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GreatWest ENGINEERING



Preliminary Engineering Report

TOWN OF ENNIS

Water System Improvements

May 2024

Client Commitment *Empowered Employees* *Quality Solutions*

TOWN OF ENNIS

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Water System Improvements

May 2024

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GreatWest
ENGINEERING

Table of Contents

1.0 EXECUTIVE SUMMARY 1
1.1 Introduction and Background 1
1.2 Problem Definition 2
1.3 Alternatives Considered 2
1.4 Preferred Alternative 3
1.5 Project Costs and Budget 4
2.0 PROJECT PLANNING 6
2.1 Location 6
2.2 Environmental Resources Present 9
2.2.1 Land Resources 9
2.2.2 Biological Resources 10
2.2.3 Water Resources 11
2.2.4 Floodplains 12
2.2.5 Wetlands 12
2.2.6 Cultural Resources 13
2.2.7 Socio-economic and Environmental Justice Issues 13
2.3 Population Trends 14
2.4 Community Engagement 14
3.0 EXISTING FACILITIES 16
3.1 Location Map 16
3.2 History 16
3.3 Condition of Existing Facilities 18
3.3.1 Supply 18
3.3.2 Treatment 21
3.3.3 Storage 22
3.3.4 Distribution System 25
3.4 Operational and Management Practices and Capabilities 30
3.5 Financial Status of any Existing Facilities 30
3.6 Water/Energy/Waste Audits 31
4.0 NEED FOR PROJECT 32
4.1 Health, Sanitation and Security 32
4.2 Aging Infrastructure 38

4.3 Reasonable Growth 39
5.0 ALTERNATIVES CONSIDERED 40
5.1 Alternative Screening 40
5.2 Supply Alternatives 40
5.2.1 Alt. S-1: New Redundant Water Supply at Rodeo Grounds 40
5.2.2 Alt. S-2: New Backup Generator 46
5.2.3 Alt. S-3: Security Fencing at Well #3 Site 48
5.3 Meter Alternatives 50
5.3.1 Alt. M-1: Install New Radio Read Water Meters 50
5.4 Treatment Alternatives 52
5.4.1 Alt. T-1: Add Chlorination at Each Well House 52
5.5 Storage Alternatives 54
5.5.1 Alt. R-1: New 150,000 Gallon Glass Lined Steel Bolted Tank and Recoating and Rehabilitation of Existing Tank 54
5.5.2 Alt. R-2: New 700,000 Glass Lined Bolted Steel Tank 59
5.5.3 Alt. R-3: New 700,000 Gallon Prestressed Concrete Tank 64
5.6 Pumping Station Alternatives 69
5.7 Distribution System Alternatives 69
5.7.1 Alt. D-1: New Valves in Distribution System 69
6.0 SELECTION OF AN ALTERNATIVE 73
6.1 Life Cycle Cost Analysis 73
6.2 Ranking Criteria 74
6.2.1 Life Cycle Costs 74
6.2.2 Operational and Maintenance Considerations 75
6.2.3 Permitting Issues 75
6.2.4 Social Impacts 75
6.2.5 Environmental Impacts 76
6.2.6 Public Health and Safety 76
6.2.7 Land Acquisition 76
6.3 Scoring of Storage Alternatives 76
6.3.1 Life Cycle Costs 77
6.3.2 Operational and Maintenance Considerations 77
6.3.3 Permitting Issues 77
6.3.4 Social Impacts 78

6.3.5 Environmental Impacts 78
6.3.6 Public Health and Safety 79
6.3.7 Land Acquisition 79
6.4 Decision Matrix and Selection of Preferred Alternative 79
6.5 Recommended Improvement Program 81
7.0 PROPOSED PROJECT 82
7.1 Preliminary Project Design 82
7.1.1 Water Supply 82
7.1.1 Water Meters 82
7.1.2 Treatment 82
7.1.3 Storage 82
7.1.4 Pumping Stations 82
7.1.5 Distribution System 82
7.2 Project Schedule 83
7.3 Permit Requirements 83
7.4 Sustainability Considerations 83
7.4.1 Water and Energy Efficiency 83
7.4.2 Green Infrastructure 83
7.5 Total Project Cost Estimate 84
7.6 Annual Operating Budget 86
7.6.1 Income 86
7.6.2 Annual O&M Costs 86
7.6.3 Debt Repayments 87
7.6.4 Reserves 87
8.0 CONCLUSIONS AND RECOMMENDATIONS 88
8.1 Funding 88
8.1.1 Funding Sources 88
8.1.2 Funding Strategy 93
8.2 Implementation 96
9.0 REFERENCES 97

List of Figures

Figure 2-1 - Project Location of Ennis, MT 7
Figure 2-2 - Ennis Planning Area 8
Figure 3-1 - Ennis Existing Water System 17
Figure 5-1 - Alternative S-1 New Water Supply at Rodeo Grounds 42
Figure 5-2 - Alternative R-1: New 150,000 Gallon Glass Lined Steel Bolted Tank and Recoating and Rehabilitation of Existing Tank 56
Figure 5-3 - Alternative R-2: New 700,000 Gallon Glass Lined Bolted Steel Tank 61
Figure 5-4 - Alternative R-3: New Concrete Tank 66
Figure 5-5 - Alternative D-1: New Gate Valve Locations 70

List of Tables

Table 1-1 - Recommended Improvement Program 4
Table 2-1 - Population of Ennis and Madison County from 1980 to 2020 14
Table 3-1 – Ennis 2021 Water Use Based on Well Hour Meter Data 19
Table 3-2 - Projected Water System Demands 20
Table 3-3 - Storage Requirements 25
Table 3-4 - Distribution Piping Summary for Ennis, MT 26
Table 3-5 - Revenues and Expenditures for Water in Ennis, MT from 2021-2023 31
Table 4-1 - Stage 1 DBPR - Regulated Contaminants/Disinfectants 35
Table 5-1 - Alternative S-1 Opinion of Probable Cost 45
Table 5-2 - Alternative S-1 Opinion of Probable O&M Costs 46
Table 5-3 - Opinion of Probable Cost Alternative S-2: New Backup Generator 48
Table 5-4 - Opinion of Probable Cost-Alternative S-3: Security Fencing at Well #3 Site 50
Table 5-5 - Opinion of Probable Cost-Alternative M-2: Installation of Radio Read Water Meters 52
Table 5-6 - Opinion of Probable Cost Alternative S-1: Add Chlorination at Each Well House 54
Table 5-7 - Opinion of Probable Cost-Alternative R-1: New 150,000 Gallon Glass Lined Steel Bolted Tank and Recoating and Rehabilitation of Existing Tank 58

Table 5-8 - Opinion of Probable Annual Operation & Maintenance Costs-Alternative R-1: New 150,000 Gallon Steel Water Storage Tank and Recoat Existing Storage Tanks 59
Table 5-9 - Opinion of Probable Cost-Alternative R-2: New 700,000 Gallon Glass Lined Bolted Steel Tank 63
Table 5-10 - Opinion of Probable Annual Operation & Maintenance Costs-Alternative R-2: New 700,000 Gallon Glass Lined Bolted Steel Tank.....64
Table 5-11 - Opinion of Probable Cost-Alternative R-3: New 700,000 Gallon Prestressed Concrete Tank 68
Table 5-12 - Opinion of Probable Annual Operation & Maintenance Costs-Alternative R-3 69
Table 5-13 - Opinion of Probable Cost-Alternative D-1: New Valves in Distribution System 72
Table 6-1 - Summary of net present values for storage alternatives 74
Table 6-2 - Decision matrix for preferred alternative 80
Table 6-3 - Recommended Improvement Program 81
Table 7-1 - Opinion of Probable Cost-Proposed Project (Alternatives S-1 +R-3) 85
Table 7-2 - Revenues and Expenditures of Ennis, MT from FY 2021-2023 86
Table 7-3 - Opinion of Probable Annual O & M Costs 87
Table 8-1 - Funding Scenarios for Ennis 94
Table 8-2 - Detailed Project Budget 95
Table 8-3 - Project Implementation Schedule.....96

List of Appendices

Appendix A	Environmental Checklist and Agency Correspondence
Appendix B	MTNHP Land Cover/Land Resources
Appendix C	NRCS Soil Report
Appendix D	Ennis Source Water Delineation and Assessment Report
Appendix E	NHP Species of Concern
Appendix F	DEQ Sanitary Survey
Appendix G	Floodplain Mapping
Appendix H	Wetlands and Riparian Mapping
Appendix I	2015-2019 ACS Census Data and Target Rate Information
Appendix J	DEQ PWS Compliance Sampling Records and Water Quality Analyses
Appendix K	Preliminary Hydrogeologic Evaluations

Appendix L	Distribution System Model
Appendix M	Water Rights
Appendix N	Financial Information
Appendix O	Public Outreach and Community Engagement
Appendix P	Resolutions
Appendix Q	SRF Priority List Survey

1.0 EXECUTIVE SUMMARY

1.1 Introduction and Background

The domestic water system serving the Town of Ennis includes several components. The existing source of water for the system currently consists of two wells. These wells, located in the west-central and southeast portions of Town, pump water directly into the distribution piping, which in turn feeds the user demands and fills the reservoir. The storage reservoir is a 530,000 gallon on-grade bolted steel tank located on a hill west of Town. Telemetry systems run between the wells and the tank enabling control of the reservoir level and pumping cycles. The distribution system consists of 4-inch, 6-inch, 8-inch, 10-inch, 12-inch, and 14-inch mains with associated fittings, gate valves and fire hydrants. The water usage is metered and there are approximately 670 customer accounts including both residential and commercial services. The current population of Ennis is estimated at 935 people.

