dates

1896

Significant Person
(Complete if Criterion B is marked above)

N/A

Cultural Affiliation

N/A

Architect/Builder

Ernest and Hyrum Scofield, builders

Narrative Statement of Significance

(Explain the significance of the property on one or more continuation sheets.)

_X_ See continuation sheet(s) for Section No. 8

9. Major Bibliographical References

Bibliography
(Cite the books, articles, and other sources used in preparing this form on one or more continuation sheets.)

Previous documentation on file (NPS):

___ preliminary determination of individual listing (36 CFR 67) has been requested
___ previously listed in the National Register
___ previously determined eligible by the National Register
___ designated a National Historic Landmark
___ recorded by Historic American Buildings Survey # ________
___ recorded by Historic American Engineering Record # ________

Primary location of additional data:

_x_ State Historic Preservation Office
___ Other State agency
___ Federal agency
_x_ Local government
___ University
_x_ Other

Name of repository:
Family History

_X_ See continuation sheet(s) for Section No. 9

STATEMENT OF SIGNIFICANCE

The Anna Nielson Scofield House is eligible for listing in the National Register of Historic Places under Criterion C. It is an excellent and locally significant example of a rural Folk Victorian dwelling. It serves to illustrate the evolution of a typical rural dwelling during the prosperity, depression and recovery of the local agricultural economy during the first half of the 20th century. It is also one for the few remaining examples of this type of rural dwelling in its community.

Folk or vernacular housing can be defined as structures which were built to provide basic shelter for the common people. These structures tend to bear little trace of the fashionable architectural tastes or trends of their time. They are generally built with inexpensive local materials and can often trace their general plan and structural characteristics to a few basic antecedents.[1] During the later part of the 20th century, mass-produced materials--particularly milled lumber--began to be available in isolated rural communities due to expansion of the national railroad network. Folk housing began to utilize these materials and to apply them to traditional folk forms. The resultant structures were still simple and removed from the "high style" but were also substantially different from the pre-mass-consumer culture predecessors. These structures have been commonly referred to as Folk Victorian. This phase in vernacular building lasted until the advent of mail-order houses and the true dissemination of popular architectural styles into rural areas during the first half of the 20th century.[2]

The Anna Nielson Scofield House is an excellent local example of a Folk Victorian dwelling. The building was constructed of mass-produced lumber using the balloon framing method. It is clearly a folk house, as it demonstrates little in the way of architectural detail and has decidedly odd proportions and massing. What mass-produced decoration is present is restricted to the porch--a typical Folk Victorian practice.

The Anna Nielson Scofield House also demonstrates the typical evolution of a rural dwelling over the course of the first half of the 20th century. No portion of the American economy has been more vulnerable to the vagaries of boom and bust than rural, agriculturally dependent communities. As such, buildings in rural locales tend to evolve over time--additions or amenities being added as finances and the general economic climate would allow.

The building consists of three distinct developmental phases linked to the boom, bust and recovery of the rural economy in southeast Idaho during the first half of this century. The oldest part of the house--consisting of the southern half including the kitchen ell--was constructed in 1896 for Mrs. Anna Nielson Scofield (a local widow) by her sons Ernest and Hyrum. This portion of the house consisted of a typical side-gabled, central-chimney, hall-and-parlor house with a rear kitchen addition or ell. Although built of massed-produced lumber, the form of this initial portion of the house can trace its origins to Colonial New England.[3] The hall-and-parlor form is also typically associated with Mormon folk housing in Southeast Idaho.[4] Mrs. Scofield was, indeed, a Mormon convert from Denmark who emigrated to the West in the 1850s. Initial construction of the house corresponds to the beginning of one of the most significant expansions in the rural economy which lasted from the mid-1890s through the end of the First World War.[5] The second phase (the north wing) of the house also corresponds with this economic boom--having been constructed circa 1910. It was added to the house by Anna Scofield's son, Ernest, and his family. This was done so that he might take care of his elderly mother.

No further substantial additions were made to the house for the next quarter century. Ernest Scofield and his family continued to live in the house until his death in 1936. This period of non-activity corresponds to the hard times that beset rural communities during the 1920s and 1930s.[6] It was following Ernest's death in the late 1930s that the final addition of a bathroom with indoor plumbing was made to the house. This corresponds to the economic recovery of the New Deal era when substantial government funds were invested in rural communities devastated by the effects of the Great Depression.[7] As such, the period of significance for the property extends through the end of the pre-World War II recovery period in 1941.

The Anna Nielson Scofield House is one of the very few historic structures in Fish Haven that retains its historic character. Fish Haven was originally a rural agricultural community established by Mormon colonists from Utah in the 1860s and 1870s. Beginning in the 1920s, however, Fish Haven began to develop as one of Bear Lake's resort communities. This 20th century development soon overwhelmed the earlier agricultural community and many lakeside parcels were subdivided and developed for summer cabins. The Scofield House is one of the few structures of its type remaining in Fish Haven. It serves to illustrate the rural architectural development of the community and is a fine example of local Folk Victorian architecture. As such, it is worthy of listing in the National Register under Criterion C.

ENDNOTES

1. McAlester, Virginia and Lee, A Field Guide to American Houses, Alfred A. Knopf, New York, 1988, p.63.

2. Ibid, p.109-110.

3. Ibid, p.94.

4. Attebery, Jennifer Eastman, Building Idaho: An Architectural History, University of Idaho Press, Moscow, Idaho, 1991, p. 39.

5. Schwantes, Carlos A., In Mountain Shadows: A History of Idaho, University of Nebraska Press, Lincoln, Nebraska, 1991, p. 161.

6. Ibid, p. 189-190.

7. Ibid, p. 204-206.

BIBLIOGRAPHY

Attebery, Jennifer Eastman, Building Idaho: An Architectural History, University of Idaho Press, Moscow, Idaho, 1991.

McAlester, Virginia and Lee, A Field Guide to American Houses, Alfred A. Knopf, New York, 1988.

Schwantes, Carlos A., In Mountain Shadows: A History of Idaho, University of Nebraska Press, Lincoln, Nebraska, 1991.

Note: Information specific to the history of the Scofield family and the evolution of the Scofield House was provided via various family papers and genealogical records held by MarJean Watts, Smithfield, UT.

10. Geographical Data

Acreage of property less than one

UTM References
(Place additional UTM references on a continuation sheet.)

	Zone	Easting	Northing		Zone	Easting	Northing
A	1/1	4/6/7/3/0/0	4/6/5/3/6/6/0	B	/	/ / / / /	/ / / / / /
C	/	/ / / / /	/ / / / / /	D	/	/ / / / /	/ / / / / /

Verbal Boundary Description
(Describe the boundaries of the property.)
Parcel 13, Section 14, Township 16S, Range 43 E, Boise Meridian

___ See continuation sheet(s) for Section No. 10

Boundary Justification
(Explain why the boundaries were selected.)
The above described parcel constitutes all of the property historically associated with the Anna Nielsen Scofield House.

___ See continuation sheet(s) for Section No. 10

11. Form Prepared By

name/title MarJean Watts with assistance from IDSHPO staff
organization ______ date 1/26/98
street & number 505 Parkview Circle telephone (435) 563-5283
city or town Smithfield state UT zip code 84335

Additional Documentation

Submit the following items with the completed form:

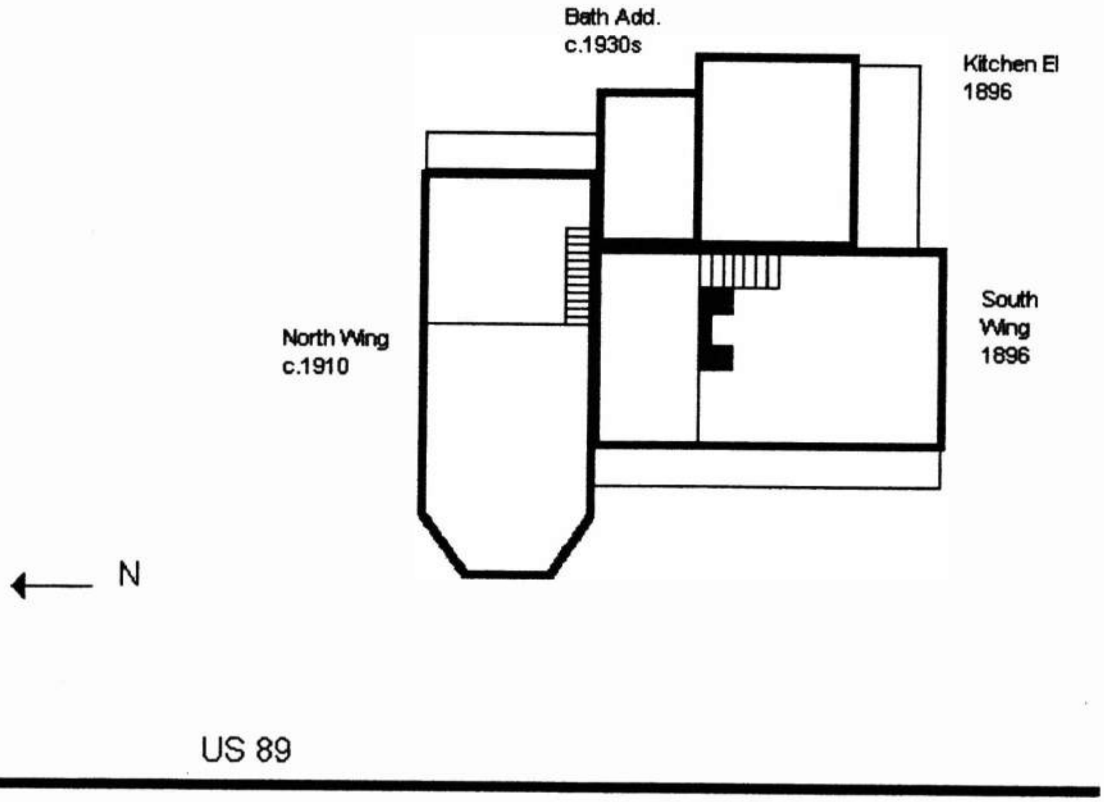
- **Continuation Sheets**
- **Maps:** A **USGS map** (7.5 or 15 minute series) indicating the property's location.

  A **Sketch map** for historic districts and/or properties having large acreage or numerous resources.
- **Photographs:** Representative **black and white photographs** of the property.
- **Additional items** (Check with the SHPO or FPO for any additional items.)

Property Owner

name MarJean Watts
street & number 505 Parkview Circle telephone (435) 563-5283
city or town Smithfield state UT zip code 84335

Anna Nielson Scofield House
Fish Haven, Bear Lake Co.
Idaho



UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES
EVALUATION/RETURN SHEET

REQUESTED ACTION: NOMINATION

PROPERTY NAME: Scofield, Anna Nielsen, House

MULTIPLE NAME:

STATE & COUNTY: IDAHO, Bear Lake

DATE RECEIVED: 3/03/99 DATE OF PENDING LIST: 3/16/99
DATE OF 16TH DAY: 4/01/99 DATE OF 45TH DAY: 4/17/99
DATE OF WEEKLY LIST:

REFERENCE NUMBER: 99000417

REASONS FOR REVIEW:

APPEAL:	N	DATA PROBLEM:	N	LANDSCAPE:	N	LESS THAN 50 YEARS:	N
OTHER:	N	PDIL:	N	PERIOD:	N	PROGRAM UNAPPROVED:	N
REQUEST:	N	SAMPLE:	N	SLR DRAFT:	N	NATIONAL:	N

COMMENT WAIVER: N

✓ ACCEPT ___RETURN ___REJECT 4.1.99 DATE

ABSTRACT/SUMMARY COMMENTS:

Entered in the
National Register

RECOM./CRITERIA________________

REVIEWER________________ DISCIPLINE________________

TELEPHONE________________ DATE________________

DOCUMENTATION see attached comments Y/N see attached SLR Y/N

1. Scofield, Anna Nielson, House
2. Bear Lake Co., Idaho
3. Idaho SHPO
4. 8/14/98
5. Idaho SHPO
6. View from W
7. Photo #1

1. Scofield, Anna Nielson, House
2. Bear Lake Co., Idaho
3. Idaho SHPO
4. 8/14/98
5. Idaho SHPO
6. View from SW
7. Photo #2

1. Scofield, Anna Nielson, House
2. Bear Lake Co., Idaho
3. Idaho SHPO
4. 8/14/98
5. Idaho SHPO
6. View from W (bay detail)
7. Photo #3

1. Scofield, Anna Nielson, House
2. Bear Lake Co., Idaho
3. Idaho SHPO
4. 8/14/98
5. Idaho SHPO
6. View from W.
7. Photo #4

1. Scofield, Anna Nielson, House
2. Bear Lake Co., Idaho
3. Idaho SHPO
4. 8/14/98
5. Idaho SHPO
6. View from N.
7. Photo #5

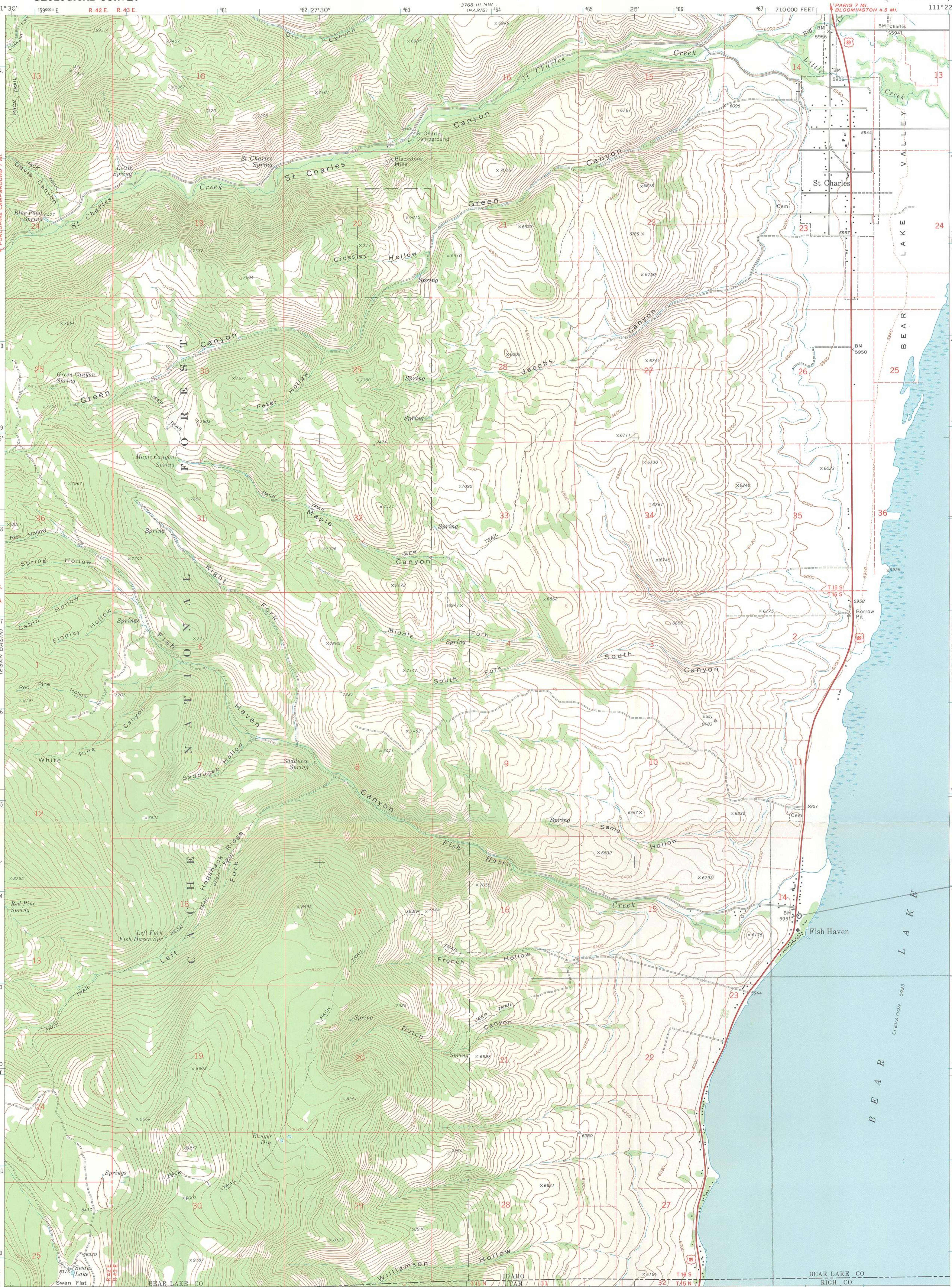
1. Scofield, Anna Nielson, House
2. Bear Lake Co., Idaho
3. Idaho SHPO
4. 8/14/98
5. Idaho SHPO
6. View from NE.
7. Photo #6

1. Scofield, Anna Nielson, House
2. Bear Lake Co., Idaho
3. Idaho SHPO
4. 8/14/98
5. Idaho SHPO
6. View from E
7. Photo # 7

1. Scofield, Anna Nielson, House
2. Bear Lake Co., Idaho
3. Idaho SHPO
4. 8/14/1998
5. Idaho SHPO
6. View from SE
7. Photo #8

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ST. CHARLES QUADRANGLE
IDAHO–UTAH
7.5 MINUTE SERIES (TOPOGRAPHIC)



Scofield, Anna Nielson, House

Fish Haven, Bear Lake Co., ID

UTM

12/ ~~467300~~ 467230 / ~~4653660~~ 4653895

Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1968. Field checked 1969

Polyconic projection. 1927 North American datum

10,000-foot grid based on Idaho coordinate system, east zone

1000-meter Universal Transverse Mercator grid ticks, zone 12, shown in blue

To place on the predicted North American Datum 1983 move the projection lines 11 meters north and 64 meters east as shown by dashed corner ticks

There may be private inholdings within the boundaries of the National or State reservations shown on this map

UTM GRID AND 1969 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 20-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

IDAHO
QUADRANGLE LOCATION

ROAD CLASSIFICATION

Primary highway, hard surface — Light-duty road, hard or improved surface

Secondary highway, hard surface — Unimproved road

Interstate Route — U. S. Route — State Route

ST. CHARLES, IDAHO–UTAH
N4200—W11122.5/7.5

1969

DMA 3768 III SW—SERIES V893

Form No. 10-300 (Rev. 10-74)

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES INVENTORY -- NOMINATION FORM

DATA SHEET

FOR NPS USE ONLY
RECEIVED JAN 21 1976
DATE ENTERED MAY 3 1976

SEE INSTRUCTIONS IN *HOW TO COMPLETE NATIONAL REGISTER FORMS*
TYPE ALL ENTRIES -- COMPLETE APPLICABLE SECTIONS

1 NAME

HISTORIC Wilhelmina Nelson House ~~and Cabins~~

AND/OR COMMON

2 LOCATION

STREET & NUMBER U. S. 89 __NOT FOR PUBLICATION

CITY, TOWN Saint Charles __ VICINITY OF

CONGRESSIONAL DISTRICT 2

STATE Idaho CODE 16 COUNTY Bear Lake CODE 007

3 CLASSIFICATION

CATEGORY	OWNERSHIP	STATUS	PRESENT USE	
__DISTRICT	__PUBLIC	__OCCUPIED	X AGRICULTURE	__MUSEUM
X BUILDING(S)	X PRIVATE	X UNOCCUPIED	__COMMERCIAL	__PARK
__STRUCTURE	__BOTH	__WORK IN PROGRESS	__EDUCATIONAL	__PRIVATE RESIDENCE
__SITE	**PUBLIC ACQUISITION**	**ACCESSIBLE**	__ENTERTAINMENT	__RELIGIOUS
__OBJECT	__IN PROCESS	__YES: RESTRICTED	__GOVERNMENT	__SCIENTIFIC
	__BEING CONSIDERED	X YES: UNRESTRICTED	__INDUSTRIAL	__TRANSPORTATION
		__NO	__MILITARY	__OTHER:

4 OWNER OF PROPERTY

NAME Patience Stewart Williamson and Carmena S. Dickemore

STREET & NUMBER 3832 North Highway 89-91

CITY, TOWN Ogden __ VICINITY OF STATE Utah

5 LOCATION OF LEGAL DESCRIPTION

COURTHOUSE, REGISTRY OF DEEDS, ETC. Bear Lake County Courthouse

STREET & NUMBER Main Street

CITY, TOWN Paris STATE Idaho

6 REPRESENTATION IN EXISTING SURVEYS

TITLE Idaho State Historic Preservation Plan

DATE 1972 __FEDERAL X STATE __COUNTY __LOCAL

DEPOSITORY FOR SURVEY RECORDS Idaho State Historical Society

CITY, TOWN 610 N. Julia Davis Drive, Boise STATE Idaho

7 DESCRIPTION

CONDITION		CHECK ONE	CHECK ONE
__EXCELLENT	X DETERIORATED	__UNALTERED	X ORIGINAL SITE
__GOOD	__RUINS	__ALTERED	__MOVED DATE______
__FAIR	__UNEXPOSED		

DESCRIBE THE PRESENT AND ORIGINAL (IF KNOWN) PHYSICAL APPEARANCE

This grouping of an old home, three cabins and the surrounding out-buildings provides a good example of a typical homestead in southeastern Idaho. The Nelson house (built about in 1896) is a two-story wooden farm house built in an L-shape. The facade is dominated by the gable of the ell and the smaller gables of the two dormer windows. These and other dormers are cut through the eave line, with half the window in the dormer above and half the window in the wall below. All windows are double-hung sash, set either singly or in pairs. Placed on a cement foundation, the house is clapboard up to the eaves and shingles in the gables.

Of the three log cabins on the farm, two are similar in size and shape. The one nearest the house is the original cabin built shortly after 1876. After 1896 it became a shop for John Nelson, with a bellows, tire shrinker, and harness making equipment. The other was a granery. The logs in the walls are fairly slender, notched together at the corners with saddle notches. The gable roofs are steeply pitched, and the gable ends of one of these two cabins have vertical board construction.

The third cabin, identified by Wilhelmina Nelson of Saint Charles as the Jens Moller Haugaard Borglum residence, is in somewhat poorer condition than the other two. Built well over one-hundred years ago, it was moved onto the homestead from just a short distance away, and used for years as a chicken coop. Its low walls utilize stout logs, held together with saddle notches at the corners. The low pitched roof is supported by log purlins which are covered with rough-cut timber and slabs. These, in turn, support the remains of a sod covering.

The outbuildings complete this typical farm grouping. Several clapboard sheds are clustered behind the main house, along with the outhouses and the two log cabins. Toward the two barns and corrals is the Borglum cabin, and several more sheds are found by the barns.