Portions of the present system date back to 1961. Substantial improvements, upgrading, and additions to the Town's system have been constructed since then. The Town completed a Water System Analysis in 1991 to identify the condition and needs of the system at that time. Many areas of the system were improved in 1995 based on these recommendations, including the construction of a new water storage tank, new transmission main from the tank to the distribution system, and significant upgrades to the distribution system.

In 2012, routine maintenance and inspection on one of the two wells revealed that the well was badly encrusted and portions of the slotted portion of the well casing had cracked. Given the age of the well, its condition and with questionable viability for continued use for the long-term, the Town elected to abandon this well and construct a replacement well at the same site. The new well was completed in 2014.

Growing concerns with water supply capacity and new developments with the aging water storage tank led the Town to have an updated PER prepared to address these and other on-going issues with the water system. To best address the deficiencies in the water system and to develop a technically and financially feasible plan to implement the necessary improvements, the Town has retained Great West Engineering to complete the Preliminary Engineering Report of its water system. The PER follows the interagency Uniform Preliminary Engineering Report Outline and meets all associated requirements.

1.2 Problem Definition

Health and safety of the public is by far the largest concern for any community water system. The water supply does not meet DEQ-1 standards which require that the system to be able to provide the maximum daily demand with the highest capacity well out of service. An additional 272 gallons per minute of source capacity is needed to meet projected demands and DEQ standards.

The existing steel water storage tank is 29 years old, is leaking and requires significant maintenance should it remain in service. The existing storage capacity is not sufficient to meet system demands and provide the needed fire protection. A lack of adequate fire protection increases concerns that the local volunteer fire department would be unable to control a fire at the school sufficiently to save the lives of children and teachers. The inability to control fires also puts the firefighters at greater risk. As the American Water Works Association suggests, *"Fire protection through the water system reduces fire insurance rates, though more importantly; it protects the tax base from destruction from fire, preserves jobs, and most importantly preserves human life and reduces human suffering."*

Other system deficiencies that have been identified but have been deemed lower priorities than the issues listed above include:

- Lack of ability to easily provide chlorine disinfection of the water system in the event of an emergency;
- Lack of a backup power source on the water supply;
- No security fencing around the storage tank site and Well #3 to prevent vandalism and ensure continued safe drinking water for all consumers;
- Excessive lost and unaccounted for water in the water system;
- Individual water service meters are over 25-years old and need to be replaced;
- Inadequate valving in portions of the distribution system

1.3 Alternatives Considered

The alternative screening process considered various alternatives for the water system improvements. After an initial evaluation, some alternatives were determined to be non-viable for the Town and were eliminated from further review. Alternatives that were determined viable and therefore discussed in greater detail include the following:

Supply Alternatives:

- Alt. S-1: New Redundant Water Supply at Rodeo Grounds
- Alt. S-2: New Backup Generator
- Alt. S-3: Security Fencing at Well #3 Site

Meter Alternative:

- Alt. M-1: Install New Radio Read Water Meters

Treatment Alternative:

- Alt. T-1: Add Chlorination at Each Well House

Distribution System Alternative:

- Alt. D-1: New Valves in Distribution System

Storage Alternatives:

- Alt. R-1: New 150,000 Gallon Glass Lined Steel Bolted Tank and Recoating and Rehabilitation of Existing Tank
- Alt. R-2: New 700,000 Glass Lined Bolted Steel Tank
- Alt. R-3: New 700,000 Gallon Prestressed Concrete Tank

1.4 Preferred Alternative

The Town has identified water supply and storage improvements as its top priority. The recommended improvements will address the most significant threat to public health and safety.

The proposed project includes development of redundant water supply capacity for the Town's water system and consists of drilling a new well and completing a previously drilled well near the Rodeo Grounds on the northwest edge of town. A new wellhouse will be constructed at the site to house piping and controls for operation of the two new wells. The new wells will ensure the Town continues to have a reliable water supply and will improve the operation and management of the water system.

The proposed project also includes abandonment of the existing steel tank and construction of a new prestressed concrete tank near the existing storage tank. The preliminary tank size is 32 feet tall with a diameter of 60 feet, which will provide the required storage of 700,000 gallons.

The alternatives presented have been compiled into a recommended improvement program with priorities established by the Town. Priorities #1 and #2 will be the immediate focus of the Town. The remaining projects will be completed as funds allow. Table 1-1 presents a priority list of the recommended improvements. The Town may wish to reprioritize the improvements over time as the need arises.

Table 1-1 - Recommended Improvement Program

Recommended Improvement Program		
Item	Description	Estimated Cost
Priority #1	New Redundant Water Supply Wells at Rodeo Grounds	$ 925,000
Priority #2	New 700,000 Gallon Prestressed Concrete Storage Tank	$ 3,083,000
Priority #3	Replace 20% of Water Meters	$ 117,000
Priority #4	Install New Backup Generator at Well #2	$ 116,000
Priority #5	New Valves in Distribution System	$ 111,000
Priority #6	Add Chlorination at Each Well House	$ 95,000
Priority #7	Security Fencing at Well #3	$ 11,000

1.5 Project Costs and Budget

The total estimated cost for the proposed project is $4,008,000. These costs are detailed in Table 7-1. Various funding sources for the improvements are considered in Chapter 8 and include a variety of grant and low interest loan sources available to the Town of Ennis.

The Town's preferred funding package and that recommended by this PER includes:

- $500,000 MCEP Grant
- $125,000 DNRC-RRGL Grant
- $214,133 Town of Ennis ARPA MAG
- $225,000 Madison County ARPA MAG
- $500,000 SRF Loan Forgiveness
- $2,183,000 SRF Loan
- $10,867 Town Reserves

Table 8-1 presents the various funding scenarios considered, including the proposed funding strategy. Table 8-2 is a Detailed Project Budget based upon the proposed funding strategy.

The Town understands the significant infrastructure improvements needed in their water system. With this understanding, the Town is taking a steady and moderate approach to increasing water rates to help put the community in a position to complete all of the necessary improvements and to provide long-term stability for the water system.

Assuming the overall funding strategy is successful, the project will increase residential user rates by an estimated $18 per month per EDU. The current monthly water user rate is $37.54 and the current monthly sewer user rate is $47.43. The combined water and sewer user cost per month, including the proposed project, is approximately $103.43. This amount compared to the Town's target rate as established by the Montana Department of Commerce ($88.70) shows that the Town will be at 116% of target rate. The Town is capable of providing the necessary funds to repay the new debt service and meet coverage requirements while adequately operating and maintaining the system.

2.0 PROJECT PLANNING

This PER was prepared under the direction and approval of the Town of Ennis and complies with DEQ design requirements and regulations. State and federal funding agencies working with Montana that are members of the Water, Wastewater, and Solid Waste Action Coordination Team (W2ASACT) have adopted the Uniform Preliminary Engineering Report for Montana Public Facility Projects. Members of W2ASACT include CDBG, MCEP, RD, SRF, INTERCAP, and DNRC funding programs. The PER requirements must be met by communities that are planning to use any of these funding agencies. Following PER report format criteria is a condition of all planning and construction grant funds that may be received from MCEP, CDBG, DNRC, and RD as well as the SRF loan program.

2.1 Location

The Town of Ennis is located in Madison County on Highway 287 approximately 14 miles east of Virginia City. The town borders the west bank of the Madison river and is bounded by the Tobacco Root Mountains to the west, the Gravelly Range to the southwest, and the Madison Range to the east. These complex mountain ranges extend upwards of 11,000 feet above mean sea level. The Madison River flows north through the valley. The nearest large city is Bozeman, located 53 miles northeast of Ennis. A map of the project's location is shown below in Figure 2-1.

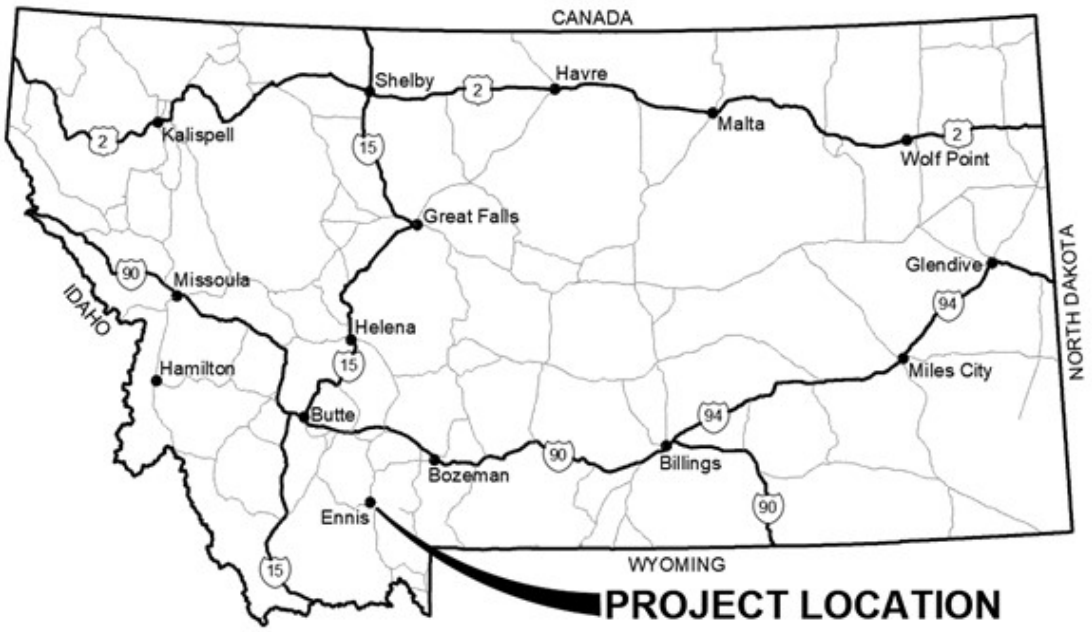


Figure 2-1 - Project Location of Ennis, MT

More specifically, the city of Ennis is located at:

- Township/Section/Range: Township 5 S, Range 1 W, Sections 32 & 33 and Township 6 S, Range 1 W, Section 4
- Latitude/Longitude: 45º 20’ 57” North Latitude, 111º 43’ 58” West Longitude
- Average Elevation: 4,941 Feet

The Town of Ennis is characterized by two distinct topographic zones: the lower elevation portion of town, along the Madison River, and a bench elevated 15-20 feet including generally the west-northwest and south portion of Town. Figure 2-2 presents a topographic map of the planning area.

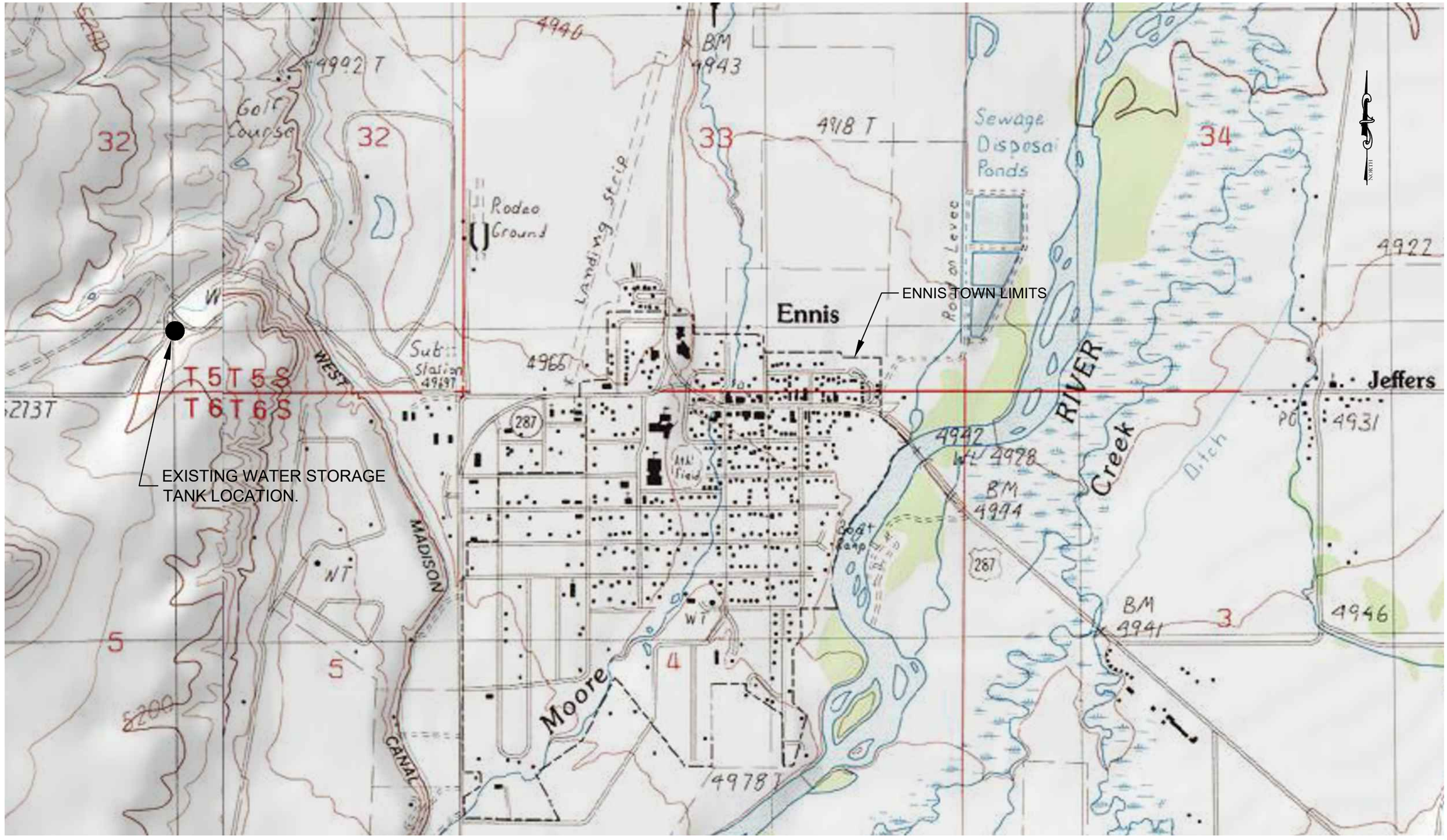


Figure 2-2
Ennis Planning Area

TOWN OF ENNIS
WATER SYSTEM PRELIMINARY ENGINEERING REPORT

GreatWest ENGINEERING

X:\Shared\Helena Projects\1-18184-Ennis On Call 2018\TO 7 - Water PER\CADD 1-18184-TO7\Exhibits\1-18184-TO7-Planning Area.dwg

2.2 Environmental Resources Present

As part of any major construction project, the impacts of the project on the surrounding environment must be considered and provisions made to mitigate any negative impacts. The Uniform Application for Public Facility Projects streamlines the process by utilizing a standard procedure called the Uniform Environmental Checklist. A completed Uniform Environmental Checklist for the proposed water system improvements in Ennis is included in Appendix A. The Environmental Checklist, along with the findings of the PER, was presented to the Town at a public hearing held on February 8, 2024.

As part of quantifying the impacts to various environmental and historic resources, the Uniform Checklist process includes the process of sending letters to pertinent local, state, and federal agencies requesting comments on any potential environmental impacts resulting from the proposed improvements. The letters and responses to these letters, and the adopted resolution, are included in Appendix A.

2.2.1 Land Resources

Ennis is built approximately halfway between Three Forks and West Yellowstone in the Maddison River Valley. The Town's central location leads to the community being a local hub for business in the valley. To quantify the land use in the area, the Map Viewer from the Montana Natural Heritage Program's website was accessed, and a report, presented in Appendix B, was generated for the area. Land within the Town's limits is primarily low intensity residential buildings, but smaller portions of Town are used for commercial and industrial purposes. Generally, these commercial lands serve the residents and seasonal tourists who come to the area for fishing opportunities and sightseeing at Yellowstone National Park. These businesses included bars, restaurants, several breweries, a distillery, grocery stores, and several outdoor and sportsman stores.

Outside of Ennis, land is primarily used for agricultural purposes. These lands include cultivated crops like wheat and barley, but agriculture also includes grazing land for livestock. The most common ecological system in nearby undeveloped areas is the Rocky Mountain Lower Montane, Foothill, and Valley Grassland.

In addition to land cover, a custom soils report from Natural Resource Conservation's online soil mapper was generated. A copy of the report is provided in Appendix C. Geologic maps of the

area indicate that geology is mostly alluvial deposits from modern channels and some gravel deposits. Various loams and sands generally comprise the soils in the area. The predominant soil types near Ennis include the following:

- Rivra-Ryell-Havre Complex (107)

  This is a deep, very well-drained soil typically located in floodplains. It is formed from sandy and gravelly alluvium and has slopes ranging from 0-2 percent. This soil has high permeability and is considered farmland of local importance.

- Scravo very cobbly sandy loam (115)

  This is a deep, well-drained soil found primarily on stream terraces. It averages 0 to 4 percent in slope and displays moderately high to high permeation capabilities. This soil is considered to be not prime farmland.

- Attewan Loam (10)

  Attenwan loam is a very deep, well-drained soil found in stream terraces and alluvial fans. This loam typically has slopes of 0 to 2 percent and moderately high to high drainage capabilities. This soil is considered to be prime farmland if irrigated.

No lands currently used for farming within the planning area will be taken out of production. The project will take place in previously disturbed areas and will not result in a change of land use. The lands involved with the proposed system improvements are not considered to be prime farmland. No adverse impacts to land resources are expected.

2.2.2 Biological Resources

The grasslands in the Madison Valley and the Madison River provide important habitat for various species in the area. The grasslands in the valley are composed of various grasses, sedges, wildflowers, and sagebrush. In these areas, large mammals like pronghorn, deer, and elk are present, but smaller animals like rabbits, snakes, and various birds inhabit the area. Additionally, the Madison River and associated wetland systems provide important habitat for numerous species of plants and animals. Flora associated with the river include reeds, cattails, and bulrush. The Madison River also contains and supports various fish, rodents, amphibians, reptiles, and migratory birds.