8 SIGNIFICANCE

PERIOD	AREAS OF SIGNIFICANCE -- CHECK AND JUSTIFY BELOW			
__PREHISTORIC	__ARCHEOLOGY-PREHISTORIC	__COMMUNITY PLANNING	__LANDSCAPE ARCHITECTURE	__RELIGION
__1400-1499	__ARCHEOLOGY-HISTORIC	__CONSERVATION	__LAW	__SCIENCE
__1500-1599	X AGRICULTURE	__ECONOMICS	__LITERATURE	X SCULPTURE
__1600-1699	X ARCHITECTURE	__EDUCATION	__MILITARY	__SOCIAL/HUMANITARIAN
__1700-1799	__ART	__ENGINEERING	__MUSIC	__THEATER
X 1800-1899	__COMMERCE	__EXPLORATION/SETTLEMENT	__PHILOSOPHY	__TRANSPORTATION
__1900-	__COMMUNICATIONS	__INDUSTRY	__POLITICS/GOVERNMENT	__OTHER (SPECIFY)
		__INVENTION		

SPECIFIC DATES | BUILDER/ARCHITECT

STATEMENT OF SIGNIFICANCE

Born in Malma, Sweden, 9 January 1854, Wilhelmina Nelson arrived in New York June 20, 1876, and settled in Saint Charles later that year. She lived next door to the J. M. H. Borglum residence, and when the old cabin could not be retained on its original site, she had it moved a short distance to a location close to her original log home. She survived to the age of 96, and took considerable pride in having maintained the Borglum structure.

The now abandoned farm of Wilhelmina Nelson outside the little town of St. Charles provides an excellent example of housing typical of the area. Retaining its integrity, the Nelson group offers a glimpse into the past. The ulilitarian design of these buildings reflects two types of architecture common to the western frontier--log construction and clapboard construction. While many of these types of buildings are still in existence, few remain intact and unaltered in their integrity as a group, as the Nelson cabins do.

The Borglum home, preserved because of local interest in J. H. M. Borglum's son, Gutzon--sculptor of Mt. Rushmore--is the third of the log cabins in this group. Gutzon Borglum's unfinished autobiography stated that his father (who came to Bear Lake in 1866) dug the house half into the ground, finishing it with logs and sod. * This description fits that of the present cabin, with its low log walls and sod roof. Gutzon Borglum, a native of Bear Lake valley, spent his first year there.

*Information from Robert J. Casey and Mary Borglum, Give the Man Room, New York: The Bobbs-Merrill Company, Inc., 1952, p. 28. Lincoln Borglum, son of Gutzon, concurs in this identification.

9 MAJOR BIBLIOGRAPHICAL REFERENCES

Casey, Robert J. and Mary Borglum.
Give the Man Room, New York: The Boobs-Merrill Company, Inc., 1952

10 GEOGRAPHICAL DATA

8 or 9 acres WRL 4/1/76

ACREAGE OF NOMINATED PROPERTY less than 10 acres

UTM REFERENCES

	ZONE	EASTING	NORTHING
A	1 2	4 6 7 9 6 0	4 6 6 1 8 3 8 (8 2 0)
B			
C			
D			

VERBAL BOUNDARY DESCRIPTION

The nomination includes only the house and barn, along with three cabins and small outbuildings between the house and barn.

LIST ALL STATES AND COUNTIES FOR PROPERTIES OVERLAPPING STATE OR COUNTY BOUNDARIES

STATE	CODE	COUNTY	CODE
STATE	CODE	COUNTY	CODE

11 FORM PREPARED BY

NAME / TITLE
Merle W. Wells, State Historic Preservation Officer

ORGANIZATION
Idaho State Historical Society

DATE
January 12, 1976

STREET & NUMBER
610 N. Julia Davis Drive

TELEPHONE
208 384-2120

CITY OR TOWN
Boise, Idaho 83706

STATE

12 STATE HISTORIC PRESERVATION OFFICER CERTIFICATION

THE EVALUATED SIGNIFICANCE OF THIS PROPERTY WITHIN THE STATE IS:

NATIONAL ___ STATE X LOCAL ___

As the designated State Historic Preservation Officer for the National Historic Preservation Act of 1966 (Public Law 89-665), I hereby nominate this property for inclusion in the National Register and certify that it has been evaluated according to the criteria and procedures set forth by the National Park Service.

STATE HISTORIC PRESERVATION OFFICER SIGNATURE Merle Wells

TITLE State Historic Preservation Officer DATE 14 January 76

FOR NPS USE ONLY
I HEREBY CERTIFY THAT THIS PROPERTY IS INCLUDED IN THE NATIONAL REGISTER

Acting [signature] DATE 5/3/76

DIRECTOR, OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION

ATTEST: Charles A. Herrington DATE 5.3.76

KEEPER OF THE NATIONAL REGISTER

76000668

Property Nelson, Wilhelmina, House + Cabins

State Idaho Working Number 1.21.76.2382 BEAR LAKE

TECHNICAL more Precise acreage

Photos 2

Maps 1

CONTROL

pl

OK 2.2.76

If accepted do so more for typical early Idaho building groups than for Borglum

HISTORIAN

Accept

W. R. Luce

2/23/76

ARCHITECTURAL HISTORIAN

ACCEPT

HWJandl

2/25/76

ARCHEOLOGIST

OTHER

HAER

Inventory ______

Review ______

REVIEW UNIT CHIEF

Accept

Cole

4/30/76

BRANCH CHIEF

KEEPER

Herring

5.3.76

National Register Write-up ______ Send-back ______ Entered MAY 3 1976

Federal Register Entry 6-1-76 Re-submit ______

INT:2106-74

United States Department of the Interior National Park Service WASO No. 7

Form No. 10-301a
(Rev. 10-74)

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES
PROPERTY PHOTOGRAPH FORM

FOR NPS USE ONLY
RECEIVED JAN 21 1976
DATE ENTERED MAY 3 1976

SEE INSTRUCTIONS IN *HOW TO COMPLETE NATIONAL REGISTER FORMS*
TYPE ALL ENTRIES   ENCLOSE WITH PHOTOGRAPH

1 NAME

HISTORIC Wilhelmina Nelson House and Cabins

AND/OR COMMON

2 LOCATION

CITY, TOWN Saint Charles   ___VICINITY OF   COUNTY Bear Lake   STATE Idaho

3 PHOTO REFERENCE

PHOTO CREDIT Idaho State Historical Society   DATE OF PHOTO 1974

NEGATIVE FILED AT Idaho State Historical Society

4 IDENTIFICATION

DESCRIBE VIEW, DIRECTION, ETC. IF DISTRICT, GIVE BUILDING NAME & STREET
View of Wilhelmina Nelson house from southwest

PHOTO NO.
1 of 2

Form No. 10-301a
(Rev. 10-74)

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES
PROPERTY PHOTOGRAPH FORM

FOR NPS USE ONLY
JAN 21 1976
RECEIVED
MAY 3 1976
DATE ENTERED

SEE INSTRUCTIONS IN *HOW TO COMPLETE NATIONAL REGISTER FORMS*
TYPE ALL ENTRIES ENCLOSE WITH PHOTOGRAPH

1 NAME

HISTORIC Wilhelmina Nelson House and Cabins

AND/OR COMMON

2 LOCATION

CITY, TOWN Saint Charles ___VICINITY OF COUNTY Bear Lake STATE Idaho

3 PHOTO REFERENCE

PHOTO CREDIT Idaho State Historical Society DATE OF PHOTO 1974

NEGATIVE FILED AT Idaho State Historical Society

4 IDENTIFICATION

DESCRIBE VIEW, DIRECTION, ETC. IF DISTRICT, GIVE BUILDING NAME & STREET PHOTO NO.

Granery next to Wilhelmina Nelson house, looking west. 2 of 2

Title: Nelson, Wilhelmina House and Cabins, Bear Lake Cty., Idaho

Loc. Granary, looking west.

2. Granery next to Wilhelmina Nelson house. 2 of 2

Form No. 10-301
(Rev. 10-74)

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES PROPERTY MAP FORM

FOR NPS USE ONLY	
RECEIVED	JAN 21 1976
DATE ENTERED	MAY 3 1976

SEE INSTRUCTIONS IN *HOW TO COMPLETE NATIONAL REGISTER FORMS*
TYPE ALL ENTRIES -- ENCLOSE WITH MAP

1 NAME

HISTORIC Wilhelmina Nelson House and Cabins

AND/OR COMMON

2 LOCATION

CITY, TOWN Saint Charles ___VICINITY OF

COUNTY Bear Lake

STATE Idaho

3 MAP REFERENCE St. Charles Quadrangle

SOURCE U.S. Geological Survey

SCALE 1:24000 7 1/2'

DATE 1969

4 REQUIREMENTS

TO BE INCLUDED ON ALL MAPS

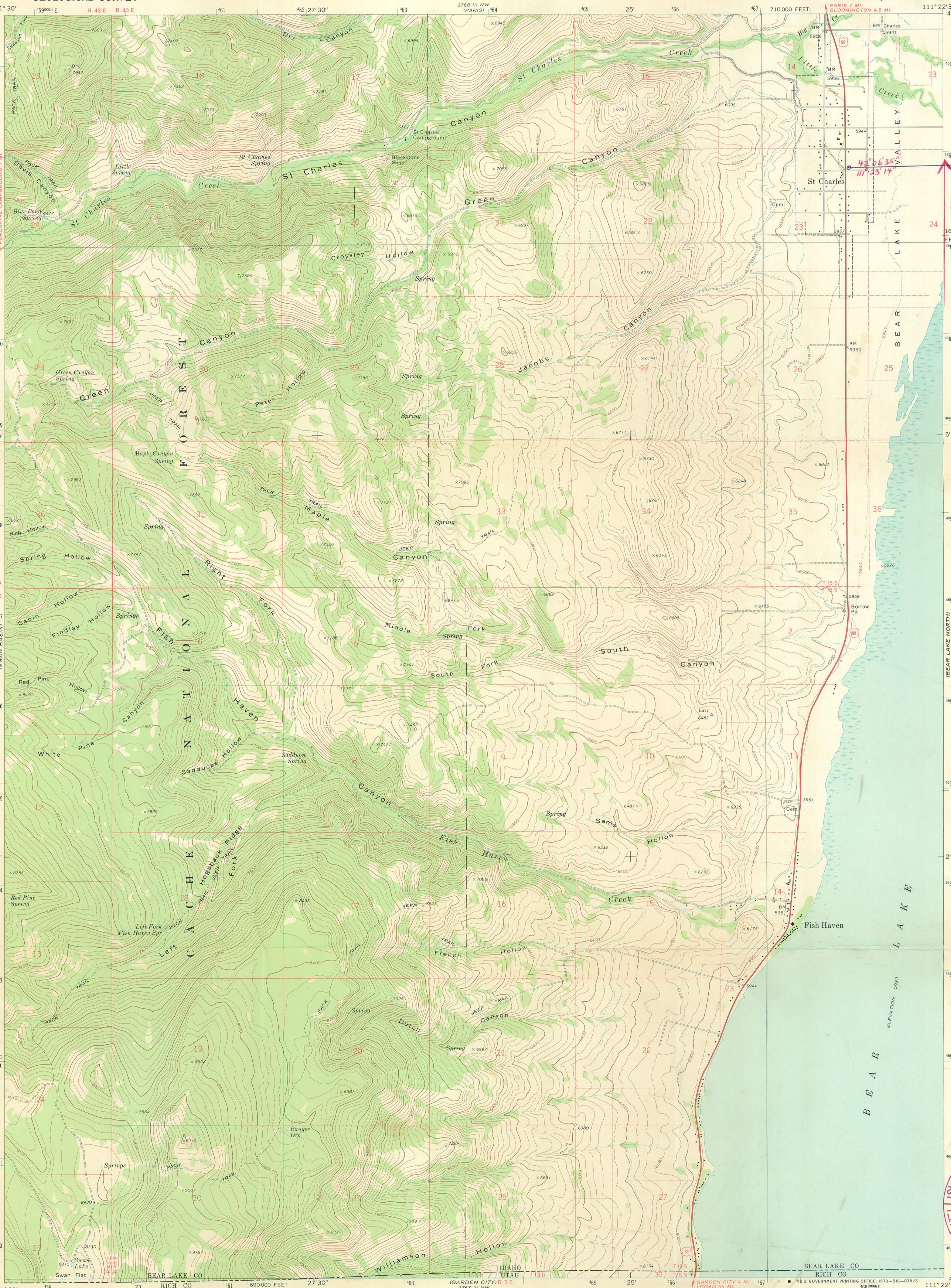
1. PROPERTY BOUNDARIES
2. NORTH ARROW
3. UTM REFERENCES

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ST. CHARLES QUADRANGLE
IDAHO—UTAH
7.5 MINUTE SERIES (TOPOGRAPHIC)

Wilhelmina Nelson
House & Cabins

Zone: 12
Easting: 4,67,960
Northing: 46,61,838



111° 30′ 42° 00′ 27′30″ 25′ 111° 22′30″

Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1968. Field checked 1969

Polyconic projection. 1927 North American datum
10,000-foot grid based on Idaho coordinate system, east zone
1000-meter Universal Transverse Mercator grid ticks, zone 12, shown in blue

Fine red dashed lines indicate selected fence lines

Where omitted, land lines have not been established

GN MN 0° 18′ 5 MILS 16½° 293 MILS

UTM GRID AND 1969 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 20-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

IDAHO
QUADRANGLE LOCATION

ROAD CLASSIFICATION

Primary highway, hard surface		Light-duty road, hard or improved surface	
Secondary highway, hard surface		Unimproved road	
Interstate Route	U. S. Route	State Route	

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR WASHINGTON, D. C. 20242
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

☆U.S. GOVERNMENT PRINTING OFFICE: 1973—516—079/5

ST. CHARLES, IDAHO—UTAH
N4200—W11122.5/7.5

1969

AMS 3768 III SW—SERIES V893

ENTRIES IN THE NATIONAL REGISTER

STATE IDAHO

Date Entered MAY 3 1976

Name	Location
Nelson, Wilhelmina, House and Cabins	**Saint Charles** **Bear Lake County**

Also Notified

Hon. Frank Church
Hon. James A. McClure
Hon. George V. Hansen

cc: Regional Director, Pacific Northwest Region

State Historic Preservation Officer
Dr. Merle W. Wells
Historic Preservation Coordinator
Idaho State Historical Society
610 North Julia Davis Drive
Boise, Idaho 83706

PR:MMOtt:cam:5/10/76

INT: 2950-75

NATIONAL REGISTER DATA SHEET

KP

(1) NAME as it appears on federal register: Nelson, Wilhelmina, House and Cabins
(2) OTHER NAMES:
(3) date of entry: 5-3-76
(4) county code: 007

(5) LOCATION street & number: U.S. 89
city / town: Saint Charles
vicinity of
state: ~~IL~~ ID
county: Bear Lake
(6) NPS REGION: Pacific NW

(7) OWNER: ☒ PRIVATE ☐ STATE ☐ MUNICIPAL ☐ COUNTY ☐ MULTIPLE ☐ FEDERAL (agency name)
(8) ADMINISTRATOR:

(9) EXISTING SURVEYS ☐ HABS ☐ HAER ☐ NHL
(10) FUNDED? ☐ YES ☒ NO
(11) CONGRESS. DISTRICT 2
(12) SOURCE of NOMINATION ☒ STATE ☐ FEDERAL
if state who prepared form?
☐ LOCAL ☐ PRIVATE ORGANIZATION

(13) WITHIN NATIONAL REGISTER HISTORIC DISTRICT? ☐ YES, NAME ☒ NO
(14) WITHIN NATIONAL HISTORIC LANDMARK? ☐ YES, NAME ☒ NO
(15) ACREAGE 8-9

(16) CONDITION
☐ excellent ☐ good ☐ fair
☒ deteriorated ☐ ruins ☐ unexposed ☐ unexcavated
☐ altered ☐ unaltered ☐ reconstructed ☐ excavated
☒ original site ☐ moved ☐ unknown

(17) features:
INTERIOR: ☒ SUBSTANTIALLY INTACT-1 ☐ NOT INTACT-0 ☐ UNKNOWN-4 ☐ NOT APPLICABLE-7
EXTERIOR: ☒ SUBSTANTIALLY INTACT-2 ☐ NOT INTACT-0 ☐ UNKNOWN-5 ☐ NOT APPLICABLE-8
ENVIRONS: ☒ SUBSTANTIALLY INTACT-3 ☐ NOT INTACT-0 ☐ UNKNOWN-6 ☐ NOT APPLICABLE-9

(18) ACCESS ☐ YES-Restricted ☒ YES-Unrestricted ☐ No Access ☐ Unknown
(19) ADAPTIVE USE ☐ YES ☐ NO
(20) SAVED? ☐ YES
IS PROPERTY A HISTORIC DISTRICT? ☐ yes ☒ no

(21) AREAS OF SIGNIFICANCE:
☐ ARCHEOLOGY-prehistoric-2 ☐ ARCHEOLOGY-historic-1 ☒ AGRICULTURE-3 ☒ ARCHITECTURE-4 ☐ ART-5
☐ COMMERCE-6 ☐ COMMUNICATIONS-7 ☐ CONSERVATION-8 ☐ ECONOMICS-9 ☐ EDUCATION-10
☐ ENGINEERING-11 ☐ ENTERTAINMENT-26 ☐ EXPLORATION-12 ☐ HEALTH-27 ☐ INDUSTRY-13 ☐ INVENTION-14
☐ LANDSCAPE ARCH.-15 ☐ LAW-16 ☐ LITERATURE-17 ☐ MILITARY-18 ☐ MUSIC-19 ☐ PHILOSOPHY-20
☐ POLITICS/GOVT.-21 ☐ RELIGION-22 ☐ SCIENCE-23 ☐ SOCIAL/HUMANITARIAN-24 ☐ SOCIAL/CULTURAL-30 ☐ TRANSPORTATION-25
☐ RECREATION-28 ☐ SETTLEMENT-29 ☐ URBAN PLANNING-31 ☐ OTHER (SPECIFY)

(22) CLAIMS: explain
'first' ☐
'oldest' ☐
'only' ☐

(23) functions
WHEN HISTORICALLY SIGNIFICANT: RESIDENCE & FARM
CURRENTLY: ABANDONED

(24) dates of initial construction: [redacted] 1870-1890s
major alterations:
historic events:

(25) ETHNIC GROUP ASSOCIATION

(26) architectural style(s): VERNACULAR
(27) architect:
(28) master builder:
(29) engineer:

(30) landscape architect / garden designer:
(31) interior decorator:
(32) artist:
(33) artisan:
(34) builder/contractor:

(35) NAMES give role & date
PERSONAL:
EVENTS:
INSTITUTIONAL:

(36) NATIONAL REGISTER WRITE-UP Frame, wood siding with gable shingling; 2 stories, L-shaped, gabled roof with wall dormers, interior chimneys, side entrance; log, and log and sod construction outbuildings. Remains of typical SE ~~Indiana~~ ~~Iowa~~ IA homestead; home of Gutzon Borglum, sculptor of Mt. Rushmore.

sp'

reviewers initials KB date 1/11/78

IF ADDITIONAL SPACE NEEDED, NUMBER & PUT ON REVERSE

Place

St. Charles city, Idaho

St. Charles city, Idaho is a city, town, place equivalent, and township located in Idaho.