To identify potentially unique or sensitive species of fauna and flora, the Montana Natural Heritage Program's Species of Concern database was accessed. A copy of the reports of species of concern for both the plants and animals can be found in Appendix E. Animals of concern near Ennis include Townsend's Big-eared Bat, Long-eared Myotis, Grizzly Bear, Golden Eagle, Great Blue Heron, Burrowing Owl, Ferruginous Hawk, Veery, Trumpeter Swan, Greater Sage-Grouse, Clark's Nutcracker, Long-billed Curlew, Sage Thrasher, Thick-billed Longspur, Brewer's Sparrow, Arctic Grayling and Western Pearlshell. Additionally, The Montana Sage Grouse Habitat Conservation Program online mapper was used to identify habitat for Sage Grouse in the area, and a copy of the map can be found in Appendix E. Although Sage Grouse may be present nearby, the generated map shows that the protected habitat is located west of Town and will not be impacted by any improvements in Ennis.

Plant species of concern in the area include Railhead Milkvetch, Wedge-leaf Saltbush, Parry's Fleabane, Andean Water-milfoil, Spiny Skeletonweed, Alkali Primrose, Mealy Primrose, Alkali-marsh Ragwort, and Pale Duckweed.

2.2.3 Water Resources

Groundwater in the area is generally of high quality as a potable water source. Groundwater level can be a concern for development in a few areas in Ennis. According to local sources and limitations indicated in well records, the groundwater level is moderately high in certain parts of town, but is not usually a concern for development of structures with deep foundations or basements since the water level is below 10 feet in most parts of town. Structures in the vicinity of Moore's Creek have encountered groundwater at foundation depth in the north part of Ennis. Well data for the area north of the town limits, near Moore's Creek, shows a static water level at 2 feet and the area on the east end of town is typically around 4 - 6 feet to groundwater.

Groundwater contamination from underground fuel storage tanks has been a problem in the past at several locations in Ennis. Some of the sites have been cleaned up and are in compliance with the Montana Underground Storage Tank Act, while others are still in the cleanup and remediation process. The Department of Environmental Quality Environmental Services Section maintains a statewide database of all storage tank releases reported since 1986. The system tracks the status and final disposition of each site. There are currently no active facilities with active leaks listed; however, there are 7 facilities that are inactive but still have active leaks. Active leaks are defined as ones in which the cleanup and remediation process is not complete.

The Ennis planning area has numerous wells drilled for domestic and stock water use. Well data indicates that the static water level varies from moderately deep in the area west of Ennis (50'-200') to shallower depths averaging less than 50 ft. deep over in the alluvial valley north and east of town. Water quality and yield are good throughout the study area with typical yields in the range of 10 to 35 gpm. Several wells have been drilled in the alluvial area with yields in excess of 300 gpm.

The Ennis planning area is part of the Madison River watershed which encompasses a 1,933 square mile area beginning at Three Forks 36 miles to the north and extending south of town along the river into Yellowstone Park. The watershed divide is located along the Tobacco Root Range and Gravelly Range to the west and south, and on the Madison Range to the east. The streams from the mountain zones converge on the Madison River which flows through the study area on the east side of Ennis. The Madison River is 200 miles long and is joined by numerous tributaries along its length, including Moore's Creek, O'Dell Creek and Bear Creek that pass through the Ennis Planning Area. The water use and water quality of the streams and irrigation ditches are primarily responsible for the quality of the local aquifers. These surface water resources form the principal re-charge to the basin fill aquifers and have a direct effect on the ground water chemistry.

2.2.4 Floodplains

A FEMA floodplain map search for the Town was conducted using the FEMA Flood Map Service Center for the Town area (Appendix G). No area outside of the Town limits or east of the Madison River have been mapped. Areas of the Town around Moore Creek lie within a special flood hazard zone, including a regulatory floodway. As such, many properties bordering the creek lie within the 50- and 100- year flood hazard areas. This floodway runs along South First Street and northeast of Jefferson Street. Permitting will be pursued and approved before construction for all components within the floodplain.

2.2.5 Wetlands

Mapped riparian and wetland areas of Montana are provided by the Montana Natural Heritage Program. Wetlands are present east of Town along and to the east of the Madison River. Some freshwater emergent wetlands are also present to the north of Town. No wetlands are delineated within Town limits. If work is proposed within any of these mapped wetlands or if wetland habitat is encountered during site reconnaissance for design, a detailed delineation and assessment will

be performed. If wetland disturbance appears to be unavoidable for any portion of the project, the appropriate permits will be obtained from the Army Corp of Engineers prior to commencement of construction activity. The Army Corps was contracted regarding the proposed project and correspondence can be found in Appendix A. A map of the existing wetland in the area of proposed improvements, obtained from the U.S. Fish and Wildlife Service National Wetlands Inventory is included in Appendix H.

2.2.6 Cultural Resources

Cultural resources include historic and prehistoric archeological sites, historic architecture, engineering features and structures, and resources of significance to Native Americans. The Montana State Historic Preservation Office (SHPO) was contacted to determine whether there are significant historical and cultural resources within the project area. Response from SHPO is included in Appendix A, and states that there are some previously recorded sites within the designated project locales. However, SHPO feels there is a low likelihood that cultural resources will be impacted in areas where the ground has been previously disturbed, and therefore determined that a recommendation for a cultural resource inventory is unwarranted. In the event the project creates a need to alter a structure or if cultural materials are inadvertently discovered, SHPO will be contacted.

2.2.7 Socio-economic and Environmental Justice Issues

In order to describe the economic profile of Ennis, the Montana Department of Commerce's web page for income and poverty trends was accessed. The online tool provides a summary of the 5 year period for the American Communities Survey (ACS) from 2014 to 2019. A copy of the ACS summary is available in Appendix I. The median income for a household is $46,280 with a low and moderate income percent of 37.1%. The poverty rate in Ennis is low at 5.2%; however, the rate for residents above retirement age is 1.4% which is substantially lower than those younger than 65 with a rate of 5.1%.

From the 2020 decennial census., the Town is predominantly white with the majority of ancestry being related to German, English, and Irish. Any improvements to the water system would provide equal benefits across the community, and no specific demographic would be targeted or harmed by any projects.

2.3 Population Trends

Population change is a vital factor when a municipality is considering capital improvements. The current and future number of residents has a direct effect on the required capacity for the Town's water system. In order to project future population of the Town, data from the United States Census Bureau was acquired from their online database. The data included population counts of both Ennis and Madison County from the decennial censuses from 1980 to 2020. A summary of the population is provided below in Table 2-3, and the percent change in population between census counts were determined.

Table 2-1 - Population of Ennis and Madison County from 1980 to 2020

Town of Ennis Population (1980-2020)				
Year	Ennis	% Annual Increase/Decrease	Madison County	% Annual Increase/Decrease
1980	660	-	5,448	-
1990	773	1.71	5,989	0.99
2000	840	0.87	6,851	1.44
2010	838	-0.02	7,691	1.23
2020	917	0.94	8,623	1.21
Average		0.88		1.22
2042[2]	1,100	1.0		-

(1) US Census Bureau
(2) Population of Town at Design Year (2042) estimated from 2020 Census at conservative 1.0% Annual Growth

The population of Ennis and the surrounding area has generally seen growth over the last 40 years with an average population growth of 0.88 percent. In order to estimate future demands, a population growth rate of 1.0% was assumed for a standard 20-year design period. Assuming a starting design year of 2022, the population at the end of design life would be 1,100 for the Town.

2.4 Community Engagement

As part of improving a public utility, input from the community is necessary. Capital improvements require the support of rate payers in order to be successful. To provide an opportunity for community members to comment and learn about the preliminary recommendations, public presentations were given on February 8, 2024 and April 11, 2024. The presentations provided information on the preliminary findings, need for improvements, and current cost estimates. In

addition to this information, questions were taken at the conclusion of the presentation. A copy of the presentations, along with Affidavits of Publications for the public hearings and screen shots from the public hearings can be found in Appendix O.

3.0 EXISTING FACILITIES

3.1 Location Map

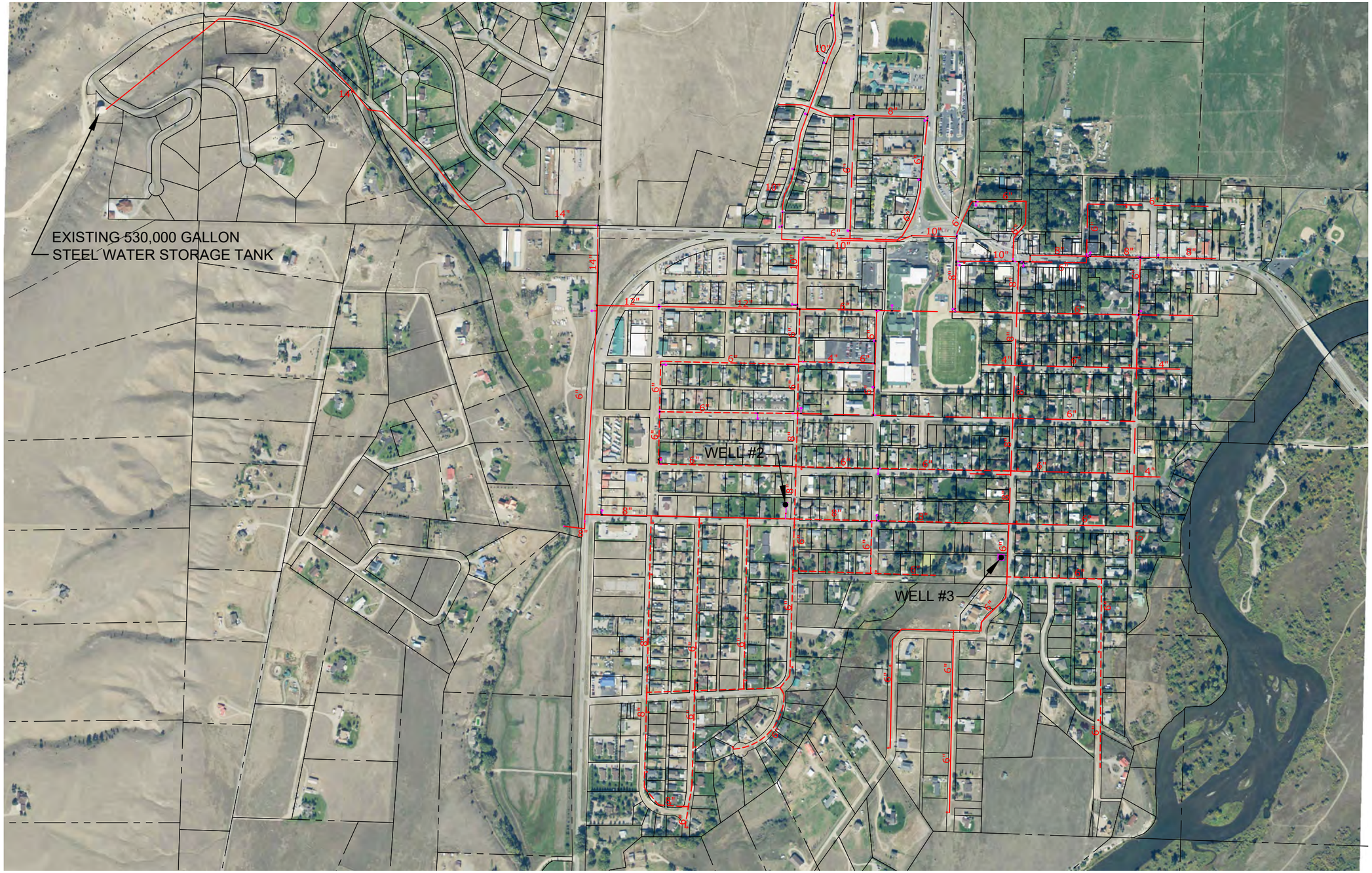
Figure 3-1 is a map showing the location and schematic layout of the existing water system.

The Town of Ennis' domestic water system consists of several components. As outlined in Figure 3-1, the existing sources of water for the system currently consist of two wells. These wells, located in the west-central and southeast portions of Town, pump water directly into the distribution piping, which in turn feeds the user demands and fills the reservoir. The storage reservoir is a 530,000 gallon on-grade bolted steel tank located on a hill west of Town. Telemetry systems run between the wells and the tank enabling control of the reservoir level and pumping cycles. The distribution system consists of 4-inch, 6-inch, 8-inch, 10-inch, 12-inch, and 14-inch mains with associated fittings, gate valves and fire hydrants.

3.2 History

Portions of the present system date back to 1961. Substantial improvements, upgrading, and additions to the Town's system have been constructed since then. The Town completed a Water System Analysis in 1991 to identify the condition and needs of the system at that time. Many areas of the system were improved in 1995 based on these recommendations, including the construction of a new water storage tank, new transmission main from the tank to the distribution system, and significant upgrades to the distribution system.

Although these improvements greatly reduced the vulnerabilities of the Town's water system, not all recommended improvements were made. In 2008, a Preliminary Engineering Report was completed for the water system. This report examined the needs of the system following the 1995 improvements. In that report, it was found that additional water supply was needed to meet the demands of the system. In 2011, the Town drilled a new well on the northwest edge of Town, near the rodeo grounds. Unfortunately, this new well did not produce the yield expected or desired, and the project was put on hold and the well was left uncompleted.



0 300 600
SCALE IN FEET

LEGEND
- PVC
- CAST IRON
- ASBESTOS CEMENT

GreatWest ENGINEERING

Figure 3-1
Ennis Existing Water System

TOWN OF ENNIS
WATER SYSTEM PRELIMINARY ENGINEERING REPORT

Y:\Shared\Helena Projects\1-18184-Ennis On Call 2018\TO 7 - Water PER\CADD 1-18184-TO7\Exhibits\1-18184-TO7-Figure 3-1 Existing Water System.dwg

In 2012, routine maintenance and inspection on one of the two wells revealed that the well was badly encrusted and portions of the slotted portion of the well casing had cracked. Given the age of the well, its condition and with questionable viability for continued use for the long-term, the Town elected to abandon this well and construct a replacement well at the same site. The new well was completed in 2014.

In April 2014, a local telephone cooperative severed a water main in the system, while installing a fiber optic line. Montana's Department of Environmental Quality (DEQ) determined that the drinking water was unsafe and required Ennis to decontaminate the system by flushing chlorine throughout the water distribution system. The water supply in Ennis does not require disinfection and therefore, disinfection equipment is not in place at either of the two well houses. The system operators were forced to climb to the top of the water tank with 5-gallon buckets of chlorine and empty them into the tank through the roof access hatch. The wells were then turned on to fill up the 530,000-gallon water tank to chlorinate and disinfect the system. Once the reservoir was full, the operators began flushing the distribution network with the highly chlorinated water. It took several days to complete the decontamination process and bring the system back online. During that time, a boil order was in effect for each household and business served by the water system.

Once the crisis had passed, the DEQ recommended that the Town prepare an Emergency Response Plan for the drinking water system. An Emergency Response Plan for the water system was completed in 2017 along with a PER update that recommended improvements for the Town to consider to better handle emergency situations with the water system.

Growing concerns with water supply capacity and new developments with the aging water storage tank led the Town to have an updated PER prepared to address these and other on-going issues with the water system.

3.3 Condition of Existing Facilities

3.3.1 Supply

Water Demand

Current Water Demands

In Ennis, water is metered at both of the wells and at individual resident and commercial users. However, after reviewing several years of this data, it appears the meter data is not very reliable.

The most reliable information appears to be the well hour meter data from 2021. The well hour meter data combined with the well pumping rates allow for a determination of the water source monthly flows. Water usage for each month of 2021 is summarized in Table 3-1. The total annual flow in gallons is also shown in Table 3-1.

Table 3-1 – Ennis 2021 Water Use Based on Well Hour Meter Data

2021 Water Use Based on Well Hour Meter Data			
Month	Total Monthly Source Flow (gallons per day)[1]	Average Daily Source Flow (gallons per day)[1]	Average Per Capita Use (gpcd)[2]
January	6,987,000	225,387	241
February	6,999,000	249,964	267
March	7,617,000	245,710	263
April	7,557,000	251,900	269
May	6,351,000	204,871	219
June	14,667,000	488,900	523
July	16,392,000	528,774	566
August	12,837,000	414,097	443
September	10,740,000	358,000	383
October	7,176,000	231,484	248
November	5,469,000	182,300	195
December	5,598,000	180,581	193
Yearly Total	111,522,000		
Average		305,540	326

Notes:
[1]Based on 2021 well hour meter data.
[2]Based on existing service population of 935

As indicated in the table, the average daily water usage per capita varies from a low of 193 gallons in December to a high of 566 gallons in July. This compares to an average over the entire year of 326 gpd. The average day demand of 305,540 gallons over a 24-hour period is equivalent to a flow rate of 212 gpm.

A maximum daily demand for the water system must be determined. The definition of maximum day demand is the highest volume of water consumed on any day in a year. Utilizing the daily total hour meter usage, a true maximum day peaking factor can be calculated. Based on the highest hour meter reading in 2021, the maximum day demand was 639,000 gallons or 444 gpm. The maximum day peaking factor is 2.10 (max day/avg day). Typical maximum day to average day peaking factors range from 2.5 to 3.5 based on communities in Montana of similar size.

In summary, the following data is used in calculating future demand:

- Average Day Demand: 305,540 gpd and 212 gpm
- Maximum Day Demand: 639,000 and 444 gpm

Projected Water Demands

With a projected population and average day demand, projected water demands can be made. The projected demands will establish the design criteria necessary to develop future improvements to the Town's water system. Based on population projections over the 20-year design period, projected water demands are calculated in Table 3-2.

Table 3-2 - Projected Water System Demands

Projected Water System Demands					
Year	Estimated Service Population	Average Day Demand		Maximum Day Demand	
		(gpd)[1]	(gpm)	(gpd)	(gpm)
2022	935	305,540	212	639,000	444
2027	976	318,176	221	666,608	463
2032	1,017	331,542	230	694,611	482
2037	1,058	344,908	240	722,614	502
2042	1,100	358,600	249	751,300	522

Notes:
[1]Based on 326 gpcd

Water Supply

Ennis' existing water supply is obtained from groundwater via two wells. The locations of the two wells are indicated in Figure 3-1. Supply Wells #2 and #3 were constructed in 1979 and 2014 respectively.

Well #2 is located at the intersection of Armitage Street and Comely Way. It has a 12-inch casing diameter and is drilled to a total depth of 142 feet. Well #2 was rehabilitated in 1995, which resulted in increased production. The well is currently producing 350 gpm without any issues.