Display Sources

Populations and People
Total Population
161
P1 | 2020 Decennial Census

Education
Bachelor's Degree or Higher
6.4%
S1501 | 2021 American Community Survey 5-Year Estimates

Housing
Total Housing Units
133
H1 | 2020 Decennial Census

Families and Living Arrangements
Total Households
55
DP02 | 2021 American Community Survey 5-Year Estimates

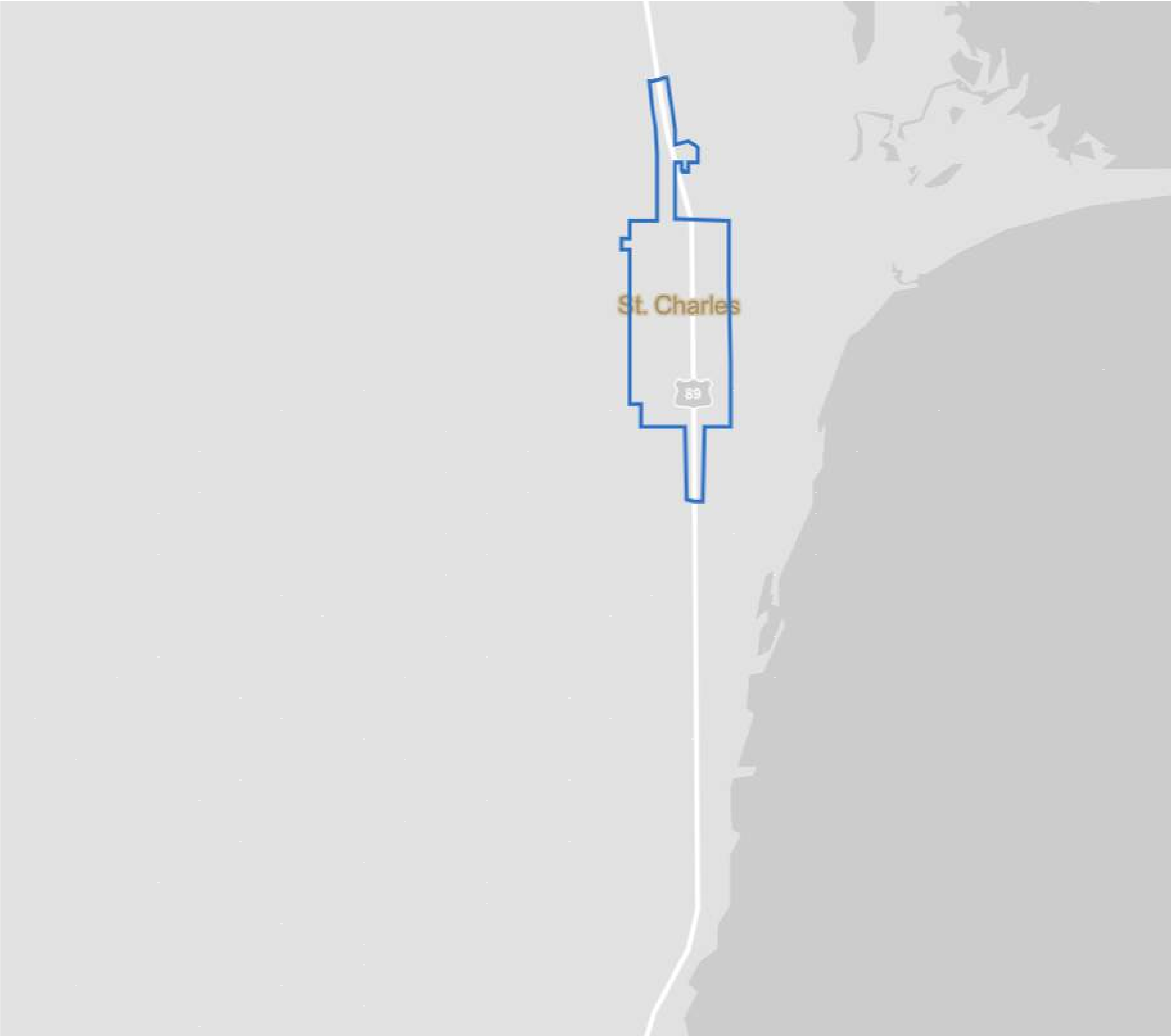
Income and Poverty
Median Household Income
-
S1901 | 2021 American Community Survey 5-Year Estimates

Employment
Employment Rate
50.9%
DP03 | 2021 American Community Survey 5-Year Estimates

Health
Without Health Care Coverage
0.0%
S2701 | 2021 American Community Survey 5-Year Estimates

Race and Ethnicity
Hispanic or Latino (of any race)
3
P2 | 2020 Decennial Census

St. Charles city, Idaho Reference Map



Source: U.S. Census Bureau

Populations and People

Age and Sex

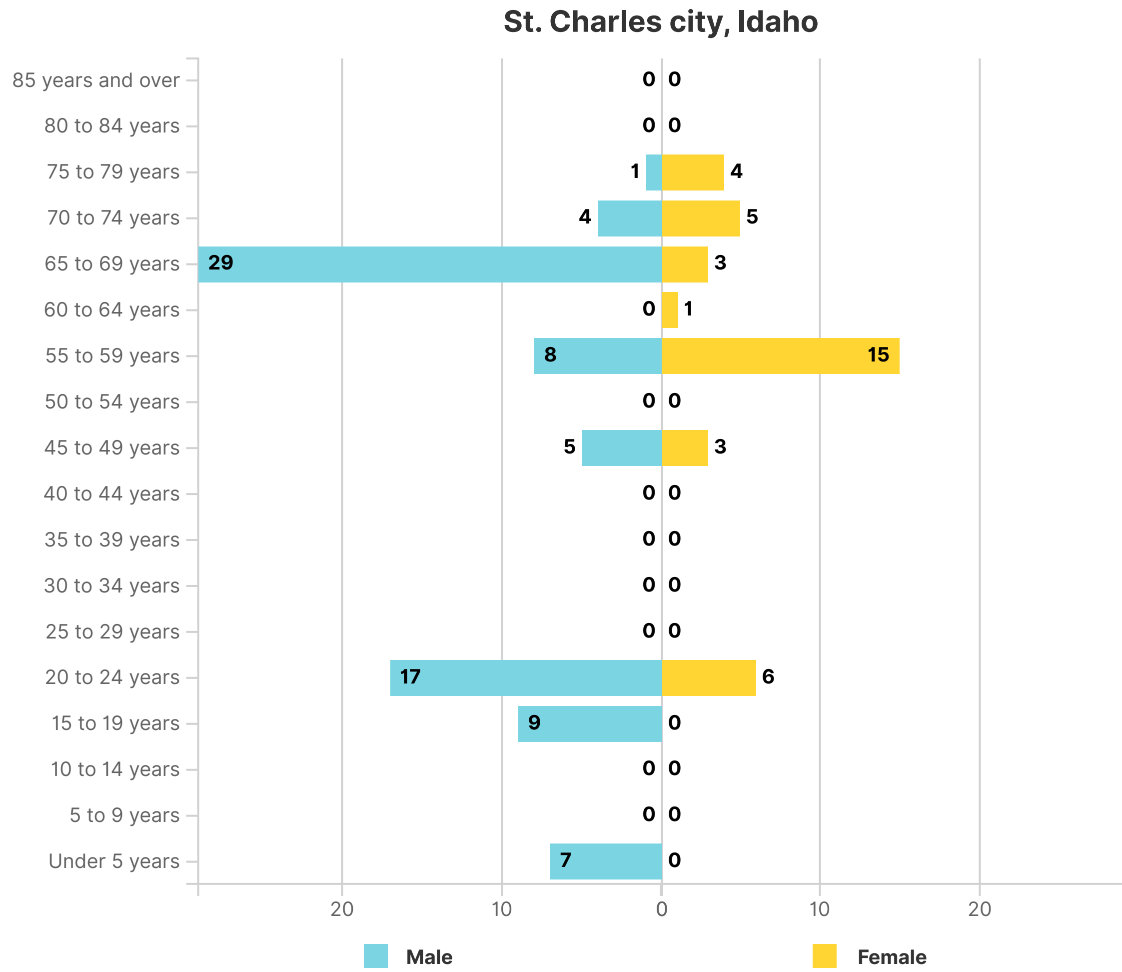
58.1 ± 10.8
Median Age in St. Charles city, Idaho

37.3 ± 0.3
Median Age in Idaho

S0101 | 2021 American Community Survey 5-Year Estimates

Population Pyramid: Population by Age and Sex
in St. Charles city, Idaho

Share / Embed



Display Margin of Error
S0101 | *2021 ACS 5-Year Estimates Subject Tables*

Ancestry

0.0% ± 26.9%
Italian Ancestry in St. Charles city, Idaho

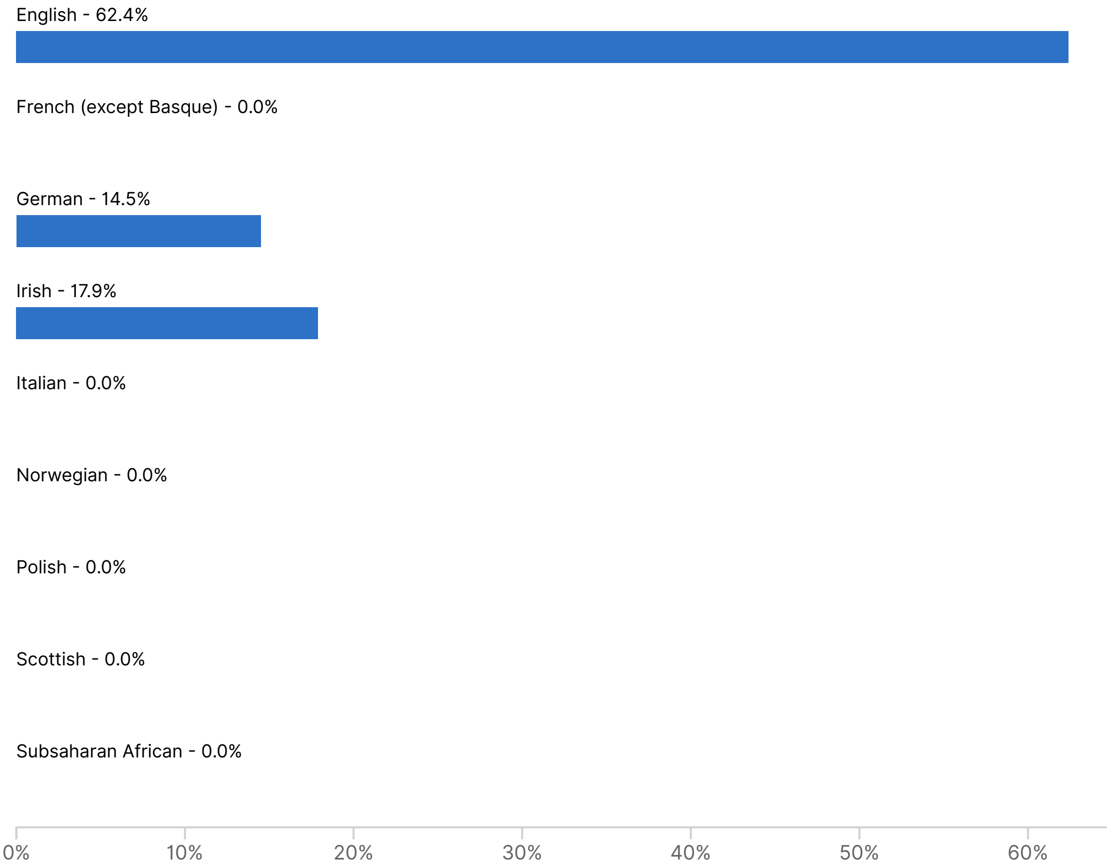
3.3% ± 0.4%
Italian Ancestry in Idaho

DP02 | *2021 American Community Survey 5-Year Estimates*

Ancestry

in St. Charles city, Idaho

Share / Embed



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DP02 | *2021 ACS 5-Year Estimates Data Profiles*

Language Spoken at Home

0.0% ± 28.2%

Language Other Than English Spoken at Home in St. Charles city, Idaho

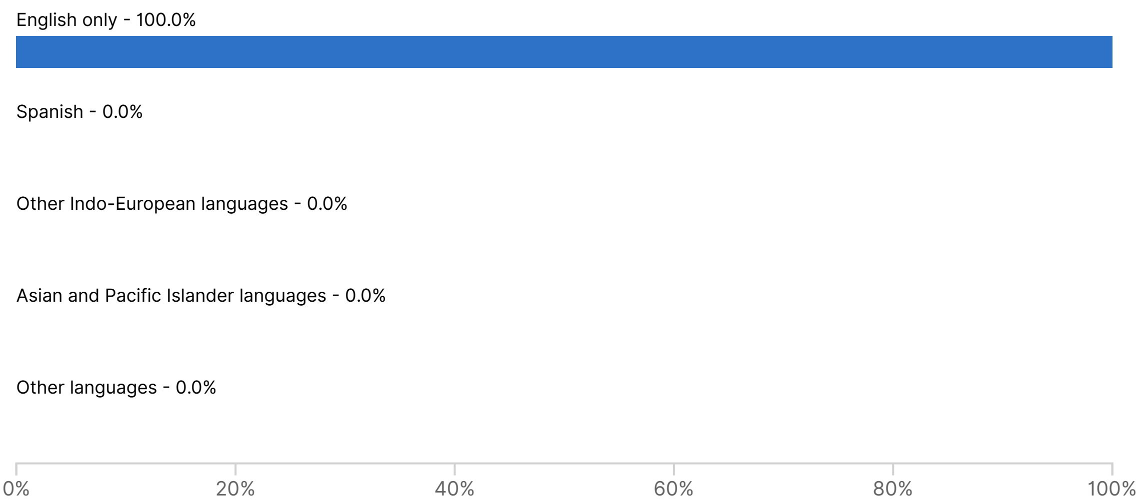
11.1% ± 0.5%

Language Other Than English Spoken at Home in Idaho

S1601 | *2021 American Community Survey 5-Year Estimates*

Types of Language Spoken at Home
in St. Charles city, Idaho

Share / Embed



Display Margin of Error

DP02 | 2021 ACS 5-Year Estimates Data Profiles

Native and Foreign Born

0.0% ± 26.9%
Foreign Born population in St. Charles city, Idaho

6.1% ± 0.5%
Foreign Born population in Idaho

DP02 | 2021 American Community Survey 5-Year Estimates

Older Population

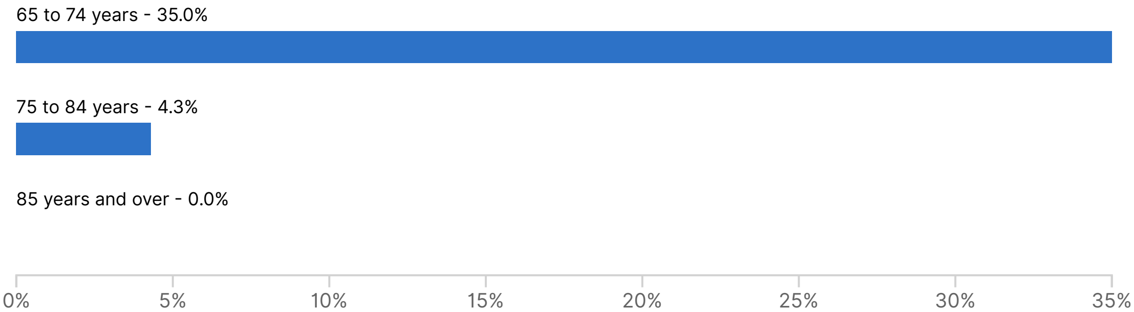
39.3% ± 18.4%
65 Years and Older in St. Charles city, Idaho

16.5% ± 0.1%
65 Years and Older in Idaho

DP05 | 2021 American Community Survey 5-Year Estimates

Older Population by Age
in St. Charles city, Idaho

Share / Embed



Display Margin of Error

DP05 | *2021 ACS 5-Year Estimates Data Profiles*

Residential Mobility

0.0% ± 26.9%

Moved From a Different State in the Last Year in St. Charles city, Idaho

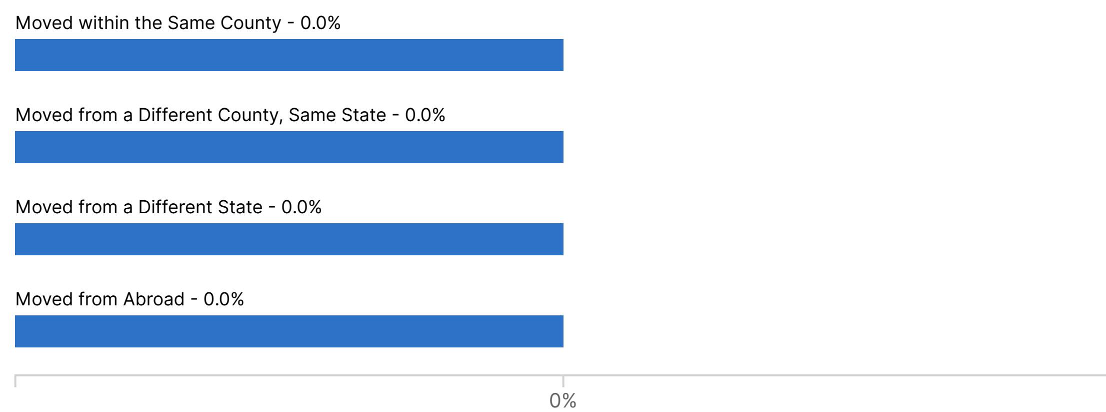
5.1% ± 0.5%

Moved From a Different State in the Last Year in Idaho

S0701 | *2021 American Community Survey 5-Year Estimates*

Residential Mobility in the Last Year
in St. Charles city, Idaho

Share / Embed



Display Margin of Error

S0701 | *2021 ACS 5-Year Estimates Subject Tables*

Veterans

12.9% ± 10.1%

Veterans in St. Charles city, Idaho

8.6% ± 0.5%

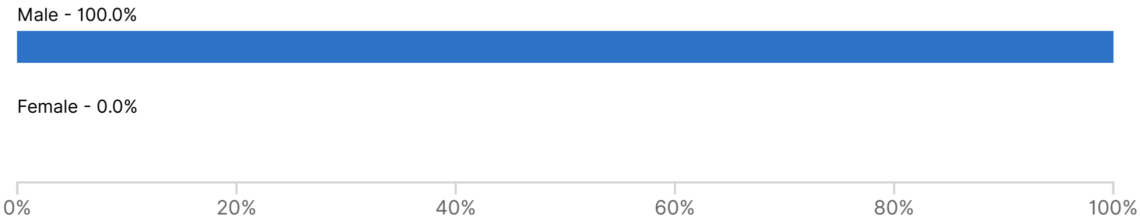
Veterans in Idaho

S2101 | *2021 American Community Survey 5-Year Estimates*

Veterans by Sex

in St. Charles city, Idaho

Share / Embed



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S2101 | *2021 ACS 5-Year Estimates Subject Tables*

IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY

REUSE PERMIT

M-087-03

(Previous Permit No. LA-000087-02)

The Fish Haven Area Recreational Sewer District (hereafter "Permittee") is hereby authorized to construct, install, and operate a reuse facility in accordance with:

1) this permit,
2) IDAPA 58.01.17, "Recycled Water Rules,"
3) an approved plan of operation and,
4) all other applicable federal, state, and local laws, statutes, and rules.

This permit is effective from the date of signature and expires on May 13, 2025

May 12, 2015

Bruce Olenick
Regional Administrator
Pocatello Regional Office
Idaho Department of Environmental Quality

Date

Department of Environmental Quality
Pocatello Regional Office
444 Hospital Way, Building #300
208-236-6160
Pocatello, ID. 83201

Contents

1. Common Acronyms, Abbreviations and Definitions

cwt	a unit of weight measurement equal to 100 pounds
DEQ	Idaho Department of Environmental Quality
DEQ Guidance	DEQ Guidance for Reclamation and Reuse of Municipal and Industrial Wastewater, latest revision
Director	Director of the Idaho Department of Environmental Quality or designee unless otherwise specified
EPA	Environmental Protection Agency
E_i	irrigation efficiency
FM	prefix for flow measurement/monitoring location, device, or method reporting serial number
GW	prefix for ground water reporting serial number
IDAPA	Idaho Administrative Procedures Act
IDWR	Idaho Department of Water Resources
IWR	irrigation water requirement - any combination of wastewater and supplemental irrigation water applied at rates commensurate to the moisture requirements of the crop, and calculated monthly during the growing season (GS). The equation used to calculate the IWR is: $IWR = P_{def} / E_i$
LG	prefix for lagoon reporting serial number
MG	million gallons
mg/kg	milligram per kilogram
mg/L	milligram per liter
MU	prefix for management unit reporting environmental serial number
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity unit
P_{def}	precipitation deficit - is synonymous with the net irrigation water requirement of the crop and for the purposes of this permit can be found at the following website http://data.kimberly.uidaho.edu/ETIdaho/
PO	plan of operation
QAPP	quality assurance project plan
Responsible Official	is the facility contact person authorized by the permittee to communicate with DEQ on behalf of the permittee on any matter related to the permit, including without limitation, the authority to communicate with and receive notices from DEQ regarding notices of violation or non-compliance, permit violations, permit enforcement, and permit revocation.

	The Responsible Official is also responsible for providing written certification of permit application materials, annual report submittals, and other information submitted to DEQ as required by the permit. Any notice to or communication with the Responsible Official is considered a notice to or communication with the permittee. The Responsible Official may designate an Authorized Representative to act as the facility contact person for any of the activities or duties related to the permit, except signing and certifying the permit application, which must be done by the Responsible Official. The Authorized Representative shall act as the Responsible Official and shall bind the permittee as described in this definition. Designation of the Authorized Representative shall follow the requirements specified in Section 6.1.3 of the permit.
SU	prefix for soil monitoring unit reporting serial number
SW	prefix for supplemental irrigation water reporting serial number
WW	prefix for wastewater reporting serial number

2. Facility Information

Information Type	Information Specific for This Permit
Type of recycled water	Municipal Class C
Method of treatment and reuse	Preliminary treatment via regulated flow through Cell #1, to a New Primary Cell, to Cell #2, Cell #3, and to winter storage in a new fifth cell. Disinfection of recycled water to Class C level, and use of recycled water for crop irrigation via slow rate land application.
System classification	VSWWS, Class I Collection System
Facility mailing address **Phone** **E-mail**	P.O. Box 24 St. Charles, ID 83272 Phone: 208-945-1065 NW ¼ of SW ¼ of Section 1 of T 15 S, R 43 E blacklabstew@gmail.com
Facility Responsible Official and Authorized Representative	Responsible Official: Mitch Poulsen Authorized Representative: (none listed) Other Facility Contact: Bill Stock Operator: Elisa Parker Notify DEQ within 30 days if there is a change in personnel for any of the above facility contacts. A minor permit modification will be issued by DEQ to confirm the change.
Ground Water	Depth to Aquifer 3 feet (spring, seasonal high water) -- > 7 feet to regional aquifer Beneficial uses: Agriculture, Industrial, Domestic The reuse area is not within the boundaries of the 2014 Nitrate Priority Area delineations. Public Water Supply wells > 1000 feet Groundwater flow reported to flow toward the ESE
Surface Water	Spring Creek, St. Charles Creek Beneficial uses: Agriculture, Aquatic Biota, Recreation

3. Compliance Schedule for Required Activities

Compliance Activity Number and Completion Due Date	Compliance Activity Description
CA-087-01 12 months prior to permit expiration	**Pre-Application Workshop:** If the permittee intends to continue operating the wastewater reuse facility beyond the expiration date of this permit, the permittee shall contact DEQ and schedule a pre-application workshop to discuss the compliance status of the facility and the content required for the wastewater reuse permit application package.
CA-087-02 One hundred eighty (180) days prior to permit expiration	**Renewal Permit Application:** The permittee shall submit to DEQ a complete permit renewal application package, which fulfills the requirements specified at the pre-application workshop identified in CA-087-02.

4. Permit Limits and Conditions

4.1. Hydraulic Management Unit Descriptions

Serial Number	Description	Irrigation System Type and Irrigation Efficiency (E_i)	Maximum Acres[a] Allowed
MU-08702	hydraulic management unit	Wheel Lines (E_i = 0.70)	18
		Total acreage	18

a. Maximum acres represent the total permitted acreage of the MU as provided by the permittee. If the permittee uses less acreage in any season or year, then loading rates shall be presented and compliance shall be determined based on the actual acreage utilized during each season or year.

4.2. Hydraulic Loading Limits

Serial Number	Growing season hydraulic loading	Non-growing season maximum hydraulic loading
MU-08702	Substantially at the crop specific irrigation water requirement (IWR)[a] **Not to exceed 16.8 Million Gallons of wastewater annually** IWR calculated using data from the following site: http://www.kimberly.uidaho.edu/ETIdaho/. NWS Camp Lifton Station	Non-growing season application is not allowed

a. Irrigation Water Requirement (IWR) – Any combination of wastewater and supplemental irrigation water applied at rates commensurate to meet the moisture requirements of the crop, and calculated monthly during the growing season (GS).

For compliance purposes, the source of P_{def} data used to calculate the IWR shall be specified in the PO.

4.3. Constituent Loading Limits

Serial Number	Constituent loading limit (from all sources)			
	Nitrogen (lb per acre)[b]	Phosphorus (lb per acre)	Salt (Non-volatile dissolved solids, NVDS) (lb per acre)	COD (lb per acre per day) [a]
MU-08702	150% of crop uptake	N/A	N/A	50

a. COD limit are expressed in pounds per acre per day (lb/acre-day) based on a seasonal average.

b. Typical crop uptake is the median constituent crop uptake from the 3 most recent years the crop has been grown. For crops having less than 3 years of on-site crop uptake data, other crop yield data or nutrient content values may only be used if approved in writing by DEQ in advance of use. If written approval is not provided by DEQ, compliance with the 150% nitrogen loading limit shall be determined by comparing the current year nitrogen loading to the current year nitrogen uptake.

N/A indicates not applicable as a limited constituent at this time.

4.4. Management Unit Buffer Zones

Serial Number	Buffer Distances (in feet) from Hydraulic Management Units					
	Public Water Supplies	Private Water Supplies	Inhabited Dwellings	Permanent and Intermittent Surface Water	Irrigation Ditches and Canals	Areas Accessible to the Public
MU-08702	1,000	500	300	100	50	0

4.5. Other Permit Limits and Conditions

Category	**Permit Limits and Conditions**
Growing Season	April 1 through October 31 (214 days)
Non-growing Season	November 1 through March 31 (151 days)
Reporting Year for Annual Loading Rates	November 1 through October 31
Disinfection limits in recycled water	Class C: The median number of total coliform organisms does not exceed 23 total coliform organisms/100 mL, as determined from the bacteriological results of the last 5 days for which analyses have been completed. No sample shall exceed 230 total coliform organisms/100 mL in any confirmed sample.
Crop or vegetation restrictions	Food crops must undergo commercial pathogen-destroying processing before being consumed by humans. See IDAPA.58.01.17.602.02, Table 3.
Grazing	Prior to grazing, the permittee shall submit a grazing management plan and receive written approval from DEQ.
Posting	Signs shall read “Warning: Recycled Water—Do Not Enter,” or equivalent signage both in English and Spanish. Signs to be posted every 500 feet and at each corner of the outer perimeter of the irrigated site. Signs are required where management unit border areas are accessible to the public.
Fencing	Three-wire fencing required around the treatment lagoons, the winter storage lagoon, and management unit MU-087-02.
Operator Licensure	The wastewater treatment facility and reuse system shall be operated by personnel certified and licensed in the State of Idaho wastewater operator training program at the operator class level specified in IDAPA 58.01.16.203 of the Wastewater Rules and properly trained to operate and maintain the system.
Construction Plans & Specifications	Pursuant to Idaho Code §39-118, IDAPA 58.01.16, and IDAPA 58.01.17, detailed plans and specifications shall be submitted to DEQ for review and approval prior to construction, modification, or expansion of any wastewater treatment, storage, conveyance structures, or reuse facility. Inspection requirements shall be satisfied and within 30 days of completion of construction and the permittee shall submit as-built plans or a letter from an Idaho Professional Engineer certifying the facilities or structures were constructed in substantial accordance with the approved plans and specifications.
Backflow prevention and testing requirements	Backflow prevention is required to protect surface water and ground water from an unauthorized discharge of recycled water or wastewater. Refer to section 9.1.1 of this permit.
Records retention requirements	Keep records generated to meet the requirements of this permit for the duration of permit, including administrative extensions, plus 2 years.

5. Monitoring Requirements

5.1. Recycled Water and Irrigation Water Monitoring, Sampling, and Analyses

5.1.1. Constituent Monitoring

Monitoring Point Serial Number and Location	Sample Description	Sample Type and Frequency	Constituents (Units in mg/L Unless Otherwise Specified)
WW-08701 Recycled water sampling point outside of the irrigation pump building exit, or at the end of the riser line to allow for adequate mixing	Recycled water after chlorination and before application to MU-08702	24-hour composite sample a minimum of four (4) individual aliquots evenly distributed by volume and over time. Reported monthly for MU-08702 during periods of recycled water use	- Total Kjeldahl nitrogen, as N - Nitrate-nitrogen, as N - Total phosphorus, as P - Total dissolved solids - pH
		Monthly Grab Sample Reported monthly for MU-08702 during periods of recycled water use In order to calculate the median coliform limits: A minimum of 3 weekly samples will be collected in the first month, (or 30 days) of operation each year to determine compliance with the Class D disinfection standards listed in Table 4.5 of this permit Return to standard monthly sampling thereafter, once three confirmed samples are taken and recorded.	-Total Coliform Organisms (CFU/100 mL)
SW-08701 Irrigation water from either a canal source or groundwater source if applied to the site	Irrigation water prior to mixing with recycled water, and prior to being applied to MU-08702	Grab sample Twice - April and August of first permit year when irrigating	- Total Kjeldahl nitrogen, as N - Nitrate-nitrogen, as N - Total phosphorus, as P - Total dissolved solids

5.1.2. Management Unit Flow Monitoring

Management Unit or Flow Measurement Serial Number and Location	Sample Description	Sample Type and Frequency	Measured Parameters, each MU
MU-08702 Treatment lagoon / winter storage lagoon pump house flow meter	Effluent volume from LG-08705 after disinfection, prior to application on MU-08702	- Daily meter reading. - Monthly, seasonal, and annual compilation of data	- Daily effluent volume (MG per month and depth reported as inches per acre per month)
MU-08702 Flow meter for supplemental irrigation water pump	Volume of water from irrigation Canal or other sources to MU-08702	- Daily flow meter readings, Daily pump run times, or hour meter readings and volume conversions - Monthly, seasonal, and annual compilation of data	- Daily Irrigation water volume when applying (MG per month and depth reported as inches per acre per month)

5.2. Ground Water Monitoring

5.2.1. Ground Water Monitoring Point Descriptions

Monitoring Point Serial Number	Common Designation	Well type	Gradient Location
GW-08701	Monitoring Well #1	Monitoring well	Upgradient from Management Unit,
GW-08702	Monitoring Well #2	Monitoring well	Downgradient from Management Unit,
GW-08703	Monitoring Well #3	Monitoring well	Downgradient from Management Unit,

5.2.2. Ground Water Monitoring, Sampling, and Analyses

Monitoring Point Serial Number	Sampling Point Description	Sample Type and Frequency	Constituents (units in mg/L unless otherwise specified)
GW-08701 GW-08702 GW-08703	Monitoring wells	Unfiltered grab sample/twice annually April and October Use filtered samples for dissolved iron and manganese samples	- Water table elevation (1/100 of a foot) - Water table depth (1/100 of a foot) - Nitrate-nitrogen, as N - Total phosphorus , as P - Total Dissolved Solids - Volatile Dissolved Solids - Total Iron - Dissolved Iron - Total Manganese - Dissolved Manganese - Chloride - EC (µmhos/cm) - Temperature - pH (Standard Units) - Total Coliform Organisms (CFU/100 mL)

5.3. Soil Monitoring

5.3.1. Soil Monitoring Unit Descriptions

Monitoring point serial number	Description	Associated Hydraulic Management Unit
SU-08702	Soil Management Unit	MU-08702

5.3.2. Soil Monitoring, Sampling, and Analyses

Monitoring point serial number	Sample type (see Note)	Sample frequency	Constituents (units in mg/kg soil unless otherwise specified)
SU-08702	Composite samples [a]	Annually in March or April, prior to wastewater application	- pH (standard units) - Plant available phosphorus (Olsen Method) - Nitrate - nitrogen - Ammonium nitrogen - EC (µmhos/cm, in saturated paste extract) - Sodium Adsorption Ratio (SAR) unitless - %OM

a. The number of sample locations specified in the PO or QAPP for each SU shall be sampled. At each location, samples shall be obtained from three depths: 0–12 inches; 12–24 inches; and 24–36 inches or refusal. The samples obtained from each depth shall be composited by depth to yield three composite samples for each soil monitoring unit; one composite sample for each depth.

5.4. Crop Monitoring

5.4.1. Crop Harvest Monitoring

Associated Hydraulic Management Units	Sample type	Sample Frequency	Parameters [a]
MU-08702	Harvested portion, each crop, From the management unit. Reported separately by acreage if different crops are grown	Each harvest	- Crop type - Harvest date - Sample collection date - Harvested acreage (acres) - As-harvested ('wet') yield in customary harvested units (tons, bushels, cwt, etc.). - As-harvested (field) moisture content (%) - Dry yield (lb)

a. Documentation of reported yields shall be provided for each harvest from each MU.

5.4.2. Plant Tissue Monitoring

Associated Hydraulic Management Units	Sample Type	Sample Frequency	Parameters [a]
MU-08702	Harvested portion, each crop Reported separately by acreage if different crops are grown	Each harvest	- Moisture content (%); - Total Kjeldahl nitrogen (%); - Nitrate nitrogen, as N (ppm) - Phosphorus as P (ppm) - Ash (%)

a. Report dry-basis results for all parameters except lab moisture content.

5.5. Lagoon Information

Serial number	Description	Estimated Surface Area, acres	Maximum Operating Volume, MG	Liner Type
LG-08701	Cell #1 Primary Treatment	6.2	13.0	Clay
LG-08702	Cell #2 Primary Treatment	6.1	14.3	Clay
LG-08703	Cell #3 Primary Treatment	4.4	11.4	Clay
LG-08704	New Primary Cell	9.4	17.4	HDPE
LG-08705	Winter Storage Cell	4.4	10.5	HDPE

6. Reporting Requirements

6.1. Annual Report Requirements

The permittee shall submit to DEQ an Annual Report prepared by a competent environmental professional covering the previous reporting year.

6.1.1. Due Date

The Annual Report is due no later than January 31, of each year, which shall cover the previous reporting year.

6.1.2. Required Contents

The Annual Report shall include the following:

1. A brief interpretive discussion of all required monitoring data. The discussion shall address data quality objectives, validation, and verification; permit compliance; and reuse facility environmental impacts. The reporting year for this permit is specified in Section 4.5.
2. Results of the required monitoring as described in Section 5 of this permit. If the permittee monitors any parameter for compliance purposes more frequently than required by this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the Annual Report. The report shall present all monitoring data in organized data summary tables to expedite review.
3. Status of all work described in Section 3 of this permit.
4. Results of all backflow testing, repairs, and replacements required by Section 9.1.1 of this permit.
5. Discussion of major maintenance activities such as major equipment replacement, lagoon liner maintenance, and wastewater treatment and reuse facility maintenance.
6. A summary of all noncompliance events that occurred during the reporting year. Examples of noncompliance events that must be discussed include, but are not limited to: exceedance of permit limits, complaints, missed monitoring events, incorrect monitoring dates or frequencies, dry monitoring wells, uncontained spills causing runoff, construction without DEQ engineering plan approval, construction without engineering inspection, and reporting incorrect acreage.
7. Submittal of the calculations and observations for hydraulic management units specified in the table below.
8. Laboratory analytical reports for monitoring specified in Section 5 of the permit. Chain of custody forms, supporting information for laboratory analytical reports, and quality assurance documentation shall be available for review upon request by DEQ.
9. The parameters in the following table:

Monitoring Point Serial Number	Parameter (Calculate for each MU)	Units
MU-08702	Recycled water loading rate	Million gallons per month, and Inches per month
	Irrigation water loading rate	Million gallons per month, and Inches per month
	Irrigation water requirement (IWR) for each crop grown	Inches per month, and Total inches applied during the GS
	Recycled water nitrogen, phosphorus, and total dissolved solids (TDS) loading rates	Pounds per acre per year on a monthly basis
	Supplemental Irrigation water nitrogen, phosphorus, and TDS loading rates	Pounds per acre per year on a monthly basis
	Fertilizer nitrogen and phosphorus application rates, reported separately as elemental N and P	Pounds per acre per year on a monthly basis
	Crop harvest and yield, Report each harvest and the annual totals for each MU.	Crop types harvested Total harvested area (acres) Total ‘dry’ yield (lb/yr, lb/acre per year)
	Crop nitrogen, phosphorus, and ash removal rates (dry-basis) Report each harvest and the annual totals for each MU.	Pounds-N per acre per year Pounds-P per acre per year Pounds Ash per acre per year

6.1.3. Submittals

All applications, annual reports, or information submitted to DEQ as required by this permit shall be signed and certified as follows:

1. Permit applications shall be signed by the Responsible Official as follows:
   a. For a corporation: by a responsible corporate officer;
   b. For a partnership or sole proprietorship: by a general partner or the proprietor, respectively;
   c. For a municipality, state, federal, Indian tribe, or other public agency: by either the principal executive officer, ranking elected official, or a person of decision-making authority who can legally bind the permittee with respect to the permit.
2. Annual reports and other information required by this permit shall be signed by the Responsible Official or by a duly Authorized Representative of that person. A person is a duly Authorized Representative only if:
   a. The authorization is made in writing by the responsible official;
   b. The authorization specifies either an individual or position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual having overall responsibility for environmental matters for the company; and
   c. The written authorization is submitted to DEQ.

Submit all applications, annual reports, and other information required by this permit to the following DEQ regional office at this address:

Engineering Manager
Idaho Department of Environmental Quality
Pocatello Regional Office
444 Hospital Way #300
Pocatello, ID 83201

The annual report shall include the following certification statement and be signed, dated, and certified by the permittee's Responsible Official or duly Authorized Representative:

"*I certify that the information provided in this submittal was prepared in conformance with the Quality Assurance Project Plan required by permit LA-000087-02, and is to the best of my knowledge, true, accurate and complete and I acknowledge that knowing submission of false or incomplete information may result in permit revocation as provided for in IDAPA 58.01.17.920.01 or other enforcement action as provided for under Idaho law.*"

Permit applications shall include the following certification statement and be signed, dated, and certified by the permittee's Responsible Official:

"I certify that the information provided in this submittal is, to the best of my knowledge, true, accurate and complete and I acknowledge that knowing submission of false or incomplete information may result in permit revocation as provided for in IDAPA 58.01.17.920.01, non-issuance of the permit, or other enforcement action as provided for under Idaho law."

Other information submitted to DEQ as required by the permit shall include the above certification statement and be signed, dated, and certified by the permittee's Responsible Official or duly Authorized Representative.

6.2. Emergency and Noncompliance Reporting

Report noncompliance incidents to DEQ's regional office at 208-236-6160, or 1-800-655-6160

In case of emergencies, call the emergency 24-hour number at 1-800-632-8000 and DEQ's regional office.

See Section 8, "Standard Permit Conditions," and IDAPA 58.01.17.500.06 for reporting requirements for facilities.

All instances of 1) permit non-compliance which may endanger public health or the environment and 2) unauthorized discharges to surface waters of the State of Idaho shall be reported to DEQ's regional office by telephone within 24 hours from the time the permittee becomes aware of the discharge at the phone numbers provided in this section.

A written follow-up shall be provided to the DEQ regional office within 5 days from the time the permittee became aware of the permit non-compliance or unauthorized discharge.

Reporting of unauthorized discharges to surface waters of the United States to the Environmental Protection Agency (EPA) may also be required. Contact information for EPA is provided below:

EPA Contact Information:
NPDES/Stormwater Coordinator, USEPA Idaho Operations Office
950 W. Bannock, Suite 900
Boise, ID 83702
(208) 378-5746 / (208) 378-5744 and EPA Hot Line (206) 553-1846

7. Section 7 – Reserved

8. Standard Permit Conditions

The following standard permit conditions are included as terms of this permit as required by the "Recycled Water Rules," (IDAPA 58.01.17.500).

500. STANDARD PERMIT CONDITIONS.
The following conditions shall apply to and be included in all permits. (4-1-88)

01. Compliance Required. The permittee shall comply with all conditions of the permit. (4-1-88)

02. Renewal Responsibilities. If the permittee intends to continue operation of the permitted facility after the expiration of an existing permit, the permittee shall apply for a new permit in accordance with these rules. (4-1-88)

03. Operation of Facilities. The permittee shall at all times properly maintain and operate all structures, systems, and equipment for treatment, control and monitoring, which are installed or used by the permittee to achieve compliance with the permit or these rules. (4-1-88)

04. Provide Information. The permittee shall furnish to the Director within a reasonable time, any information including copies of records, which may be requested by the Director to determine whether cause exists for modifying, revoking, re-issuing, or terminating the permit, or to determine compliance with the permit or these rules. (4-1-88)

05. Entry and Access. The permittee shall allow the Director, consistent with Title 39, Chapter 1, Idaho Code, to: (4-1-88)

a. Enter the permitted facility. (4-1-88)

b. Inspect any records that must be kept under the conditions of the permit. (4-1-88)

c. Inspect any facility, equipment, practice, or operation permitted or required by the permit. (4-1-88)

d. Sample or monitor for the purpose of assuring permit compliance, any substance or any parameter at the facility. (4-1-88)

06. Reporting. The permittee shall report to the Director under the circumstances and in the manner specified in this section: (4-1-88)

a. In writing at least thirty (30) days before any planned physical alteration or addition to the permitted facility or activity if that alteration or addition would result in any significant change in information that was submitted during the permit application process. When the alteration or addition results in a need for a major modification, such alteration or addition shall not be made prior to Department approval issued in accordance with these rules. (4-7-11)

b. In writing thirty (30) days before any anticipated change which would result in noncompliance with any permit condition or these rules. (4-1-88)

c. Orally within twenty-four (24) hours from the time the permittee became aware of any noncompliance which may endanger the public health or the environment at telephone numbers provided in the permit by the Director. (4-1-88)

d. In writing as soon as possible but within five (5) days of the date the permittee knows or should know of any noncompliance unless extended by the Department. This report shall contain: (4-1-88)

i. A description of the noncompliance and its cause; (4-1-88)

ii. The period of noncompliance including to the extent possible, times and dates and, if the noncompliance has not been corrected, the anticipated length of time it is expected to continue; and (4-7-11)

iii. Steps taken or planned, including timelines, to reduce or eliminate the continuance or reoccurrence of the noncompliance. (4-7-11)

e. In writing as soon as possible after the permittee becomes aware of relevant facts not submitted or incorrect information submitted, in a permit application or any report to the Director. Those facts or the correct information shall be included as a part of this report. (4-1-88)

07. Minimize Impacts. The permittee shall take all necessary actions to eliminate and correct any adverse impact on the public health or the environment resulting from permit noncompliance. (4-1-88)

08. Compliance with "Ground Water Quality Rule." Permits issued pursuant to these rules shall require compliance with IDAPA 58.01.11, "Ground Water Quality Rule." (4-7-11)

9. General Permit Conditions

The following general permit conditions are based on the cited rules at the time of issuance and are enforceable as part of this permit. Note that the rules cited in this section, and elsewhere in this permit, are supplemented by the rules themselves. Rules applicable to your facility are enforceable whether or not they appear in this permit.

9.1. Operations

9.1.1. Backflow Prevention

Reuse facilities with existing or planned cross-connections or interconnections between the recycled water system and any water supply (potable or nonpotable) or surface water, shall have backflow prevention assemblies, devices, or methods as required by applicable rule or as specified in this permit and approved by DEQ.

For public water systems, backflow assemblies shall meet the requirements of IDAPA 58.01.08.543. Assemblies shall be adequately maintained and shall be tested annually by a certified backflow assembly tester, and repaired or replaced as necessary to maintain operational status.

For domestic water supply wells, backflow prevention devices shall meet the requirements of IDAPA 07.02.04 and shall be adequately operated and maintained.

Irrigation water supply wells shall meet the requirements of IDAPA 37.03.09.36 for preventing any waste or contamination of the ground water resource. Backflow prevention assemblies or devices used to protect the ground water shall be adequately operated and maintained.

Discharge of recycled water to surface water is regulated by the EPA NPDES program. An NPDES permit is required for any discharge to surface water and backflow prevention shall be implemented to prevent any unauthorized discharge. Backflow prevention assemblies or devices used to protect surface water shall be adequately operated and maintained.

Records of all testable backflow assembly test results, repairs, and replacements shall be kept at the reuse facility along with other operational records, and shall be discussed in the Annual Report and made available for inspection by DEQ. Other approved means of backflow prevention, such as siphons and air-gap structures that cannot be tested, shall be maintained in operable order.

9.1.2. Restricted to Premises

Wastewaters or recharge waters applied to the land surface must be restricted to the premises of the application site. Wastewater discharges to surface water that require a permit under the Clean Water Act must be authorized by the United States Environmental Protection Agency (IDAPA 58.01.16.600.02).

9.1.3. Health Hazards, Nuisances, and Odors Prohibited

Health hazards, nuisances, and odors are prohibited as follows:

- Wastewater must not create a public health hazard or nuisance condition (IDAPA 58.01.16.600.03).
- No person shall allow, suffer, cause or permit the emission of odorous gases, liquids, or solids into the atmosphere in such quantities as to cause air pollution (IDAPA 58.01.01.776.01).
- Air Pollution. The presence in the outdoor atmosphere of any air pollutant or combination thereof in such quantity of such nature and duration and under such conditions as would be injurious to human health or welfare, to animal or plant life, or to property, or to interfere unreasonably with the enjoyment of life or property (IDAPA 58.01.01.006.06).

9.1.4. Solids Management

Biosolids are the nutrient-rich organic materials resulting from the treatment of sewage sludge. When treated and processed, sewage sludge becomes biosolids which can be safely recycled and applied as fertilizer to sustainably improve and maintain productive soils and stimulate plant growth.

Biosolids generated from sewage sludge are regulated by EPA under 40 CFR Part 503 and require a DEQ approved sludge disposal plan as outlined in IDAPA 58.01.16.650. Contact DEQ prior to application of biosolids at any permitted reuse facility.

Sludge is the semi-liquid mass produced and removed by wastewater treatment processes. This does not include grit, garbage, and large solids.

Sludge is generated by wastewater treatment processes at municipal and industrial facilities.

Solid Waste is any garbage or refuse, sludge from a waste water treatment plant, water supply treatment plant, or air pollution control facility and other discarded material including solid, liquid, semi-solid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations and from community activities, but does not include solid or dissolved materials in domestic sewage, or solid or dissolved material in irrigation return flows or industrial discharges which are point sources subject to permits under Section 402 of the Federal Water Pollution Control Act, as amended or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954, as amended.

Solid waste does not include inert wastes, manures and crop residues ultimately returned to the soils at agronomic rates, and any agricultural solid waste which is managed and regulated pursuant to rules adopted by the Idaho Department of Agriculture. DEQ reserves the right to use existing authorities to regulate agricultural waste that impacts human health or the environment.

Solid waste is regulated under IDAPA 58.01.06, “Solid Waste Management Rules.” Wastes otherwise regulated by DEQ (i.e. this permit) are not regulated under 58.01.06.

Waste Solids include sludge and wastes otherwise regulated by DEQ in accordance with IDAPA 58.01.06.001.03.a.xii. Waste solids may include vegetative waste, silt and mud containing organic matter, and other non-inert solid wastes.

Inert wastes are defined as non-combustible, nonhazardous, and non-putrescible solids wastes that are likely to retain their physical and chemical structure and have a deminimis potential to generate leachate under expected conditions of disposal, which includes resistance to biological attack.