Well #3 was constructed in 2014 and replaced Well #1 which had reached the end of its useful life. Well #1 was subsequently abandoned. Well #3 is located at the intersection of First Street and Grizzly Street. It has a 10-inch casing diameter and is drilled to a total depth of 150 feet. The well was test pumped at 350 gpm, which allows the Town to utilize the well at 235 gpm per DEQ standards.

The water supply is not equipped with a backup power source. In the event of a power outage, the system would need to rely on storage volume to maintain service to the users. A prolonged power outage could result in the community being without water after less than two full days at average daily flows.

The Well #3 site does not have any security fencing. A lack of security fencing makes it difficult to prevent vandalism and ensure safe drinking water for all consumers.

Water Quantity

Montana Department of Environmental Quality Circular DEQ-1 has been adopted by the Montana Water Quality Division as its standard for Community Water Systems. Based on the DEQ-1, Section 3.2.1.1: 'The total developed groundwater source capacity for systems utilizing gravity storage or pumped storage, unless otherwise specified by MDEQ, must equal or exceed the design maximum day demand with the largest producing well out of service'.

DEQ-1, Section 3.2.1.2 states: 'A minimum of two sources of groundwater must be provided.' The Town currently meets this regulation.

Ennis' current maximum day demand, as discussed above, is 444 gpm. The Town's current production capacity is 250 gpm with the largest well out of service. The system cannot meet the current maximum day demand (444 gpm) with the largest well out of service. The future max day demand is 522 gpm. The Town should develop additional water supply and maximize efforts to reduce unaccounted for water in the system to ensure that DEQ standards for water supply can be met.

Water Rights

Appendix M includes a copy of the Town's water rights for its two wells. The Town's water rights include a total flow rate of 550 gpm and a yearly volume of 834.55 acre-feet.

3.3.2 Treatment

The water supplies are untreated except for occasional sterilization following repairs or bad sample results. Future federal regulations may require treatment of groundwater supplies.

3.3.3 Storage

Water storage for Ennis currently consists of a 530,000 gallon on-grade bolted steel tank located west of town. The 530,000 gallon steel tank was constructed in 1995. The tank is approximately 47 feet in diameter and 40 feet high. The tank is connected directly to the distribution system via a 14-inch PVC transmission main. The tank has not been recoated since it was constructed. The tank is due for a recoating on both the exterior and interior surfaces. In addition, the tank is leaking, particularly along the wall/floor connection seam. The Town's 2022 Sanitary Survey in Appendix F notes the leaking on Page 3 and a photo of the leaking seam can be found on Page 14.

The water level in the storage tank and the operation of the two remote well pumps are controlled by a radio telemetry control system. The well pumps are controlled from the Well #2 pumphouse where the tank level is also indicated and documented with a chart recorder.

The well pump motors are controlled by a Consolidated Electric Company telemetry system. The telemetry utilizes radio signals to transmit an FM radio signal from the storage reservoir pressure transducer to the control panel. The motor starters are equipped with heaters and overload protection circuits.

Basically, the telemetry system sends a signal to the lead pump motor starter to initiate pumping when the level (measured as pressure by the transducer in the valve pit east of the tank) in the storage tank has reached a preset low. If the demand on the system is very high and the water level in the tank continues to drop to a preset low level, a signal is sent to the second well pump (lag) motor starter to initiate pumping. The two pumps are automatically switched between lead and lag.

Eventually the pump or pumps will begin to fill the storage tank and a signal will be sent to the motor starters to stop the pumps when the storage tank reaches a predetermined high level. If for some reason the pumps do not shut off and the water level in the tank continues to rise, a signal will be sent to turn on a high-level alarm to alert the operator of possible storage tank overflow. Likewise, if the pump(s) continue pumping beyond the pump off level an alarm will be set off at a preset low water level.

All of the described telemetry and control systems were installed with the new storage tank in 1995 and have been well-maintained. The overall condition of the storage system is good, due to the improvements in 1995.

In general, water storage can be thought of as satisfying three different needs: 1) operational storage; 2) emergency storage; and 3) fire suppression storage. Circular DEQ 1 has specific sizing requirements for storage facilities, listed below:

- Section 7.0.1: *"Storage facilities must be sufficient, as determined from engineering studies, to supplement source capacity to satisfy all system demands occurring on the maximum day, plus fire flow demands where fire protection is provided".*

- Section 7.0.1.b: *"The minimal allowable storage must be equal to the average daily demand for a 24-hour period plus fire flow demand where fire protection is provided".*

Operational Storage

Operational storage serves to provide supplemental flows to the water supply during peak periods. Whenever peak hourly demands exceed available flows from the supply, the difference must be provided with flows from storage. If storage is not adequate to supplement the supply, water pressures in the distribution system may drop to dangerously low levels. Elevated storage serves to equalize pressures. As previously shown, the Town's water supply capabilities are marginally sufficient to meet both current and projected maximum demands.

Emergency Storage

Elevated storage is important to a community due to the fact that should a power loss or pump shutdown occur, a water supply is still available. In the case of one well being out of service, flow from the remaining wells would be supplemented by the storage volume. In the extreme case of complete power failure resulting in zero flow from the water supply, the storage tank would be the sole source of water for the community.

No formula exists for determining the amount of emergency storage required. The decision is usually made on a judgment about the perceived vulnerability of the community's water supply. If a utility has several sources with auxiliary power supplies, the need for emergency storage is small. Some storage should be available for a catastrophic pipe break that cannot be easily isolated.

The length of time that storage flows will be available is dependent on the following:

- How many wells are out of service;
- How long the well(s) are out of service;
- The time of day the well(s) are out of service;
- The time of year the well(s) are out of service;
- How much the users control their water use during the emergency period;
- How much water the tank contains when the emergency period begins;
- If the water source has a backup power supply or if it is supplied by gravity; and
- The reliability of the distribution system to transport water to the users.

If a system has a single source without auxiliary power and relatively unreliable distribution system, a significant volume of emergency storage is prudent. The Town has two wells, but no auxiliary power source. The storage tank delivers water to the system by means of gravity. The distribution system is in good condition and not in need of any significant repair. The potential for a catastrophic water main break is low due to age and condition of the pipe. The residents within the Town could be easily notified of a system emergency and control their water usage until the emergency is remedied. With these factors the current emergency storage needs for the Town are minimal.

Fire Suppression Storage

The volume of fire protection is dependent upon the firefighting capabilities of the community, as well as construction material, use of the building, size of the building, and distance between buildings. The State of Montana has adopted the NFPA Uniform Fire Code, which states *"the minimum fire flow and flow duration requirements for one and two family dwellings having a fire area that does not exceed 3,600 square feet shall be 1,000 gpm".* Fire flow and flow duration for dwellings having a fire area in excess of 3,600 square feet is specified in a table according to type of construction and size of the building. The code also states that *"fire flow requirements may be modified downward by the authority having jurisdiction for isolated buildings or a group of buildings in rural areas or small communities where the development of full fire flow requirements is impractical".* The Town of Ennis is comprised primarily of residential dwellings and several commercial buildings.

The local volunteer fire department is set up to handle a 2,500 gpm capacity. Therefore, the maximum recommended fire flow for Ennis is 2,500 gpm for a two-hour period. A fire flow of

2,500 gpm for two hours equates to 300,000 gallons. Ennis storage requirements are summarized in Table 3-3.

Table 3-3 - Storage Requirements

Storage Requirements		
Storage Need	Year 2022 Demand (gallons)	Year 2042 Demand (gallons)
Operational (average day demand)	305,540	358,600
Emergency	0	0
Fire Suppression (2,500 gpm for 2 hrs.)	300,000	300,000
Total Required	605,540	658,600
Storage Deficit [1]	75,540	128,600
[1]Based on existing storage capacity of 530,000 gallons.		

The Town's existing storage capacity is 530,000 gallons and is inadequate to meet the community's needs for the existing or future scenarios. Ennis needs approximately 130,000 additional gallons of storage capacity to meet future demand plus fire flow.

3.3.4 Distribution System

Ennis' water distribution system consists of a series of mains and laterals that transport water to individual service lines. A general layout of the Town's existing water system is depicted in Figure 3-1. As indicated in this figure, the system is comprised primarily of 6-inch and 8-inch mains along with numerous gate valves and fire hydrants. Table 3-4 lists a further breakdown of the piping in the system.

Table 3-4 - Distribution Piping Summary for Ennis, MT

Distribution Piping Summary	
Pipe Size and Material	Length (ft.)
4-inch Asbestos Cement	200
4-inch Cast Iron	800
4-inch PVC	400
6-inch Asbestos Cement	15,700
6-inch Cast Iron	13,600
6-inch PVC	5,900
8-inch Asbestos Cement	4,300
8-inch Cast Iron	2,200
8-inch PVC	4,300
10-inch PVC	2,200
12-inch PVC	1,350
12-inch PVC	4,500
Total Pipe:	55,450

The original system, which was installed in 1961, consisted of 4-inch, 6-inch, and 8-inch cast iron (CI) mains with lead caulked joints. The remainder of this network is located primarily in the north and east portions of Town as delineated by the cast iron pipe shown in Figure 3-1. Through the 1970's and early 1980's the rest of the system to the west and south began filling in. The majority of the main distribution network additions occurred with the development of subdivisions such as Mirza 1, Mirza Tract No. 2, Beaverhead Estates, Deer Meadow Addition and the Madison Bench Addition. Asbestos cement (AC) pipe was the predominant material used for the mains in these areas. A major improvement project was conducted on the system in 1978 when, along with the construction of a 200,000 gallon concrete storage reservoir, 2,900 feet of polyvinyl chloride (PVC) water main was installed. The majority of the main installed was 8-inch and served to provide a more efficient core between the reservoir, Well #2 and the southwestern portion of the system. Over the years, numerous other extensions and additions to the water system were constructed by individuals and Town personnel.