Waste solids require a DEQ approved sludge disposal plan as outlined in IDAPA 58.01.16.650.

9.1.5. Temporary Cessation of Operations and Closure (IDAPA 58.01.17.801)

Temporary cessation of operations and closure must be addressed as follows:

01. Temporary Cessation. A permittee shall implement any applicable conditions specified in the permit for temporary cessation of operations. When the permit does not specify applicable temporary cessation conditions, the permittee shall notify the Director prior to a temporary cessation of operations at the facility greater than sixty (60) days in duration and any cessation not for regular maintenance or repair. Cessation of operations necessary for regular maintenance or repair of a duration of sixty (60) days or less are not required to notify the Department under this section. All notifications required under this section shall include a proposed temporary cessation plan that will ensure the cessation of operations will not pose a threat to human health or the environment. (4-7-11)

02. Closure. A closure plan shall be required when a facility is closed voluntarily and when a permit is revoked or expires. A permittee shall implement any applicable conditions specified in the permit for closure of the facility. Unless otherwise directed by the terms of the permit or by the Director, the permittee shall submit a closure plan to the Director for approval at least ninety (90) days prior to ceasing operations. The closure plan shall ensure that the closed facility will not pose a threat to human health and the environment. Closure plan approval may be conditioned upon a permittee’s agreement to complete such site investigations, monitoring, and any necessary remediation activities that may be required. (4-7-11)

9.1.6. Plan of Operation (IDAPA 58.01.17.300.05)

The PO must comply with the following:

05. Reuse Facility Operation and Maintenance Manual or Plan of Operations. A facility's operation and maintenance manual must contain all system components relating to the reuse facility in order to comply with IDAPA 58.01.16 "Wastewater Rules," Section 425. Manuals and manual amendments are subject to the review and approval provision therein. In addition to the content required by IDAPA 58.01.16.425, manuals for reuse facilities shall include, if applicable: operation and management responsibility, permits and standards, general plant description, operation and control of unit operations, land application site maps, wastewater characterization, cropping plan, hydraulic loading rate, constituent loading rates, compliance activities, seepage rate testing, site management plans, monitoring, site operations and maintenance, solids handling and processing, laboratory testing, general maintenance, records and reports, store room and inventory, personnel, an emergency operating plan, and any other information required by the Department. (4-7-11)

9.1.7. Seepage Testing Requirements (IDAPA 58.01.16.493.02.c)

Subsequent Tests. All lagoons covered under these rules must be seepage tested by an Idaho licensed professional engineer, an Idaho licensed professional geologist, or by individuals under their supervision every ten (10) years after the initial testing. (5-8-09)

9.1.8. Ground Water Quality Rule (IDAPA 58.01.11)

The permittee shall comply with the requirements of "Ground Water Quality Rule" (IDAPA 58.01.11).

9.2. Administrative

Requirements for administration of the permit are defined as follows.

9.2.1. Permit Modification (IDAPA 58.01.17.700)

01. Modification of Permits. A permit modification may be initiated by the receipt of a request for modification from the permittee, or may be initiated by the Department if one (1) or more of the following causes for modification exist: (4-7-11)

a. Alterations. There are material and substantial alterations or additions to the permitted facility or activity which occurred after permit issuance which justify the application of permit conditions that are different or absent in the existing permit. (4-7-11)

b. New standards or regulations. The standards or regulations on which the permit was based have been changed by promulgation of amended standards or regulations or by judicial decision after the permit was issued. (4-7-11)

c. Compliance schedules. The Department determines good cause exists for modification of a compliance schedule or terms and conditions of a permit. (4-7-11)

d. Non-limited pollutants. When the level of discharge of any pollutant which is not limited in the permit exceeds the level which may cause an adverse impact to surface or ground waters. (4-7-11)

e. To correct technical mistakes, such as errors in calculation, or mistaken interpretations of law made in determining permit conditions. (4-7-11)

f. When a treatment technology proposed, installed, and properly operated and maintained by the permittee fails to achieve the requirements of the permit. (4-7-11)

9.2.2. Permit Transferable (IDAPA 58.01.17.800)

01. General. A permit may be transferred only upon approval of the Department. No transfer is required for a corporate name change as long as the secretary of state can verify that a change in name alone has occurred. An attempted transfer is not effective for any purpose until approved in writing by the Department. (4-7-11)

9.2.3. Permit Revocation (IDAPA 58.01.17.920)

01. Conditions for Revocation. The Director may revoke a permit if the permittee violates any permit condition or these rules, or the Director becomes aware of any omission or misrepresentation of condition or information relied upon when issuing the permit. (4-7-11)

02. Notice of Revocation. Except in cases of emergency, the Director shall issue a written notice of intent to revoke to the permittee prior to final revocation. Revocation shall become final within thirty-five (35) days of receipt of the notice by the permittee, unless within that time the permittee requests an administrative hearing in writing. The hearing shall be conducted in accordance with IDAPA 58.01.23, Rules of Administrative Procedure before the Board of Environmental Quality." (5-3-03)

03. Emergency Action. If the Director finds the public health, safety or welfare requires emergency action, the Director shall incorporate findings in support of such action in a written notice of emergency revocation issued to the permittee. Emergency revocation shall be effective upon receipt by the permittee. Thereafter, if requested by the permittee in writing, the Director shall provide the permittee a revocation hearing and prior notice thereof. Such hearings shall be conducted in accordance with IDAPA 58.01.23, Rules of Administrative Procedure Before the Board of Environmental Quality." (3-15-02)

04. Revocation and Closure. A permittee shall perform the closure requirements in a permit, the closure requirements of these rules, and complete all closure plan activities notwithstanding the revocation of the permit. (4-7-11)

9.2.4. Violations (IDAPA 58.01.17.930)

Any person violating any provision of these rules or any permit or order issued thereunder shall be liable for a civil penalty not to exceed ten thousand dollars ($10,000) or one thousand dollars ($1,000) for each day of a continuing violation, whichever is greater. In addition, pursuant to Title 39, Chapter 1, Idaho Code, any willful or negligent violation may constitute a misdemeanor. (4-1-88)

9.2.5. Severability

The provisions of this permit are severable, and if a provision or its application is declared invalid or unenforceable for any reason, that declaration will not affect the validity or enforceability of the remaining provisions.

10. Other Applicable Laws

DEQ may refer enforcement of the following provisions to the state agency authorized to enforce that rule. The permittee shall comply with all applicable provisions identified in this section. Compliance with this permit does not relieve the permittee from applicable requirements in other federal, state, and local laws, statutes, and rules.

10.1. Owner Responsibilities for Well Use and Maintenance

10.1.1. Well Use

The well owner must not operate any well in a manner that causes waste or contamination of the ground water resource. Failure to operate, maintain, knowingly allow the construction of any well in a manner that violates these rules, or failure to repair or properly decommission (abandon) any well as herein required will subject the well owner to civil penalties as provided by statute. See IDAPA 37.03.09.036.01 and consult the Idaho Department of Water Resources (IDWR) for more information.

10.1.2. Well Maintenance

The well owner must maintain the well to prevent waste or contamination of ground waters through leaky casings, pipes, fittings, valves, pumps, seals, or through leakage around the outside of the casings, whether the leakage is above or below the land surface. Any person owning or controlling a noncompliant well must have the well repaired by a licensed well driller under a permit issued by the IDWR director in accordance with the applicable rules. See IDAPA 37.03.09.036.02 and consult IDWR for more information.

10.1.3. Wells Posing a Threat to Human Health and Safety, or Causing Contamination of the Ground Water Resource

The well owner must have any well shown to pose a threat to human health and safety or cause contamination of the ground water resource immediately repaired or decommissioned (abandoned) by a licensed well driller under a permit issued by the IDWR director in accordance with the applicable rules. See IDAPA 37.03.09.036.06 and consult the IDWR for more information.

11. Site Maps

Figure 1. Fish Haven Area Recreational Sewer District - Vicinity Map

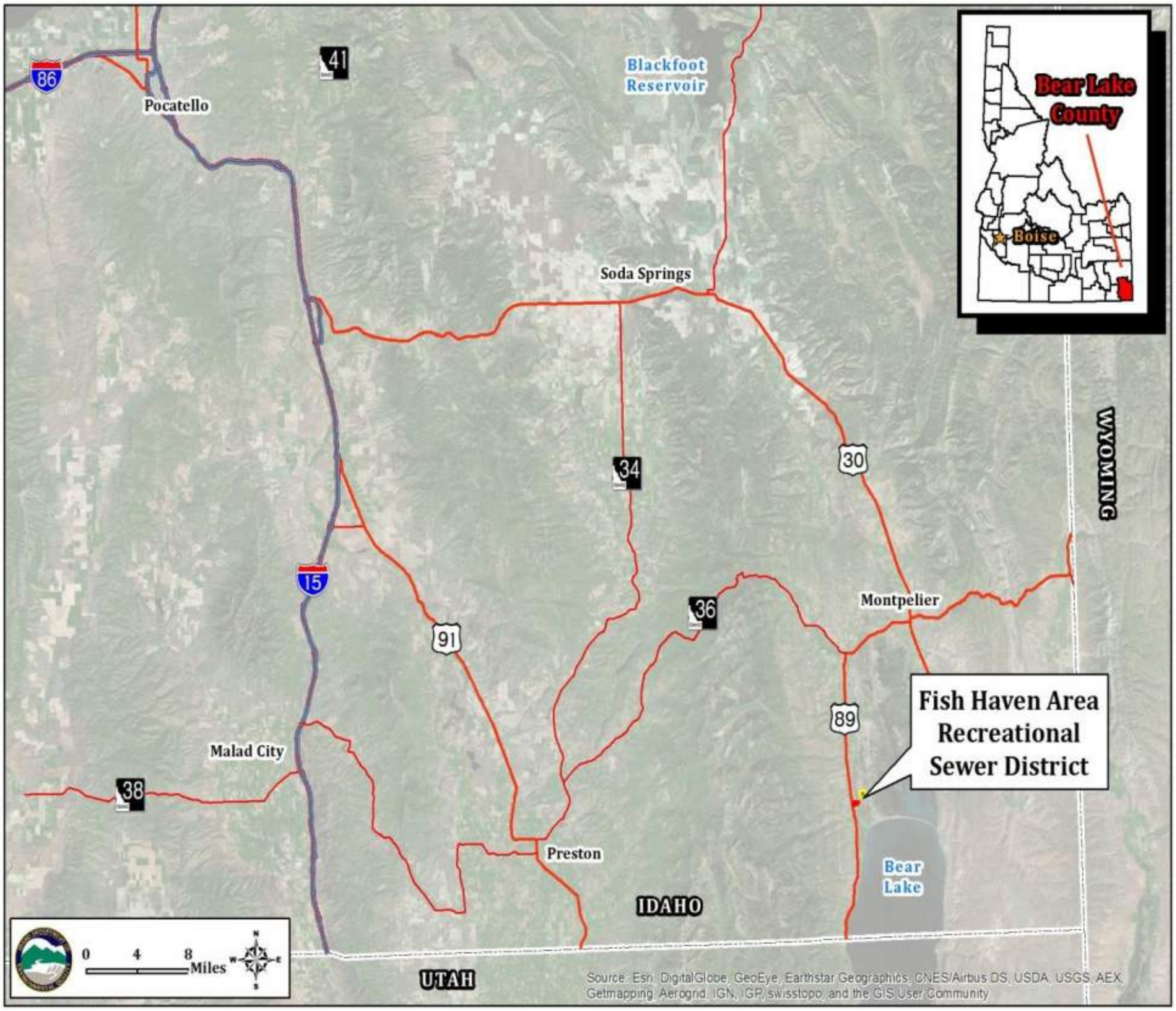
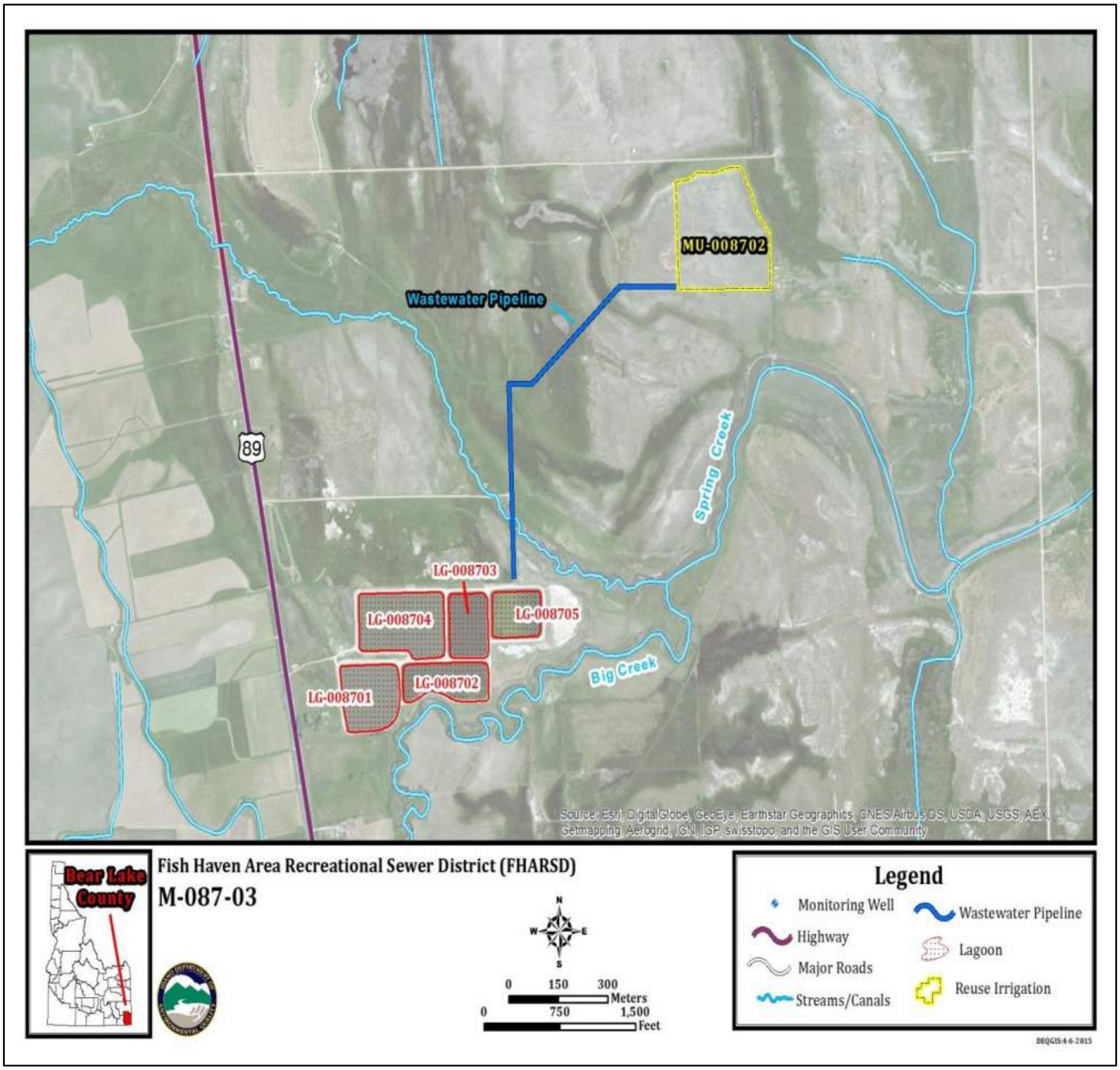


Figure 2. Fish Haven Hydraulic Management Unit, sprinkler area, pipeline, and lagoons.



APPENDIX B: MODEL RESULTS

Pump Curves
Junctions and their Source of Inflow
InfoSWMM Model – Location of Junctions and their Inflow Basins
Inflow Calculation at each Junction – Existing
Inflow Calculation at each Junction – Future

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Customer :
Project name : Default

Pump Performance Datasheet

Encompass 3.0 - 24.0.1

Main LS Pump Curve

Item Number / Tags	: 001	Size	: Hydromatic-S4LP/S4LXP
Service	:	Stages	: 1
Quantity	: 1	Based on curve number	: SUB_S_PE_AH_00011_D_4 Rev 2021-05-24
Quote number	: 212106	Date last saved	: 12 Apr 2024 11:27 AM

Operating Conditions

Flow, rated	: 375.0 USgpm
Differential head / pressure, rated (requested)	: 120.0 ft
Differential head / pressure, rated (actual)	: 120.2 ft
Suction pressure, rated / max	: 0.00 / 0.00 psi.g
NPSH available, rated	: Ample
Site Supply Frequency	: 60 Hz

Performance

Speed criteria	: Synchronous
Speed, rated	: 1750 rpm
Impeller diameter, rated	: 10.88 in
Impeller diameter, maximum	: 11.88 in
Impeller diameter, minimum	: 9.00 in
Efficiency	: 51.65 %
NPSH required / margin required	: - / 0.00 ft
Ns (imp. eye flow) / Nss (imp. eye flow)	: 1,582 / - US Units
Minimum Continuous Stable Flow	: 265.1 USgpm
Head, maximum, rated diameter	: 141.3 ft
Head rise to shutoff	: 17.57 %
Flow, best eff. point	: 912.3 USgpm
Flow ratio, rated / BEP	: 41.11 %
Diameter ratio (rated / max)	: 91.54 %
Head ratio (rated dia / max dia)	: 77.06 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Selection status	: Acceptable

Liquid

Liquid type	: Water
Additional liquid description	:
Solids diameter, max	: 0.00 in
Solids diameter limit	: 3.25 in
Solids concentration, by volume	: 0.00 %
Temperature, max	: 68.00 deg F
Fluid density, rated / max	: 1.000 / 1.000 SG
Viscosity, rated	: 1.00 cP
Vapor pressure, rated	: 0.34 psi.a

Material

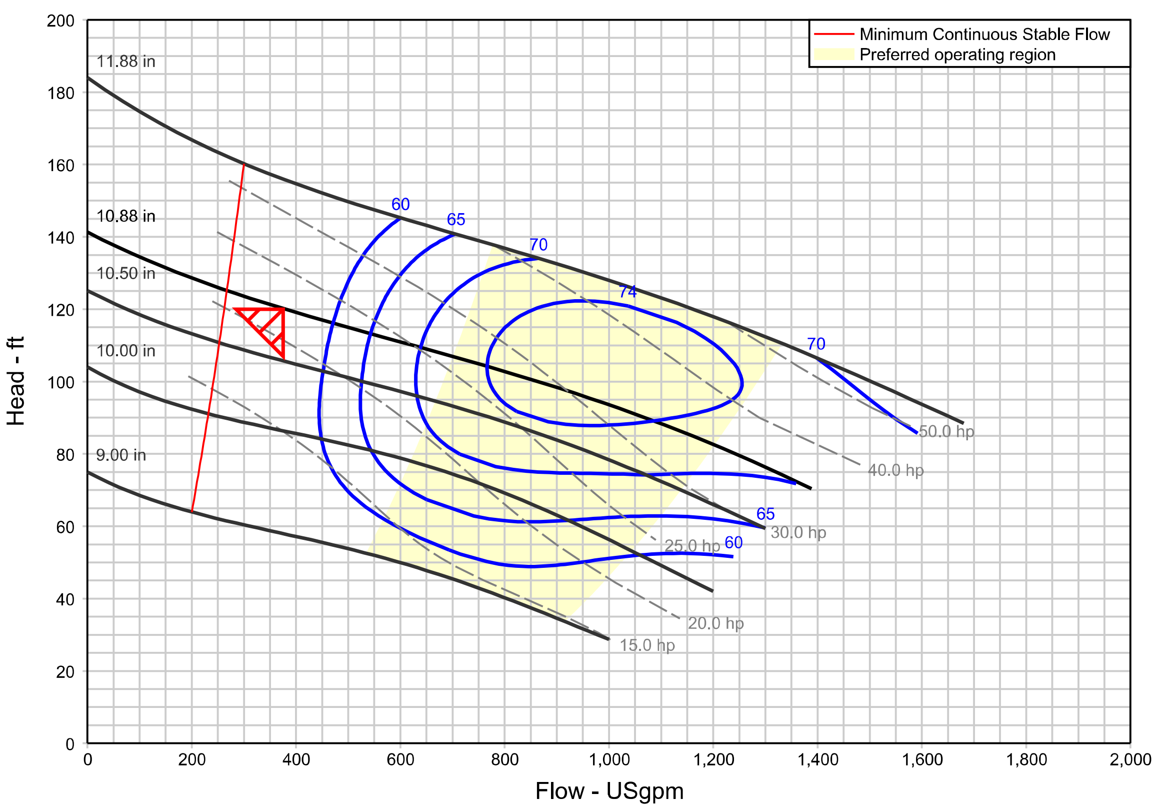
Material selected	: Standard

Pressure Data

Maximum working pressure	: 61.15 psi.g
Maximum allowable working pressure	: N/A
Maximum allowable suction pressure	: N/A
Hydrostatic test pressure	: N/A

Driver & Power Data (@Max density)

Driver sizing specification	: Maximum power
Margin over specification	: 0.00 %
Service factor	: 1.15
Power, hydraulic	: 11.38 hp
Power, rated	: 22.03 hp
Power, maximum, rated diameter	: 35.46 hp
Minimum recommended motor rating	: 40.00 hp / 29.83 kW



PENTAIR

Customer :
Project name : Default

Pump Performance Datasheet

Encompass 3.0 - 24.0.1

South LS Pump Curve

Item Number / Tags	: 014	Size	: Hydromatic - S4N/S4NX
Service	:	Stages	: 1
Quantity	: 1	Based on curve number	: SUB_S_E_AH_00005_B_4 Rev 2016-01-14
Quote number	: 212106	Date last saved	: 12 Apr 2024 11:34 AM

Operating Conditions

Flow, rated	: 100.0 USgpm
Differential head / pressure, rated (requested)	: 45.00 ft
Differential head / pressure, rated (actual)	: 48.02 ft
Suction pressure, rated / max	: 0.00 / 0.00 psi.g
NPSH available, rated	: Ample
Site Supply Frequency	: 60 Hz

Performance

Speed criteria	: Synchronous
Speed, rated	: 1750 rpm
Impeller diameter, rated	: 7.38 in
Impeller diameter, maximum	: 8.00 in
Impeller diameter, minimum	: 5.50 in
Efficiency	: 31.73 %
NPSH required / margin required	: - / 0.00 ft
Ns (imp. eye flow) / Nss (imp. eye flow)	: 2,222 / - US Units
Minimum Continuous Stable Flow	: 86.62 USgpm
Head, maximum, rated diameter	: 52.73 ft
Head rise to shutoff	: 17.18 %
Flow, best eff. point	: 398.3 USgpm
Flow ratio, rated / BEP	: 25.11 %
Diameter ratio (rated / max)	: 92.19 %
Head ratio (rated dia / max dia)	: 76.34 %
Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
Selection status	: Acceptable

Liquid

Liquid type	: Water
Additional liquid description	:
Solids diameter, max	: 0.00 in
Solids diameter limit	: 3.00 in
Solids concentration, by volume	: 0.00 %
Temperature, max	: 68.00 deg F
Fluid density, rated / max	: 1.000 / 1.000 SG
Viscosity, rated	: 1.00 cP
Vapor pressure, rated	: 0.34 psi.a

Material

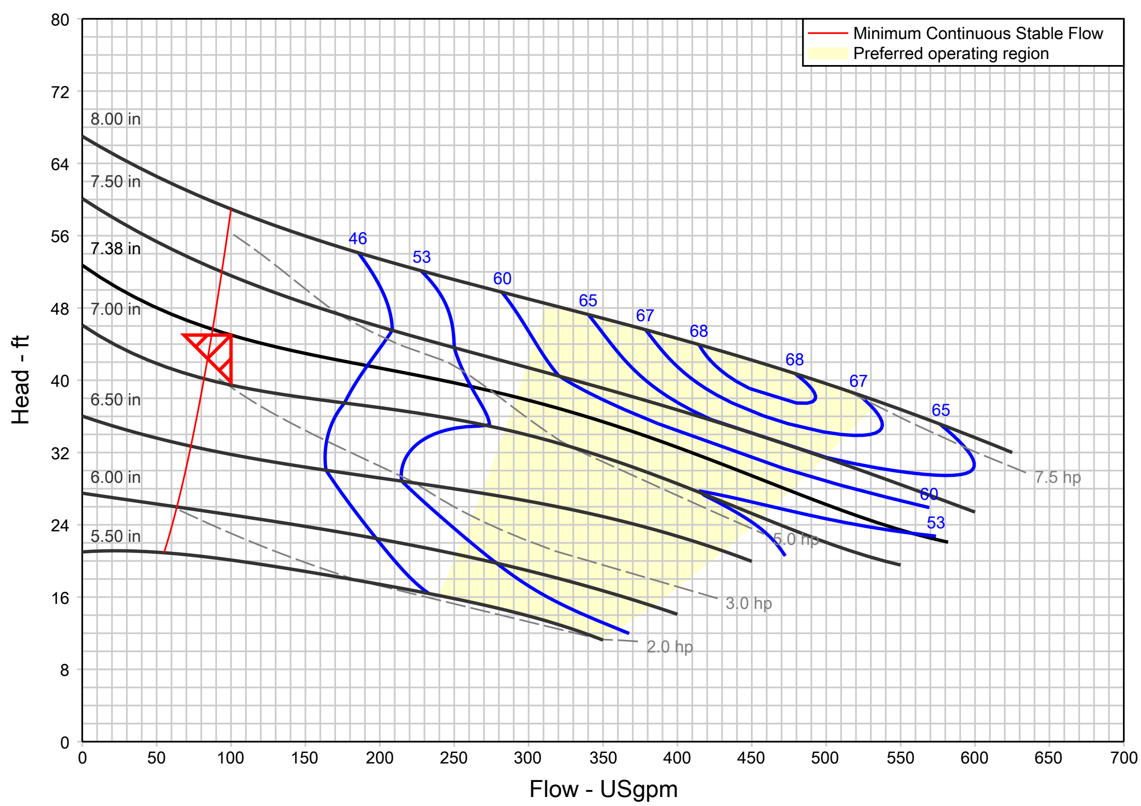
Material selected	: Standard

Pressure Data

Maximum working pressure	: 22.82 psi.g
Maximum allowable working pressure	: N/A
Maximum allowable suction pressure	: N/A
Hydrostatic test pressure	: N/A

Driver & Power Data (@Max density)

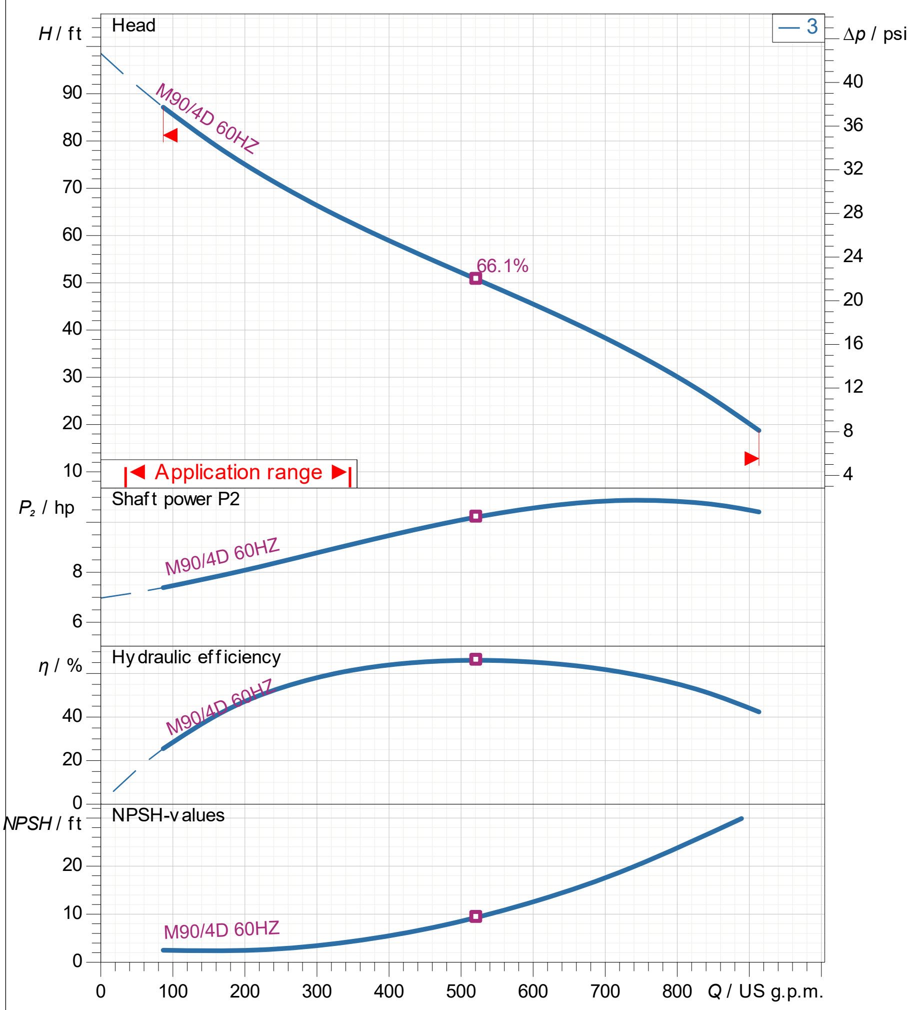
Driver sizing specification	: Maximum power
Margin over specification	: 0.00 %
Service factor	: 1.15
Power, hydraulic	: 1.14 hp
Power, rated	: 3.58 hp
Power, maximum, rated diameter	: 6.27 hp
Minimum recommended motor rating	: 7.50 hp / 5.59 kW



South Reserve Pump Curve

SULZER

AFP 1049 60 HZ



Test Standard
No test norm defined for this product

Curve Name
3

Impeller Diameter
9 5/16 inch

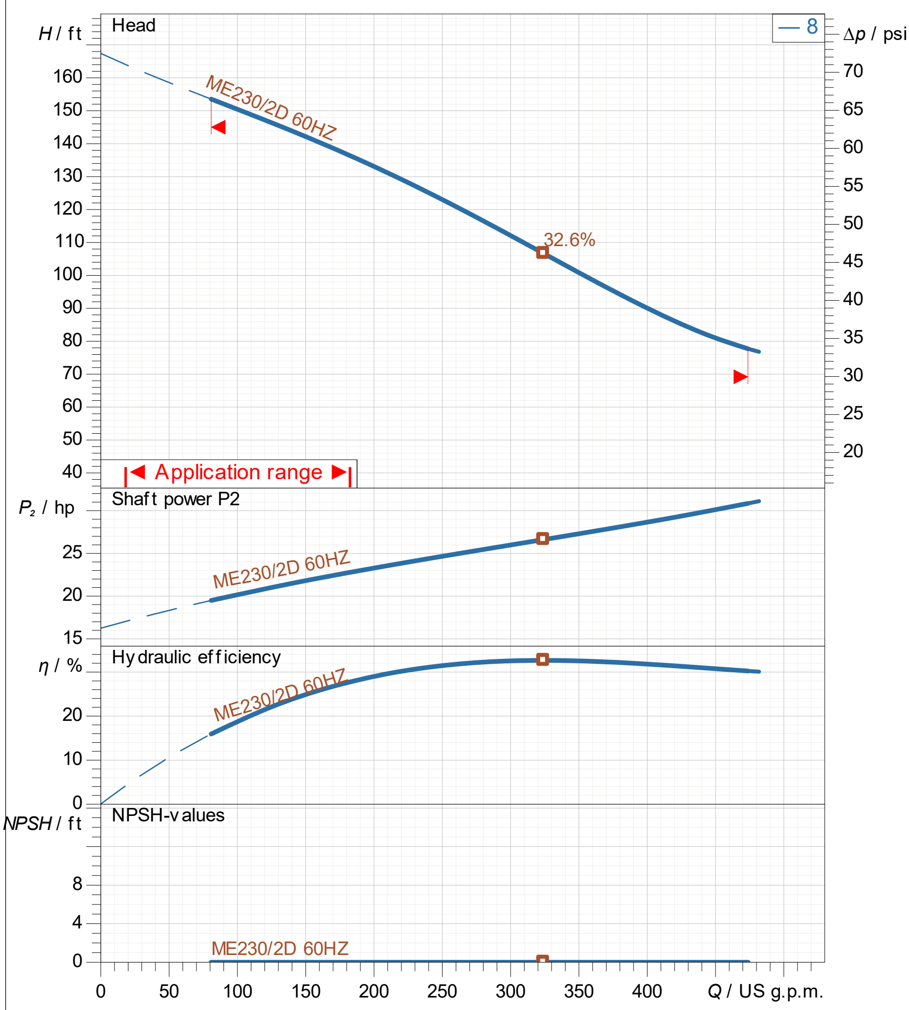
2024-03-19

Operating data specification		Power input	
Flow		Head	
Efficiency		Shaft power	
NPSH		Fluid	Water
Temperature	68 °F	Nature of system	Single head pump
No. of pumps	1		
Pump data			
Type	AFP 1049 60 HZ	Make	ABS
Series	AFP (old) M1-ME3 (1kW-22kW)	Impeller	Stdd
N° of vanes		Impeller size	9 5/16 inch
Free passage	3.15 inch	Suction flange	DN100
Discharge flange	DN100	Type of installation	
Moment of inertia			Wet well stationary with pedestal
Motor data			
Rated voltage	460 V	Frequency	60 Hz
Rated power P2	12.1 hp	Nominal Speed	1660 rpm
Number of poles	4	Efficiency	80.5 %
Power factor	0.87	Rated current	16 A
Starting current	65.6 A	Rated torque	38.2 lbf ft
Starting torque	48.1 lbf ft	Degree of protection	IP 68
Insulation class	F	No. starts per hour	10

North Reserve Pump Curve

SULZER

AFP 1034 60 Hz



Test Standard
No test norm defined for this product

Curve Name
8

Impeller Diameter
7 1/8 inch

Use High head pedestal
Part Nr 62325019

2024-03-19

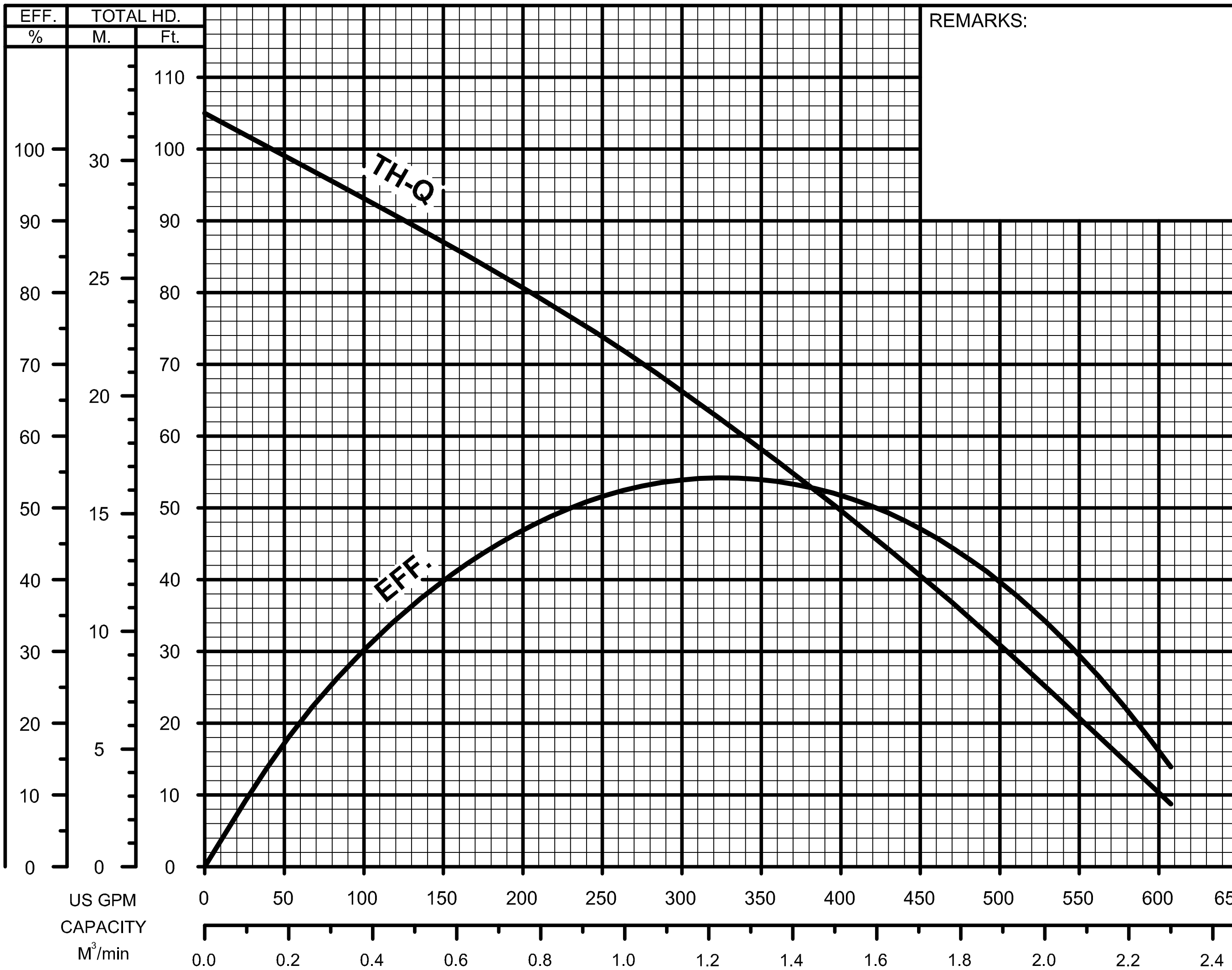
Operating data specification			
Flow		Power input	
Efficiency		Head	
NPSH		Shaft power	
Temperature	68 °F	Fluid	Water
No. of pumps	1	Nature of system	Single head pump
Pump data			
Type	AFP 1034 60 Hz	Make	ABS
Series	AFP (old) M1-ME3 (1kW-22kW)	Impeller	Stdd
N° of vanes		Impeller size	7 1/8 inch
Free passage	3.94 inch	Suction flange	DN100
Discharge flange	DN100	Type of installation	Wet well stationary with pedestal
Moment of inertia			
Motor data			
Rated voltage	460 V	Frequency	60 Hz
Rated power P2	30.8 hp	Nominal Speed	3550 rpm
Number of poles	2	Efficiency	91.6 %
Power factor	0.925	Rated current	34 A
Starting current	242 A	Rated torque	45.7 lbf ft
Starting torque	147 lbf ft	Degree of protection	IP 68
Insulation class	F	No. starts per hour	10

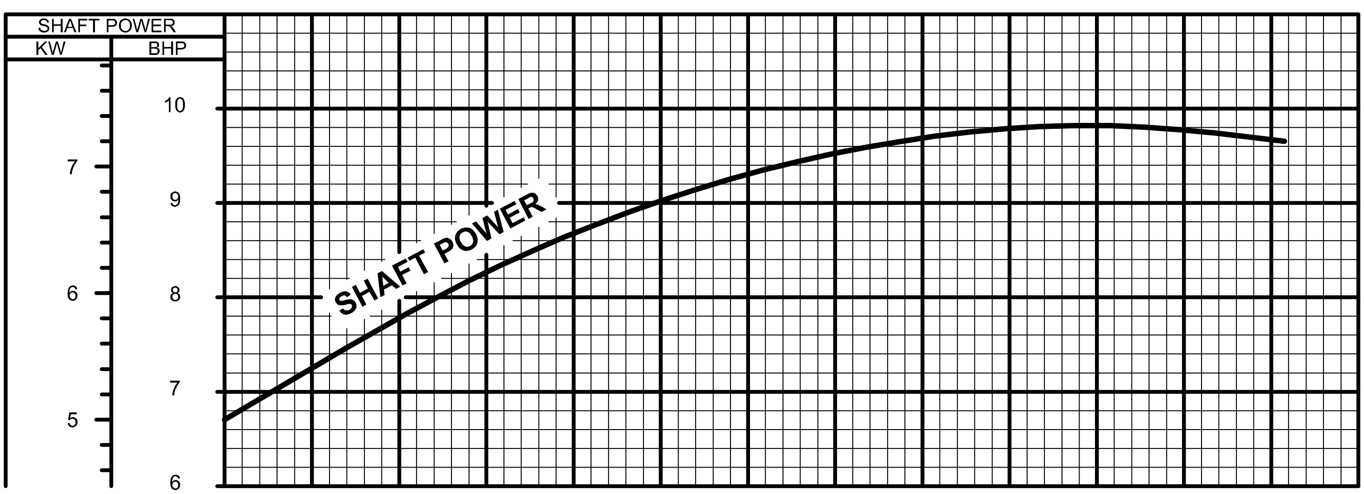
St Charles Pump Curve

AM-00157-2

TSURUMI PUMP	B-SERIES SEWAGE & WASTEWATER PUMPS	PERFORMANCE CURVE

MODEL		BORE	HP	KW	RPM	SOLIDS DIA.	LIQUID	SG.	VISCOSITY	TEMP.
(TOS)100B47.5 -64		4"/100mm	10	7.5	1748	1.57"/40mm	Water	1.0	1.123cSt.	60˚F
PUMP TYPE		PHASE	VOLTAGE		AMPERAGE	HZ	STARTING METHOD			INS.CLASS
Sewage&Wastewater		3	208-230/460/575		28.8-26.6 / 13.4 / 10.8	60	Direct On Line			F
CURVE No.	DATE	PHASE	VOLTAGE		AMPERAGE	HZ	STARTING METHOD			INS.CLASS
-	-	-	-		-	-	-			-