A study of the water system was completed in 1992 and significant improvements were made to the water distribution system again in 1995. As previously mentioned, a new 530,000 gallon water storage tank was constructed west of the Town, and connected to the distribution system via a 14-inch PVC transmission main. Other portions of the downtown distribution system were upgraded to 12-inch, 10-inch, 8-inch and 6-inch PVC water mains. These improvements greatly

improved the pressures and available fire flows in the distribution system, and gave the system greatly improved reliability.

Service lines from the water mains to individual residences and commercial units consist primarily of ¾-inch and 1-inch copper and black plastic pipe. The Town's preference for service lines is copper and therefore they encourage the use of that material. Since service lines are the responsibility of individual users, further analysis of these is beyond the scope of this study.

In general, the distribution system is well laid out. DEQ 1 requires that "the minimum size of water main for providing fire protection and serving fire hydrants shall be six-inch diameter" and "larger size mains will be required if necessary to allow the withdrawal of the required fire flow while maintaining the minimum residual pressure specified." A majority of the distribution system is 6-inches or larger. Static pressures in the system range between 100 psi in the downtown area and 75 psi in the southwest portion of the system.

System Modeling

In order to evaluate the water pressures and flows, data for the existing system was input into a computer hydraulic modeling program called WaterCAD. The computer model is used to identify specific problem areas and to determine the most effective modifications to improve the system. The WaterCAD program uses standard loop equation techniques to solve for flow through the pipe network and determine resulting pressures at the system nodes (pipe junctions) using the Hazen-Williams equation.

The Hazen-Williams equation uses a coefficient "C", which is based on the roughness of the pipe interior. Standard values can be assumed for different types of materials based on years of pipe service.

Several computer runs were made using different scenarios. Among the scenarios modeled were: the average daily flow; the peak daily flow; and the peak hourly flow. In addition, the maximum flow (fire flow) that can be obtained from a given location while maintaining a minimum residual pressure of 20 psi throughout the distribution system was determined. The results of these specific events will be discussed further in the following section. Copies of the computer runs are included in Appendix L.

DEQ 1 requires that “the system must be designed to maintain a minimum normal working pressure of 35 psi and minimum pressure under all conditions of flow (e.g. fire flows, hydrant testing, and water main flushing) must be 20 psi.”

The computer model scenario of average daily demands shows no obvious problems. The model indicates that normal operating pressures are well above 35 psi. Computer runs with peak daily and peak hourly demands yield the same results.

The system was then modeled for available fire flows throughout the system. These fire flows are modeled concurrently with the future peak daily demand flow. With the exception of a few dead-end mains on the extreme south and east sides of the system, a minimum fire flow of 1,000 gpm is available throughout the system, which is a standard for residential areas. Available fire flows in the commercial area (Main Street) and the school area exceed 3,000 gpm, which meets recommended standards. The water system improvements completed in 1995 greatly improved the pressures and available flows in the distribution system. The only remaining deficiencies are the dead-end mains on the east end of the system.

Gate Valves

An inspection of all gate valves on the system was not within the scope of this analysis.

DEQ 1 recommends, that "valves should be located at not more than 500 foot intervals in commercial districts and at not more than one block or 800 feet intervals in other districts." In general, the valving for the distribution system is well laid out. However, portions of the distribution system do not have sufficient valves to properly isolate sections of water main and facilitate directional flushing of the system in the event of an emergency. Providing adequate valving in these areas would improve operation and management of the water system.

Fire Hydrants

An inspection of all hydrants on the system was not within the scope of this analysis.

DEQ 1 states that "hydrants should be provided at each street intersection and at intermediate points between intersections as recommended by the State Fire Marshal and Insurance Services Office" and "generally, hydrant spacing may range from 350 to 600 feet depending on the area being served." A memo from the Montana State Fire Marshal Bureau dated April 13, 1979, further

states that residential hydrant spacing be a maximum of 500 feet to any structure and commercial and industrial spacing be a maximum of 350 feet to any structure.

The general hydrant layout for the system is good. Although the DEQ 1 requirements are not met in all places, for the most part the distance to structures criteria set forth by the State Fire Marshal is met.

Lost and Unaccounted For Water

Lost and unaccounted for water is defined as the difference between metered source production and metered consumption, or that water that is lost between the well and the meter located at each home or business. “Lost” water includes any water loss due to leaks or unauthorized uses such as illegal service connections. “Unaccounted for water” also results from inaccurate meters, and water leaving the system for unmetered usage such as flushing of mains, fire flows, and unmetered services. Unfortunately, the current meter data is unreliable and cannot be utilized to determine the lost and unaccounted for water.

To estimate water loss in the system, a nighttime tank drawdown test was conducted over two consecutive nights in May of 2024. The protocol of the test was to fill the tank at 2:00 am, turn the well pumps off, and then measure the tank level drawdown between 2:00 am and 5:00 am. During this time period, very little water usage should be occurring, and it can be assumed that most of the change in the water level in the tank is due to leakage from the tank and in the distribution system. Both nights that this test was conducted, the water level in the tank dropped 0.75 feet in 3 hours. Based on the geometry of the tank, this correlates to a volume of 9,950 gallons and a leakage rate over that time period of 55 gpm. Recognizing that some usage occurs during the night, we have assumed that 90% of the drawdown during this time period can be attributed to leakage in the tank and the distribution system. 90% of 55 gpm is 50 gpm. This flow rate over the course of the year adds up to approximately 26 million gallons or 24% of the water produced annually. A loss of up to 15% loss is considered acceptable in most systems and therefore the loss in Ennis should be considered excessive.

A similar test conducted back in 2012 determined that the lost water in the system was 96 gpm. The Town has been proactive over the last ten years in trying to identify the sources of the lost and unaccounted for water. Leak testing of the distribution system has been conducted diligently over that time and a few leaks have been identified. The leaks that were identified have been fixed. In addition, some leaks in the tank were repaired in 2023. These efforts have reduced the

lost water in the system by over 50%. The storage tank has documented leakage that is contributing to the current total, but there is likely still some leakage occurring in the distribution system. It is recommended that the Town continue to be diligent in identifying all sources of unaccounted for water.

3.4 Operational and Management Practices and Capabilities

The Mayor of Ennis oversees the day-to-day operations of the town. The Town Commission deals with policies, procedures, budgeting, and assessments.

The water and sanitary sewer systems are operated and maintained by certified operators. This operation crew is also responsible for maintenance of the streets, parks, and other town infrastructure. The Utility Clerk manages the billing system, and her salary is included in the water and sewer annual O&M budgets.

The most recent DEQ Sanitary Survey, completed in 2022, states the Public Works Director “is doing a great job maintaining, managing, and operating the PWS system.” The Town of Ennis currently has two licensed operators who work on operating and maintaining the water and wastewater facilities. Public works staff have done an excellent job of maintaining and operating the existing water system. All components of the system are on a regular maintenance schedule and the Town keeps good records of system operation and maintenance efforts.

Regular operation and maintenance activities for the water system include testing of the water, routine flushing of fire hydrants, exercising valves, meter replacements, and periodic cleaning of the water storage tank. The most recent sanitary survey can be found in Appendix F. The sanitary survey indicates that no major deficiencies were identified within the system according to DEQ.

3.5 Financial Status of any Existing Facilities

To determine the financial status of the water system, the Annual Financial Reports (AFRs) for the last three fiscal years for Ennis were retrieved. Copies of these financial reports are included in Appendix N. Currently, the Town does not have any long-term obligations for either the water or sewer system. Since there are no loan repayments for the public works facilities, the Town does not have any reserve obligations. A summary of the revenues and expenditures of the water system is presented below in Table 3-5.

Table 3-5 - Revenues and Expenditures for Water in Ennis, MT from 2021-2023

Revenues and Expenditures (FY 2021-2023)				
Item	FY 2021	FY 2022	FY 2023	Average
Revenues				
Charges for Services	$302,927	$281,570	$332,639	$305,712
Intergovernmental Revenue	$3,664	$5,310	$2,188	$3,721
Interest Revenue	$2,363	$2,736	$40,286	$15,128
TOTAL REVENUES	$308,954	$289,796	$375,113	$324,621
Expenditures				
Personal services	$74,939	$113,895	$58,976	$82,603
Supplies	$11,269	$26,076	$89,664	$42,336
Purchased services	$68,985	$78,850	$171,940	$106,592
Fixed charges	$5,536	$6,184	$10,281	$7,334
Depreciation and amortization	$33,156	$31,279	$31,978	$32,138
TOTAL EXPENDITURES	$193,885	$256,284	$362,818	$270,996
OPERATING INCOME	$115,069	$33,512	$12,295	$53,625

The average overall revenues for the past three fiscal years were $324,621, and the expenditures averaged $270,996. The average net financial position was $53,625.

The Town of Ennis currently charges a base rate of $18.43/user/month plus a usage charge of $1.92 per 1,000 gallons. The rate structure is based on water meter size or equivalent dwelling units (EDUs). The premise behind this method is the smallest meter size is used as the base level of service with an established base rate, and equivalent ratios are applied to the larger meters to calculate resulting water rates by multiplying the equivalent ratio by the base rate.