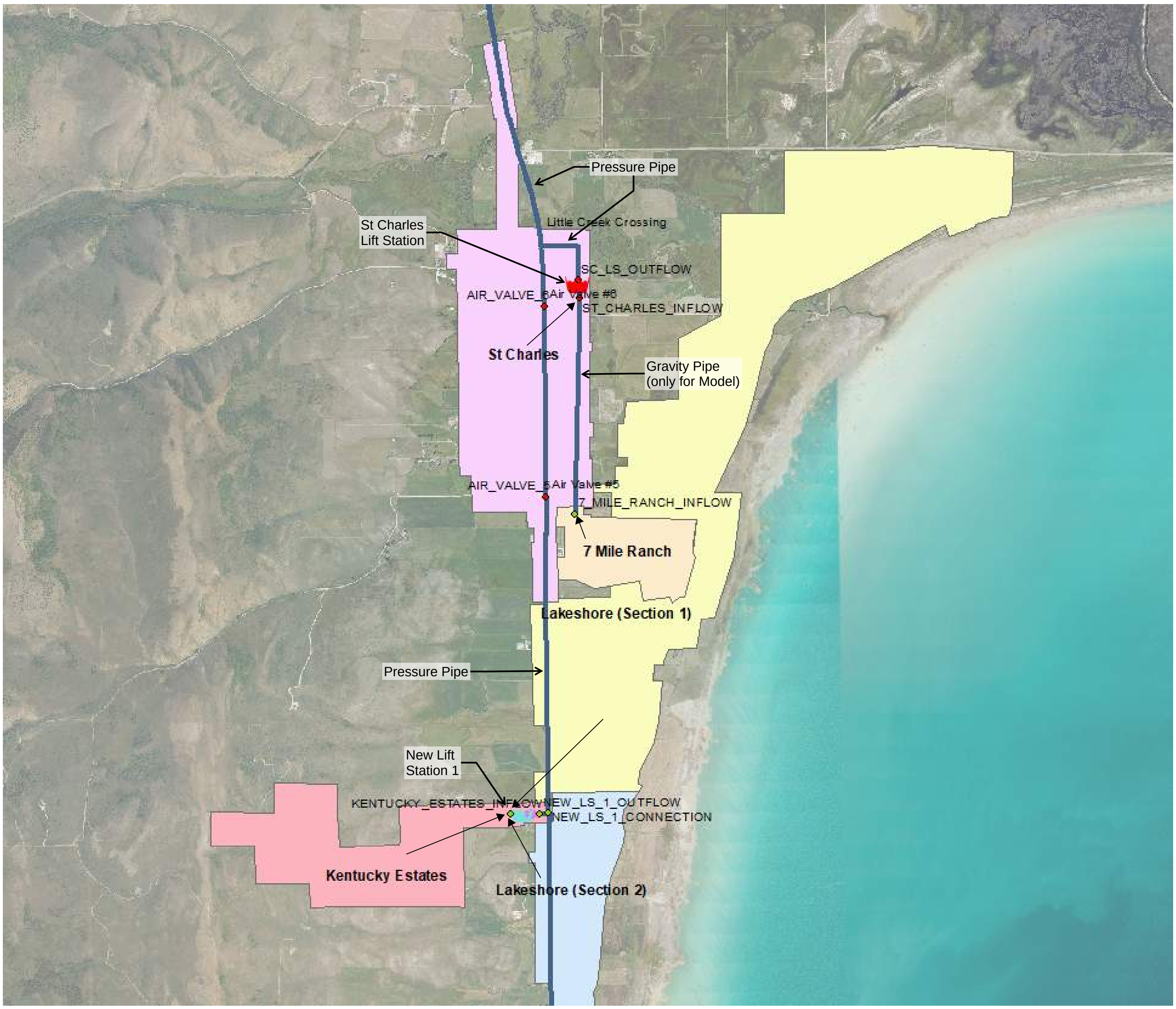




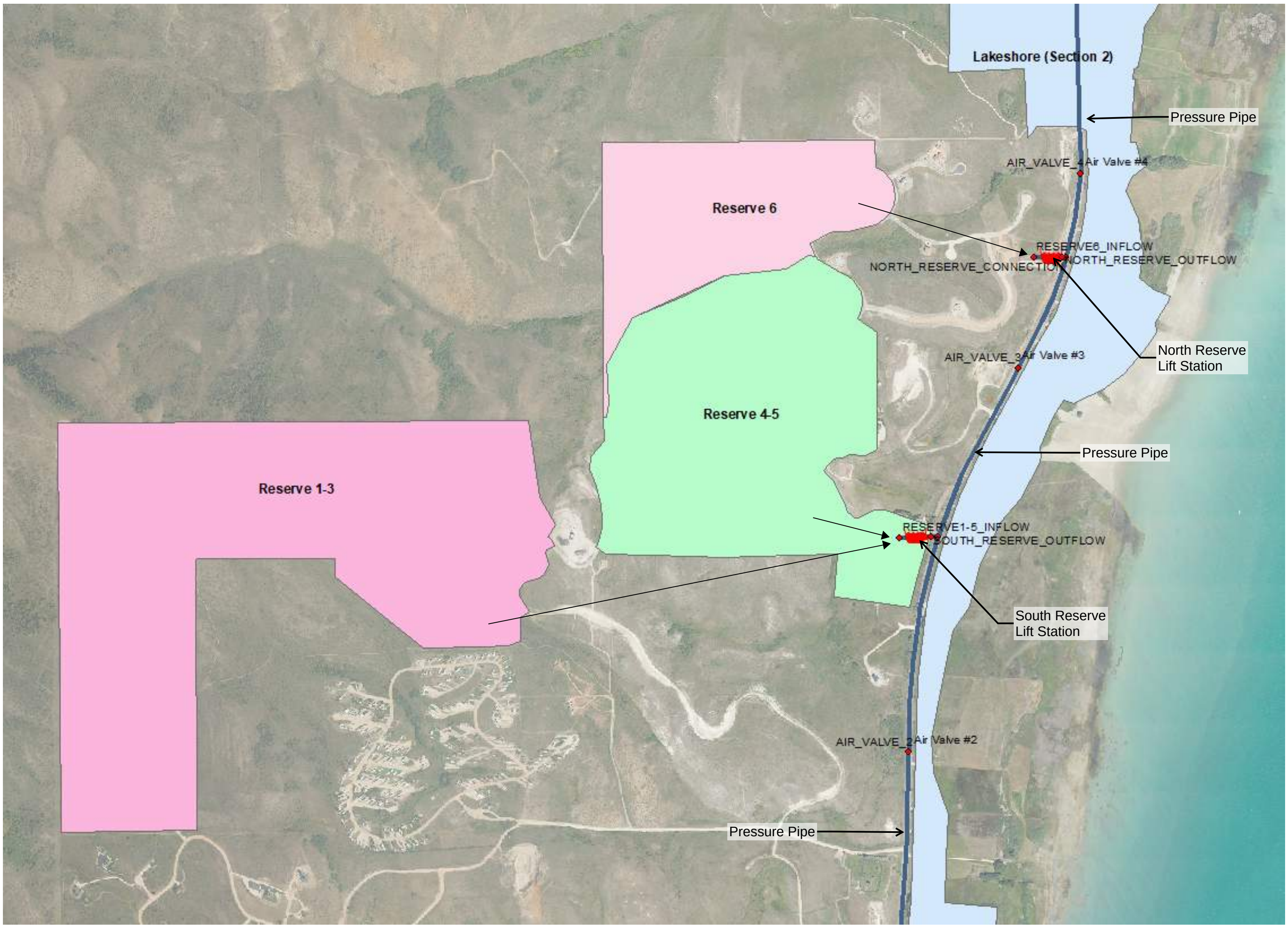
Model Junctions and their Source of Inflow

Node	Subdivisions	Lift Station	Number of Nodes
BLW_COUNTY_CLUB_ESTATES_INFLOW	Bear Lake West Country Club Estates	South LS	1
JUNCTIONS 01 - 04	Lakeshore 6	South LS	4
LAKESHORE5_INFLOW	Lakeshore 5	South LS	1
JUNCTIONS 08- 25 and 27- 30	Lakeshore 4	Main LS	22
JUNCTION 26	Bear Lake West Plats B & C Aspen Creek Meadows	Main LS	1
LAKESIDE_ESTATES_INFLOW	Lakeside Estates	Main LS	1
FISH_HAVEN_LAKESHORE3_INFLOW	Fish Haven West Lakeshore 3	Main LS	1
RESERVE1-5_INFLOW	Reserve 1-3 Reserve 4-5	South Reserve	1
RESERVE6_INFLOW	Reserve 6	North Reserve	1
ST_CHARLES_INFLOW	St Charles	St Charles LS	1
7_MILE_RANCH_INFLOW	7 Mile Ranch	St Charles LS	1
KENTUCKY_ESTATES_INFLOW	Kentucky Estates Lakeshore Section 1 Lakeshore Section 2	New LS 1	1

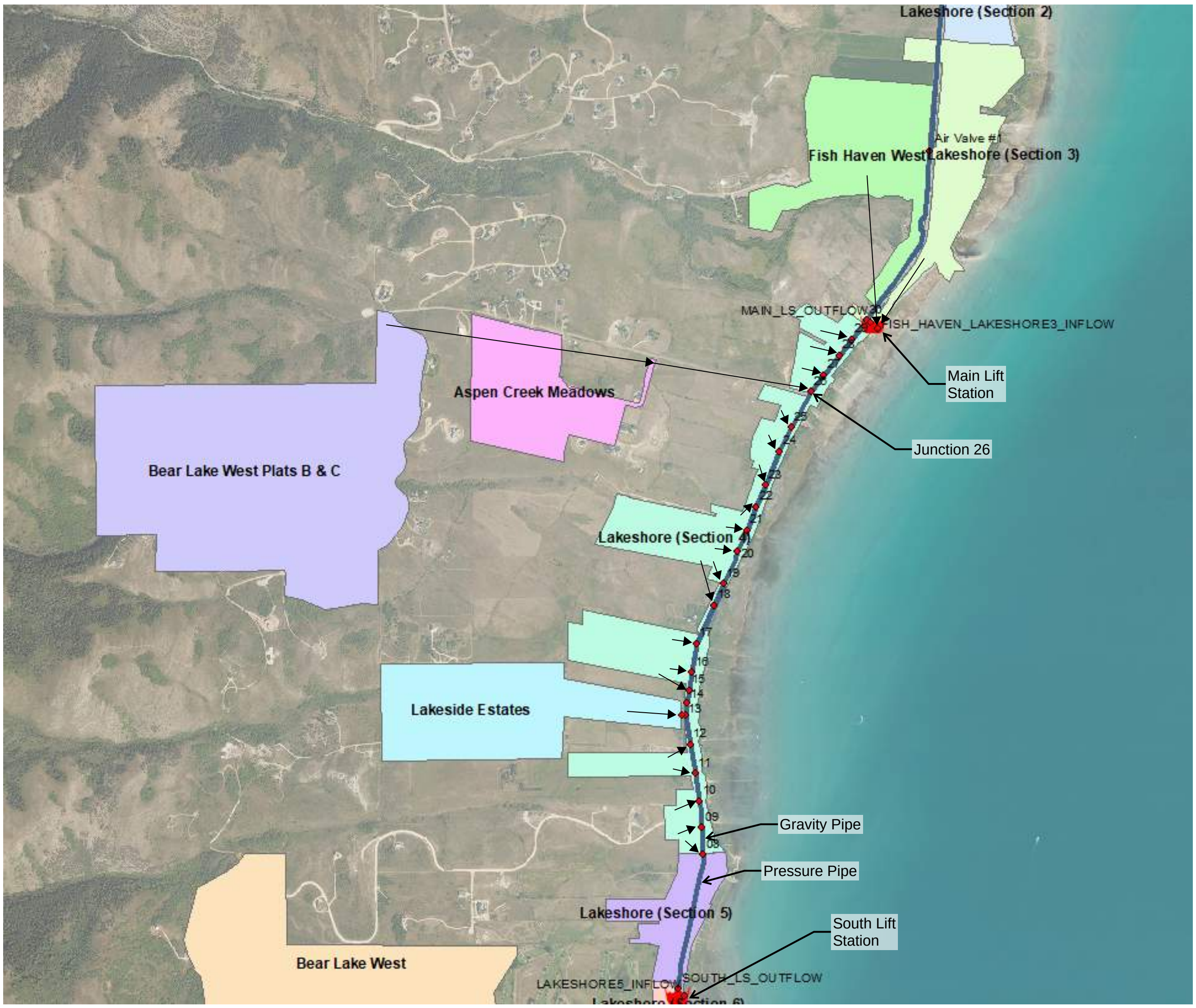
ST_CHARLES_INFLOW, 7_MILE_RANCH_INFLOW, KENTUCKY_ESTATES_INFLOW



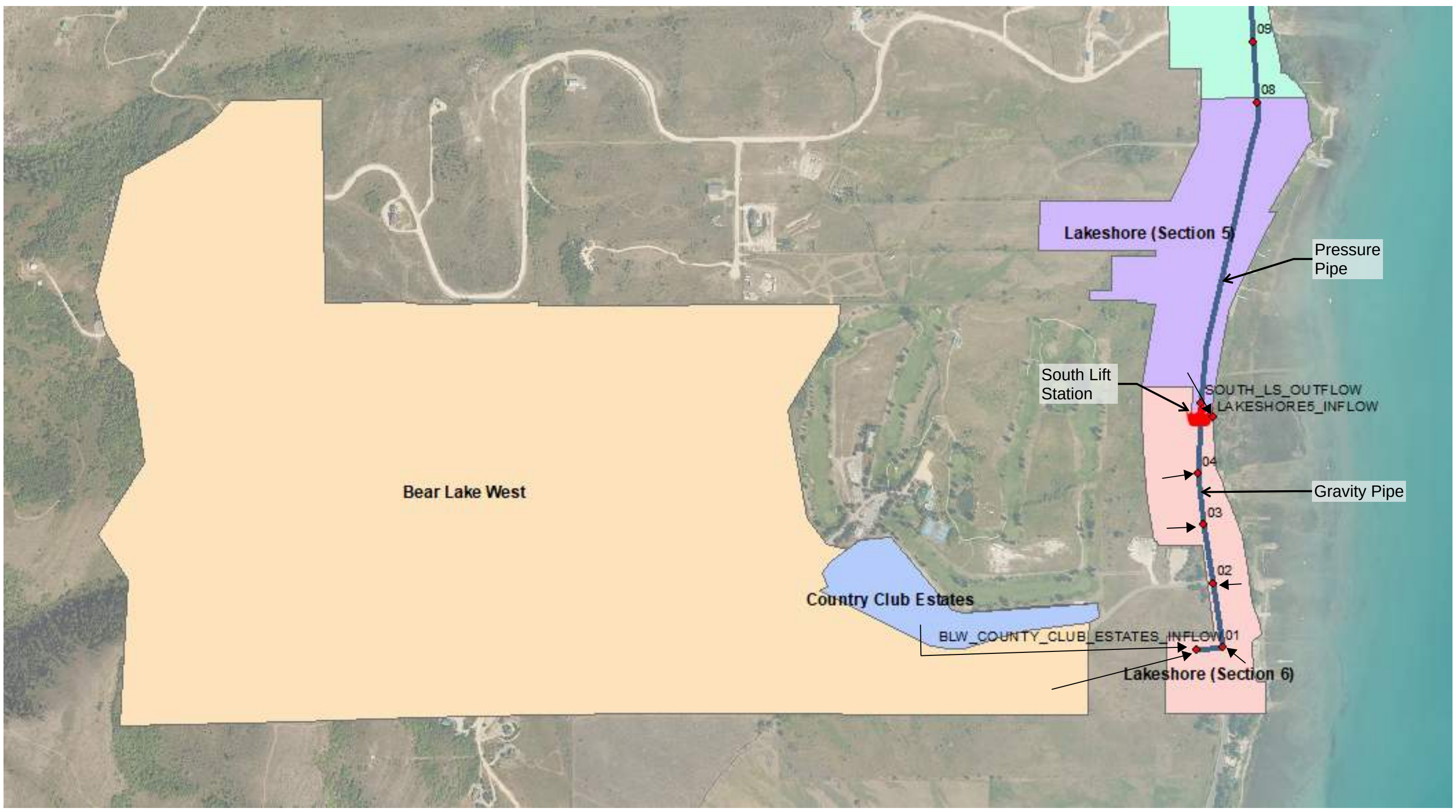
RESERVE1-5_INFLOW, RESERVE6_INFLOW



JUNCTIONS 08 – 25 and 27 – 30, Junction 26, LAKESIDE_ESTATES_INFLOW, FISH_HAVEN_LAKESHORE3_INFLOW



BLW_COUNTY_CLUB_ESTATES_INFLOW, JUNCTIONS 01 – 04, LAKESHORE5_INFLOW



Inflow Caclulations at each Node - Current

Node	Subdivisions	Lift Station	Current: # of EDUs	Current: Lift Station MDD gpd/EDU	Current: Flow gpm	Current: Number of Nodes	Current: Total Flow at Node gpm
BLW_COUNTY_CLUB_ESTATES_INFLOW	Bear Lake West	South LS	276	190	37	1	**38.5**
	Country Club Estates		15		2		
JUNCTIONS 01 - 04	Lakeshore 6	South LS	20	190	3	4	**0.7**
LAKESHORE5_INFLOW	Lakeshore 5	South LS	52	190	7	1	**6.9**
JUNCTIONS 08- 25 and 27- 30	Lakeshore 4	Main LS	33	688	16	22	**0.7**
JUNCTION 26	Bear Lake West Plats B & C	Main LS	179	688	86	1	**89.8**
	Aspen Creek Meadows		9		4		
LAKESIDE_ESTATES_INFLOW	Lakeside Estates	Main LS	66	688	32	1	**31.5**
FISH_HAVEN_LAKESHORE3_INFLOW	Fish Haven West	Main LS	47	688	22	1	**52.6**
	Lakeshore 3		63		30		
RESERVE1-5_INFLOW	Reserve 1-3	South Reserve	17	2735	32	1	**136.7**
	Reserve 4-5		55		104		
RESERVE6_INFLOW	Reserve 6	North Reserve	3	1547	3	1	**3.2**
ST_CHARLES_INFLOW	St Charles	St Charles LS	157	1159	126	1	**126.4**
7_MILE_RANCH_INFLOW	7 Mile Ranch	St Charles LS	-	-	-	-	**-**
KENTUCKY_ESTATES_INFLOW	Kentucky Estates	New LS 1	-	-	-	-	**-**
	Lakeshore Section 1		-		-		
	Lakeshore Section 2		-		-		

Inflow Calculations at each Node - Future

Node	Subdivisions	Lift Station	Future: # of EDUs	Future: Lift Station MDD gpd/EDU	Future: Flow gpm	Future: Number of Nodes	Future: Total Flow at Node gpm
BLW_COUNTY_CLUB_ESTATES_INFLOW	Bear Lake West	South LS	503	190	66.5	1	**70.2**
	Country Club Estates		28		3.7		
JUNCTIONS 01 - 04	Lakeshore 6	South LS	22	190	3	4	**0.7**
LAKESHORE5_INFLOW	Lakeshore 5	South LS	52	190	7	1	**6.9**
JUNCTIONS 08- 25 and 27- 30	Lakeshore 4	Main LS	102	688	49	22	**2.2**
JUNCTION 26	Bear Lake West Plats B & C	Main LS	435	688	208	1	**240.3**
	Aspen Creek Meadows		68		32		
LAKESIDE_ESTATES_INFLOW	Lakeside Estates	Main LS	138	688	66	1	**65.9**
FISH_HAVEN_LAKESHORE3_INFLOW	Fish Haven West	Main LS	52	688	25	1	**81.2**
	Lakeshore 3		118		56		
RESERVE1-5_INFLOW	Reserve 1-3	South Reserve	41	2735	78	1	**286.8**
	Reserve 4-5		110		209		
RESERVE6_INFLOW	Reserve 6	North Reserve	55	1547	59	1	**59.1**
ST_CHARLES_INFLOW	St Charles	St Charles LS	174	1159	140	1	**140.4**
7_MILE_RANCH_INFLOW	7 Mile Ranch	St Charles LS	60	1159	48	1	**48.3**
KENTUCKY_ESTATES_INFLOW	Kentucky Estates	New LS 1	17	688	8	1	**81.2**
	Lakeshore Section 1		50		24		
	Lakeshore Section 2		103		49		

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APPENDIX C: ALTERNATIVE COST ESTIMATES

Capital Improvement Plans

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FHARSD 2024 Wastewater Facilities Planning Study

Project Title: Winter Storage Lagoon - Phase I

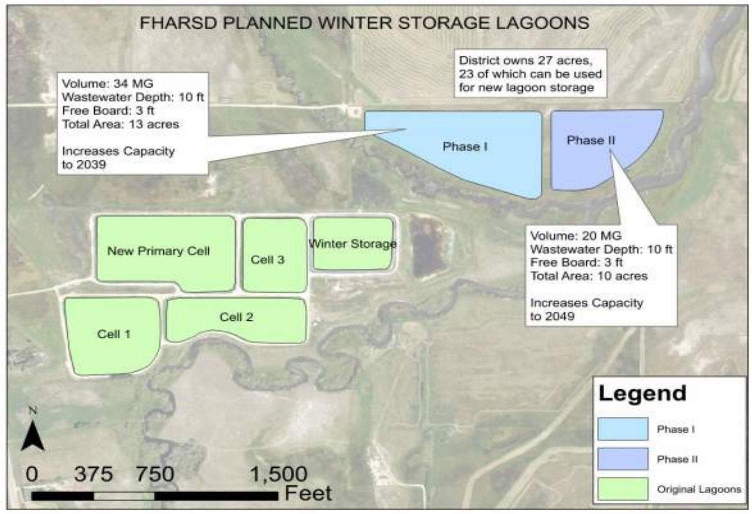
Project Identifier: 1.1

Location: Wastewater Lagoons

Need for Project:
Additional winter storage capacity is needed.

Objective:
Construct the first new winter storage lagoon adjacent to exisiting lagoons.

Design Considerations:
District already owns land northeast of the current lagoons as shown in the figure. 23 of those acres are usable for new lagoon cells.
The second 10-acre cell should be constructed no later than 2039.



General Line Item	Estimated Quantity	Unit	Unit Price	Item Cost (Rounded)	Total Cost (2024 Dollars)
New Storage Lagoon	34.0	MG	$78,000	$ 2,652,000	
Transfer Structure	3	LS	$35,000	$ 105,000	
12-inch Plug Valve	2	EA	$13,000	$ 26,000	
12-inch PVC Pipe - Excavation, Backfill	1800	LF	$90	$ 162,000	
Misc. Connections to Existing Piping	1	LS	$40,000	$ 40,000	
				Construction Subtotal	***$ 2,985,000***
Additional Elements (estimated % of above)					
Mobilization			10%	$ 299,000	
Bonding			3%	$ 75,000	
Contractor Overhead and Profit			15%	$ 448,000	
Build America Buy America (BABA)			7%	$ 209,000	
Prevailing Wages			3%	$ 90,000	
Contingency			30%	$ 896,000	
				Additional Elements Subtotal	***$ 2,017,000***
Plans and Contract Documents (lump sum and estimated % of above)					
Engineering Design and Bid Phase Services			15%	$ 751,000	
Engineering - Construction Contract Administration			5%	$ 251,000	
Engineering - Inspection			5%	$ 251,000	
Legal, Administrative, and Funding			2%	$ 101,000	
				Plans and Contract Documents Subtotal	***$ 1,354,000***
				Total Project Costs (rounded)	**$ 6,360,000**

[1]EA = each, LF = linear foot, LS = lump sum

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FHARSD 2024 Wastewater Facilities Planning Study

Project Title: Land Application Site

Project Identifier: 1.2

Location: Land Application Site

Need for Project:
Additional land application acreage is needed.

Objective:
Acquire additional land to land apply treated wastewater to.

Design Considerations:
Land application site can be purchased by the District or leased by the land owner to be used for land application. An existing farmed field will have an irrigation system that can be used. The new site will need monitoring wells. If the site is larger than needed, supplemental irrigation water will be needed. Will need to improve the existing pump station with new pumps to pump to the new site. Will need to construct a new pipeline from the pump station to the new field.

General Line Item	Estimated Quantity	Unit	Unit Price	Item Cost (Rounded)	Total Cost (2024 Dollars)
4-inch Monitoring Well	5	LS	$50,000	$ 250,000	
Irrigation Filter	1	LS	$12,000	$ 12,000	
Pump Station Interior Piping	1	LS	$40,000	$ 40,000	
Electrical (power to pump station)	1	LS	$40,000	$ 40,000	
Upsize Pumps and Control Panels	2	LS	$120,000	$ 240,000	
Transfer Structure	1	LS	$35,000	$ 35,000	
Misc. Connections to Existing Piping	1	LS	$40,000	$ 40,000	
8-inch PVC Pipe - Excavation, Backfill	13,000	LF	$120	$ 1,560,000	
				Construction Subtotal	***$ 2,217,000***
Additional Elements (estimated % of above)					
Mobilization			10%	$ 222,000	
Bonding			3%	$ 67,000	
Contractor's Overhead and Profit			15%	$ 333,000	
Build America Buy America (BABA)			7%	$ 156,000	
Contingency			30%	$ 666,000	
Prevailing Wages			3%	$ 67,000	
				Additional Elements Subtotal	***$ 1,511,000***
Plans and Contract Documents (lump sum and estimated % of above)					
Engineering Design and Bid Phase Services			15%	$ 560,000	
Engineering - Construction Contract Administration			5%	$ 187,000	
Engineering -- Inspection			5%	$ 187,000	
Legal, Administrative, and Funding			2%	$ 75,000	
				Plans and Contract Documents Subtotal	***$ 1,009,000***
				Total Project Costs (rounded)	**$ 4,740,000**

[1]EA = each, LF = linear foot, LS = lump sum

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FHARSD 2024 Wastewater Facilities Planning Study

Project Title: Miscellaneous South Lift Station Upgrades

Project Identifier: 2.1

Location: South Lift Station

Need for Project:
Needs to be addressed to keep up the sustainability of the existing lift station.

Objective:
Replace rusty guide rails, address elevation depression around the wet well rim by raising wet well rim and leveling the grade surrounding the wet well.

Design Considerations:

General Line Item	Estimated Quantity	Unit	Unit Price	Item Cost (Rounded)	Total Cost (2024 Dollars)
Replace Wet Well Lid and Hatch, and Add Riser	1	LS	$14,000	$ 14,000	
Replace Wet Well Guide Rails	1	LS	$25,000	$ 25,000	
Bypass Pumping	5	DAY	$1,500	$ 7,500	
				Construction Subtotal	*$ 47,000*
Additional Elements (estimated % of above)					
Mobilization			10%	$ 5,000	
Bonding			3%	$ 2,000	
Contractor's Overhead and Profit			15%	$ 8,000	
Build America Buy America (BABA)			7%	$ 4,000	
Contingency			30%	$ 15,000	
Prevailing Wages			3%	$ 2,000	
				Additional Elements Subtotal	*$ 36,000*
Plans and Contract Documents (lump sum and estimated % of above)					
Engineering Design and Bid Phase Services			15%	$ 13,000	
Engineering - Construction Contract Administration			5%	$ 5,000	
Engineering -- Inspection			5%	$ 5,000	
Legal, Administrative, and Funding			2%	$ 2,000	
				Plans and Contract Documents Subtotal	*$ 25,000*
				Total Project Costs (rounded)	**$ 110,000**

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KELLER ASSOCIATES

FHARSD 2024 Wastewater Facilities Planning Study

Project Title: North Reserve Lift Station Replacement

Project Identifier: 2.2

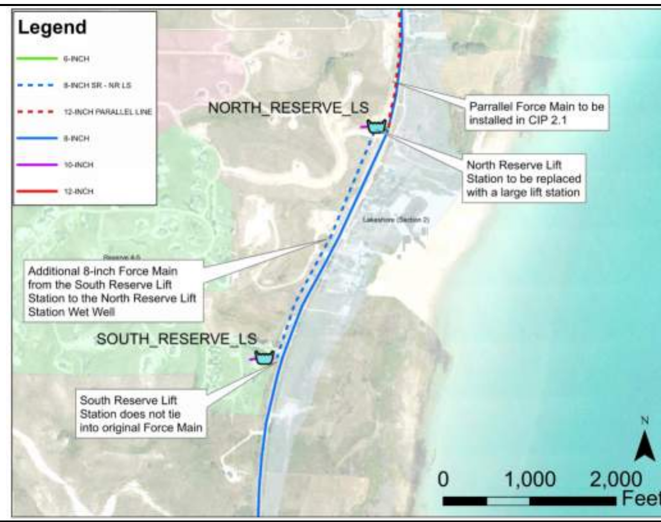
Location: Betweeen South Reserve and North Reserve Lift Stations

Need for Project:
Pumping capacity issues.

Objective:
Replace the existing North Reserve Lift Station and replace it with a larger lift station to become more of a regional lift station. This includes a new wet well, pumps, control panels, guide rails, etc.

Install a parallel 8-inch force main from the South Reserve Lift Station to the wet well of the North Reserve Lift Station instead of connecting to the original force main.

Design Considerations:
Both the installation of the 8-inch force main and the replacement of the North Reserve Lift Station must occur concurrently.



General Line Item	Estimated Quantity	Unit	Unit Price	Item Cost (Rounded)	Total Cost (2024 Dollars)
Replace Lift Station	1	LS	$460,000	$ 460,000	
Backup Generator	1	LS	$90,000	$ 90,000	
Demo Existing Lift Station	1	LS	$30,000	$ 30,000	
Road Crossing	3	EA	$10,000	$ 30,000	
Misc. Connections to Existing Piping	1	LS	$20,000	$ 20,000	
Air/Vac Valve and Vault	1	EA	$18,000	$ 18,000	
8-inch PVC Pipe - Excavation, Backfill	3,000	LF	$120	$ 360,000	
				Construction Subtotal	***$ 1,008,000***
Additional Elements (estimated % of above)					
Mobilization			10%	$ 101,000	
Bonding			3%	$ 31,000	
Contractor's Overhead and Profit			15%	$ 152,000	
Build America Buy America (BABA)			7%	$ 71,000	
Contingency			30%	$ 303,000	
Prevailing Wages			3%	$ 31,000	
				Additional Elements Subtotal	***$ 689,000***
Plans and Contract Documents (lump sum and estimated % of above)					
Engineering Design and Bid Phase Services			15%	$ 255,000	
Engineering - Construction Contract Administration			5%	$ 85,000	
Engineering -- Inspection			5%	$ 85,000	
Legal, Administrative, and Funding			2%	$ 34,000	
				Plans and Contract Documents Subtotal	***$ 459,000***
				Total Project Costs (rounded)	**$ 2,160,000**

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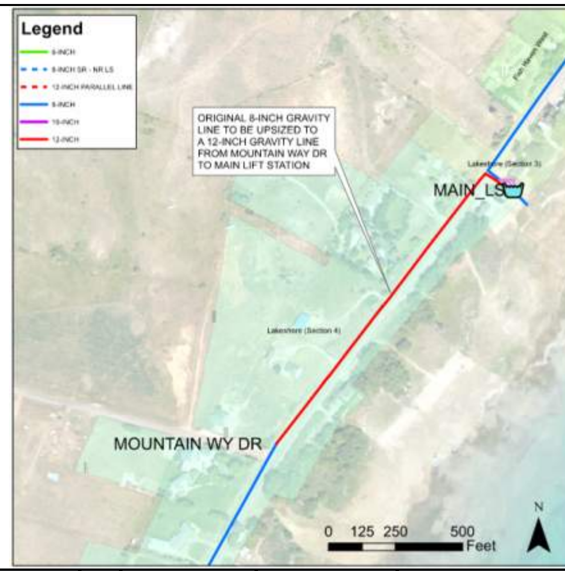
FHARSD 2024 Wastewater Facilities Planning Study

Project Title: Upsize Gravity Main Between South and Main Lift Stations	**Location: Between the South Lift Station and the Main Lift Station**
Project Identifier: 2.3	

Need for Project:
There are capacity deficiencies in the gravity system between the South Lift Station to the Main Lift Station that need to be addressed.

Objective:
Upsize the force main to a 12-inch diameter from Mountain Way Drive to the Main Lift Station.

Design Considerations:
The rest of the line would be replaced in CIP 3.1.



General Line Item	Estimated Quantity	Unit	Unit Price	Item Cost (Rounded)	Total Cost (2024 Dollars)
12-inch PVC Pipe - Excavation, Backfill	1,400	LF	$90	$ 126,000	
Traffic Control w/ Flaggers	1,400	LF	$22	$ 31,000	
Gravel Surface Repair	1,400	LF	$16	$ 23,000	
Bypass Pumping	20	DAY	$1,500	$ 30,000	
48-Inch, Standard Manhole (10' Depth)	5	EA	$8,600	$ 43,000	
				Construction Subtotal	***$ 253,000***
Additional Elements (estimated % of above)					
Mobilization			10%	$ 26,000	
Bonding			3%	$ 8,000	
Contractor's Overhead and Profit			15%	$ 38,000	
Build America Buy America (BABA)			7%	$ 18,000	
Contingency			30%	$ 76,000	
Prevailing Wages			3%	$ 8,000	
				Additional Elements Subtotal	***$ 174,000***
Plans and Contract Documents (lump sum and estimated % of above)					
Engineering Design and Bid Phase Services			15%	$ 65,000	
Engineering - Construction Contract Administration			5%	$ 22,000	
Engineering -- Inspection			5%	$ 22,000	
Legal, Administrative, and Funding			2%	$ 9,000	
				Plans and Contract Documents Subtotal	***$ 118,000***
				Total Project Costs (rounded)	**$ 550,000**

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FHARSD 2024 Wastewater Facilities Planning Study

Project Title: Replace Main Lift Station

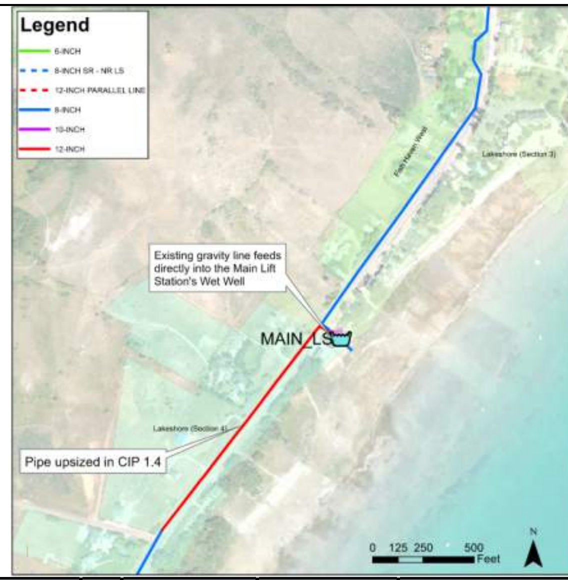
Project Identifier: 2.4

Location: Main Lift Station

Need for Project:
Main Lift Station lacks capacity for future flows. Aging infrastructure.

Objective:
Replace the existing North Reserve Lift Station and replace it with a larger lift station. This includes a new wet well, pumps, guide rails, control panels, disconnect, etc.

Design Considerations:
Pumping to the North Reserve Lift Station decreases the length of the forcemain and associated headloss. Pump size may not change signifcantly.



General Line Item	Estimated Quantity	Unit	Unit Price	Item Cost (Rounded)	Total Cost (2024 Dollars)
Replace Lift Station	1	LS	$460,000	$ 460,000	
Demo Existing Lift Station	1	LS	$50,000	$ 50,000	
Construction Subtotal					***$ 510,000***
Additional Elements (estimated % of above)					
Mobilization			10%	$ 51,000	
Bonding			3%	$ 16,000	
Contractor's Overhead and Profit			15%	$ 77,000	
Build America Buy America (BABA)			7%	$ 36,000	
Contingency			30%	$ 153,000	
Prevailing Wages			3%	$ 16,000	
Additional Elements Subtotal					***$ 349,000***
Plans and Contract Documents (lump sum and estimated % of above)					
Engineering Design and Bid Phase Services			15%	$ 129,000	
Engineering - Construction Contract Administration			5%	$ 43,000	
Engineering -- Inspection			5%	$ 43,000	
Legal, Administrative, and Funding			2%	$ 18,000	
Plans and Contract Documents Subtotal					***$ 233,000***
Total Project Costs (rounded)					**$ 1,100,000**

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FHARSD 2024 Wastewater Facilities Planning Study

Project Title: Flow Meter Installation

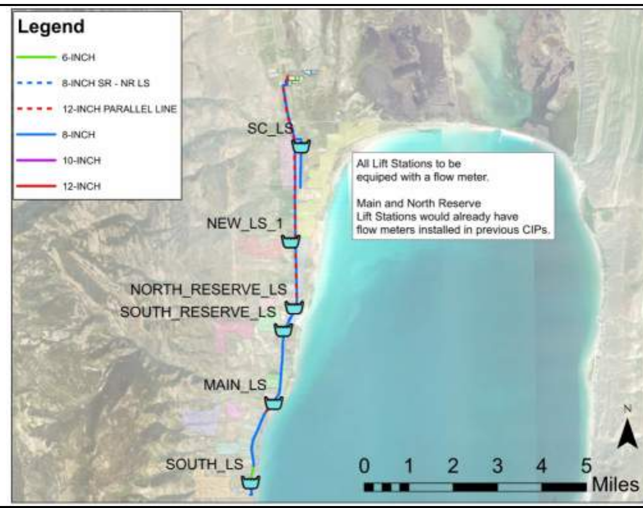
Project Identifier: 1.7

Location: All Lift Stations

Need for Project:
Flow meters are needed at all lift stations.

Objective:
Install flow meters to each lift station and integrate into SCADA system if not already done as part of other projects.

Design Considerations:
Current SCADA System is in good condition and allows for mobile access.
Main Lift Station and North Reserve Lift Station should already have a flow meter installed from their CIPs.
St. Charles, not being owned by the District, is not included in any CIPs.
Bear Lake West and Sub #9 Lift Stations are included in this CIP.



General Line Item	Estimated Quantity	Unit	Unit Price	Item Cost (Rounded)	Total Cost (2024 Dollars)
Flow Meter in Vault	5	EA	$25,000	$ 125,000	
				Construction Subtotal	***$ 125,000***
Additional Elements (estimated % of above)					
Mobilization			10%	$ 13,000	
Bonding			3%	$ 4,000	
Contractor's Overhead and Profit			15%	$ 19,000	
Build America Buy America (BABA)			7%	$ 9,000	
Contingency			30%	$ 38,000	
Prevailing Wages			3%	$ 4,000	
				Additional Elements Subtotal	***$ 87,000***
Plans and Contract Documents (lump sum and estimated % of above)					
Engineering Design and Bid Phase Services			15%	$ 32,000	
Engineering - Construction Contract Administration			5%	$ 11,000	
Engineering -- Inspection			5%	$ 11,000	
Legal, Administrative, and Funding			2%	$ 5,000	
				Plans and Contract Documents Subtotal	***$ 59,000***
				Total Project Costs (rounded)	**$ 280,000**

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FHARSD 2024 Wastewater Facilities Planning Study

Project Title: Parallel Force Main

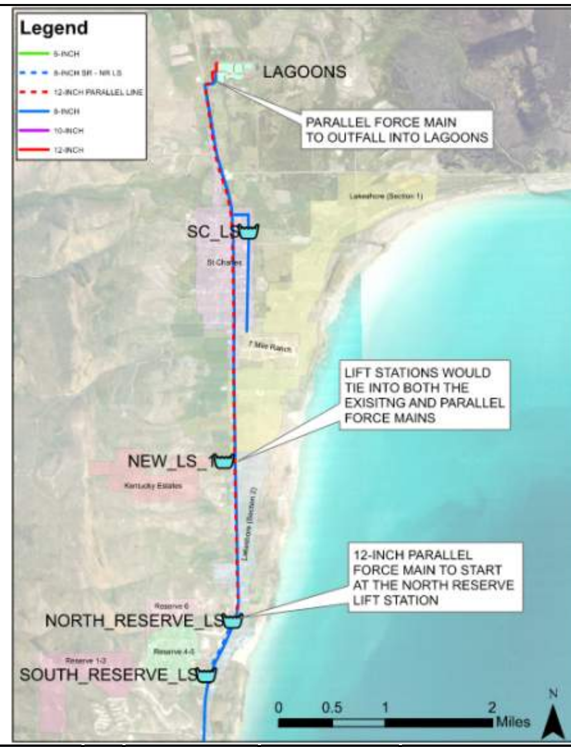
Project Identifier: 2.6

Location: Between North Reserve Lift Station and Lagoons

Need for Project:
Increase capacity of pumping system.

Objective:
Install a parallel 12-inch force main from the North Reserve Lift Station to the Lagoons.

Design Considerations:
Smaller sizing of pipe can be used, however, this size increases pump performances in the system.



General Line Item	Estimated Quantity	Unit	Unit Price	Item Cost (Rounded)	Total Cost (2024 Dollars)
12-inch PVC Pipe - Excavation, Backfill	27,100	LF	$190	$ 5,149,000	
Air/Vac Valve and Vault	4	EA	$18,000	$ 72,000	
Creek Crossing	2	LS	$25,000	$ 50,000	
Road Crossing	45	EA	$10,000	$ 450,000	
				Construction Subtotal	***$ 5,721,000***
Additional Elements (estimated % of above)					
Mobilization			10%	$ 573,000	
Bonding			3%	$ 172,000	
Contractor's Overhead and Profit			15%	$ 859,000	
Build America Buy America (BABA)			7%	$ 401,000	
Contingency			30%	$ 1,717,000	
Prevailing Wages			3%	$ 172,000	
				Additional Elements Subtotal	***$ 3,894,000***
Plans and Contract Documents (lump sum and estimated % of above)					
Engineering Design and Bid Phase Services			15%	$ 1,443,000	
Engineering - Construction Contract Administration			5%	$ 481,000	
Engineering -- Inspection			5%	$ 481,000	
Legal, Administrative, and Funding			2%	$ 193,000	
				Plans and Contract Documents Subtotal	***$ 2,598,000***
				Total Project Costs (rounded)	**$ 12,220,000**

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FHARSD 2024 Wastewater Facilities Planning Study

Project Title: Winter Storage Lagoon - Phase II

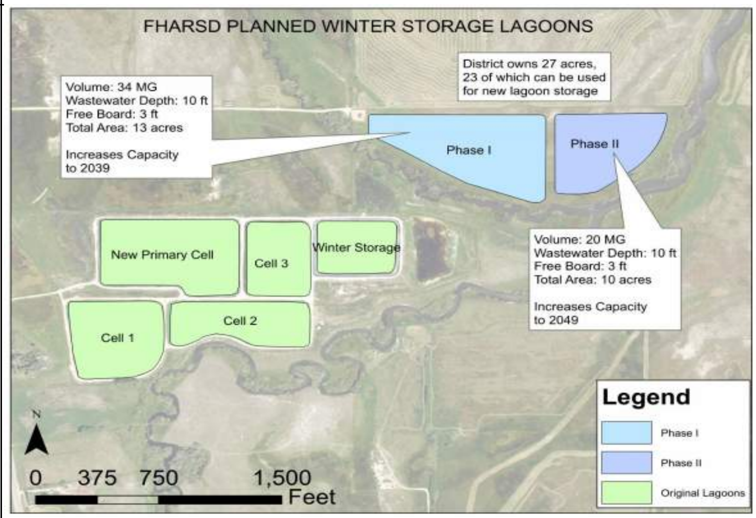
Project Identifier: 2.7

Location: Wastewater Lagoons

<u>Need for Project:</u>
Additional winter storage capacity is needed.

<u>Objective:</u>
Construct the second new winter storage lagoon adjacent to exisiting lagoons.

<u>Design Considerations:</u>
District already owns land northeast of the current lagoons as shown in the figure. 23 of those acres are usable for new lagoon cells.
The second 10-acre cell should be constructed no later than 2039.



General Line Item	Estimated Quantity	Unit	Unit Price	Item Cost (Rounded)	Total Cost (2024 Dollars)
New Storage Lagoon	20	MG	$78,000	$ 1,560,000	
Transfer Structure	1	LS	$35,000	$ 35,000	
12-inch Plug Valve	1	EA	$13,000	$ 13,000	
12-inch PVC Pipe - Excavation, Backfill	800	LF	$90	$ 72,000	
				Construction Subtotal	***$ 1,680,000***
Additional Elements (estimated % of above)					
Mobilization			10%	$ 168,000	
Bonding			3%	$ 42,000	
Contractor Overhead and Profit			15%	$ 252,000	
Build America Buy America (BABA)			7%	$ 118,000	
Prevailing Wages			3%	$ 51,000	
Contingency			30%	$ 504,000	
				Additional Elements Subtotal	***$ 1,135,000***
Plans and Contract Documents (lump sum and estimated % of above)					
Engineering Design and Bid Phase Services			15%	$ 423,000	
Engineering - Construction Contract Administration			5%	$ 141,000	
Engineering - Inspection			5%	$ 141,000	
Legal, Administrative, and Funding			2%	$ 57,000	
				Plans and Contract Documents Subtotal	***$ 762,000***
				Total Project Costs (rounded)	**$ 3,580,000**

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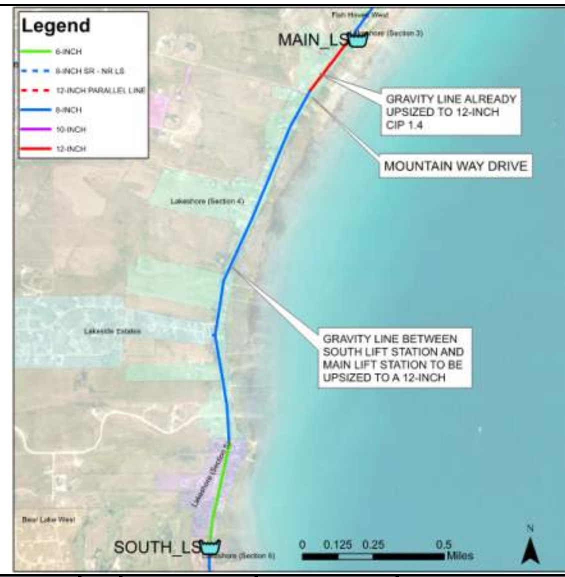
FHARSD 2024 Wastewater Facilities Planning Study

Project Title: Upsize Gravity Line Between South and Main Lift Stations	Location: Between the South Lift Station and the Main Lift Station
Project Identifier: 3.1	

Need for Project:
There are capacity needs in the system between the South Lift Station to the Main Lift Station that need to be addressed.

Objective:
Upsize the rest of the force main to a 12-inch diameter from the South Lift Station to Mountain Way Drive.

Design Considerations:
The section of line between Mountain Way Drive and the Main Lift Station would have been previously installed in CIP 2.3.



General Line Item	Estimated Quantity	Unit	Unit Price	Item Cost (Rounded)	Total Cost (2024 Dollars)
12-inch PVC Pipe - Excavation, Backfill	8,950	LF	$190	$ 1,701,000	
Road Crossing	17	EA	$10,000	$ 170,000	
				Construction Subtotal	***$ 1,701,000***
Additional Elements (estimated % of above)					
Mobilization			10%	$ 171,000	
Bonding			3%	$ 52,000	
Contractor's Overhead and Profit			15%	$ 256,000	
Build America Buy America (BABA)			7%	$ 120,000	
Contingency			30%	$ 511,000	
Prevailing Wages			3%	$ 52,000	
				Additional Elements Subtotal	***$ 1,162,000***
Plans and Contract Documents (lump sum and estimated % of above)					
Engineering Design and Bid Phase Services			10%	$ 117,000	
Engineering - Construction Contract Administration			5%	$ 59,000	
Engineering -- Inspection			5%	$ 59,000	
Legal, Administrative, and Funding			2%	$ 24,000	
				Plans and Contract Documents Subtotal	***$ 259,000***
				Total Project Costs (rounded)	**$ 3,130,000**

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APPENDIX D: PUBLIC PARTICIPATION

December 4, 2024 Public Open House Presentation
Open House Sign in Sheet

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