3.6 Water/Energy/Waste Audits

No water, energy, or waste audits have been conducted for the Ennis water system.

4.0 NEED FOR PROJECT

4.1 Health, Sanitation and Security

Health and safety of the public is the most important concern for a community water system. Providing clean, safe, and plentiful water to users is the ultimate goal of all public water systems. The Town has excellent source water quality, but insufficient supply capacity poses a threat to the system. The Town relies on two wells for its water supply. If the largest producing well is out of service, the remaining well is barely able to meet average day demands and would be deficient in meeting maximum day demands. The immediate impact of losing a well is a reduction in the available water supply for the town. This scarcity can lead to stringent water restrictions, or in the most severe case, complete lack of access to water for drinking, bathing, and sanitation purposes. Without access to an adequate water supply, a community can experience sanitation issues and residents may experience dehydration, which when prolonged can lead to heat-related illnesses. Water is essential for various services, including firefighting, healthcare facilities, and food establishments. A loss of water supply or significant reduction in supply can hinder the ability of emergency responders to extinguish fires and provide medical care, as well as affect the hygiene standards in restaurants and food processing facilities. It is critical that the Town take steps now to protect its current water supply and make necessary improvements to be able to continue providing safe, clean, and reliable water to the community.

Outside of the water supply, storage continues to be a weak point in the system's capability to provide adequate volumes of water to users in times of emergency. Montana Department of Environmental Quality's (DEQ) *Circular 1* outlines the waterworks standards to be used for public water systems in Montana. In Chapter 3 of this document, the minimum design storage capacity is defined as "the average day demand plus fire flow demand … where fire protection is provided". As previously determined, the Town does not have adequate storage to comply with this design standard. Currently, the Town's deficit is 130,000 gallons of storage.

Wildfires pose a significant threat to the Town of Ennis. According to the National Integrated Drought Information System (NIDIS) at the time of this report, Madison County is experiencing drought conditions. The most recent drought map indicates that the portion of Madison County, where Ennis is located, is in moderate drought.

Having adequate storage for fire flow is important to ensure the safety of members of the community. Without sufficient storage, the Town's ability to provide fire suppression is reduced which risks the public's safety. Firefighters rely on the system to supply enough water to extinguish fires that occur within the Town. If required fire flows are not achieved, lives of both community members and firefighters are put at risk.

Times of peak demand and emergencies could lead to low levels of water in the existing storage tank. With the known deficit, there is a potential that the entire storage tank could be drained. If that occurs, pressure in the distribution system would decrease and sections of partially full piping would allow for debris and pathogens to enter the system. Having adequate storage ensures that pressure is maintained in the system which prevents siphoning contaminants into the distribution system.

The Town's two wells pump water into the distribution system and the storage tank. The storage tank allows for the system to maintain pressure without constantly cycling the pumps. Generally, a pump's useful life can be extended by avoiding short run cycles. An undersized storage tank such as the one in Ennis can lead to short cycles. An expansion of the storage facilities can lead directly to an improved lifespan of the Town's pumps.

Regulatory Requirements

The health and safety of the public is the paramount concern for operating and maintaining a community water system. The United States enacted the Safe Drinking Water Act (SDWA) that set standards for public water systems (PWSs) to provide all persons in the U.S. with safe and reliable drinking water. The Act was amended once in 1986 and again in 1996.

The regulatory responsibilities of the State of Montana are to meet the requirements established by the EPA and to ensure that state design criteria are met in public water systems. Public water systems in Montana are legally defined as entities that provide water to 25 or more people for more than 60 days a year or have 15 or more service connections. Since the State has passed equally stringent as the SDWA, Montana has satisfied the primacy requirements set by the federal government. The EPA has granted the Montana Department of Environmental Quality (MDEQ) the ability to enforce the SDWA within Montana. Some rules set by the SDWA that are applicable to the Town's water system are described below.

National Primary Drinking Water Regulations

The National Primary Drinking Water Regulations are enforceable standards that set limits of potentially harmful constituents that may exist in a public water supply. The regulations set maximum contaminant levels (MCL) and maximum contaminant level goals (MCLG). The MCL values are the maximum concentration of contaminant that can be present in a public water system before the system is in violation of the standards. The MCLG is the goal concentration of water in a public supply, but exceedance of the MCLG does not necessarily constitute a violation of the regulation. The MDEQ has been given primacy for enforcing the maximum contaminant levels. A list of contaminants and their MCLs can be found on the EPA's web page (http://www.epa.gov).

The Town's public water system currently complies with the primary drinking water regulations.

National Secondary Drinking Water Regulations

The National Secondary Drinking Water Regulations are non-enforceable standards that regulate limits on contaminants that affect the palatability and appearance of water. The secondary standards are only recommendations by the EPA; however, individual states may choose to adopt these standards as enforceable. Several contaminants listed on the Secondary Drinking Water Regulations also appear on the primary standards. If the concentrations of these constituents are elevated, the MCLs of the primary regulations may apply. A list of the contaminants and their limits for the secondary standards are available at (http://www.epa.gov).

The Town's public water system currently complies with the secondary drinking water regulations.

Montana Department of Environmental Quality Circular DEQ 1

The State has established design and construction criteria for public water works that must be met for new facilities. The requirements are described in MDEQ's Circular DEQ 1. The State reviews and approves the design before construction on new water facilities can begin. The design of alternatives and recommended improvements in this PER will comply with MDEQ's Circular 1.

Stage 1 Disinfectants and Disinfection By-Products Rule:

The Stage 1 Disinfectants and Disinfection By-Products Rule (Stage 1 DBPR) took effect in 1998. The purpose of the Stage 1 DBPR was to reduce the public's exposure from disinfection byproducts via public water supplies. Disinfection by-products (DBPs) have been shown to cause cancer and effects on reproduction in lab animals. Research of DBPs also suggest bladder cancer and reproductive effects in humans.

The rule established seven new contaminant standards and a treatment technique of enhanced coagulation or softening to further reduce DBP exposure. It should be noted that for systems with populations of less than 10,000 persons, such as the Town of Ennis, the regulations went into effect on January 1, 2004. The Town does not currently add a disinfectant and thus does not fall under this rule. Should the Town reach a point where they are required to disinfect, a summary of the regulated contaminants that would be applicable is shown below in Table 4-1.

Table 4-1 - Stage 1 DBPR - Regulated Contaminants/Disinfectants

Stage 1 DBPR – Regulated Contaminants/Disinfectants		
Regulated Contaminants	MCL (mg/L)	MCLG (mg/L)
Total Trihalomethanes (TTHM)	0.080	
Chloroform		-
Bromodichloromethane		0
Dibromochloromethane		0.06
Bromoform		0
Five Haloacetic Acids (HAA5)	0.0060	
Monochloroacetic acid		-
Dichloroacetic acid		0
Trichloroacetic acid		0.3
Bromoacetic acid		-
Dibromoacetic acid		-
Bromate	0.010	0
Chlorite	1.0	0.8
Regulated Disinfectants	MRDL (mg/L)	MRDLG (mg/L)
Chlorine	4.0 as Cl_2	4
Chloramines	4.0 as Cl_2	4
Chlorine dioxide	0.8	0.8

Stage 2 Disinfectants and Disinfection By-Products Rule:

The Stage 2 Disinfectants and Disinfection By-Products Rule (Stage 2 DBPR) became effective in 2006. The purpose of Stage 2 DBPR is to further reduce the risk that DBRs have on public health in a public water system. Stage 2 builds on Stage 1 DBPR by focusing on monitoring for and reducing the concentrations of two classes of DBPs – Total Trichloromethanes (TTHM) and Five Haloacetic Acids (HAA5). The Stage 2 DBPR applies to all community water systems that either apply or deliver water that has been treated with primary or residual disinfectant other than ultraviolet light. The Town does not currently disinfect the water supply, and thus does not fall under this rule.

Arsenic Rule:

The Arsenic and Clarifications to Compliance and New source Monitoring Rule went into effect at the beginning of 2001. The purpose of the new rule was to improve public health by reducing the exposure to arsenic in drinking water. Scientific studies have linked arsenic exposure to bladder and lung cancer, skin damage, and circulatory system issues. The Arsenic Rule changed the MCL from 50 µg/L to 10 µg/L. The new regulation also established new requirements for monitoring new systems and drinking water sources and clarified procedures for determining compliance with MCL for IOCs, SOCs, and VOCs.

By implementing the Arsenic Rule, the EPA expects to avoid 16-26 non-fatal bladder and lung cancers per year, to avoid 21 to 30 fatal bladder and lung cancers per year, and to reduce the frequency of non-carcinogenic diseases. The new MCL for arsenic became effective at the beginning of 2006.

The Town's water system is compliant with the Arsenic Rule. There have been no known issues with arsenic in the community's drinking water, so sampling is only required every three years.

Lead and Copper Rule:

The Lead and Copper Rule went into effect in 1991 with the purpose of reducing the public's exposure to lead and copper. Since the source of most lead and copper in public water systems is the corrosion in plumbing materials, the regulation focuses primarily on reducing corrosivity. Examples of potential lead and copper sources are plumbing fixtures and pipe fittings.

The Lead and Copper Rule established action levels for lead and copper based on the 90th percentile level of tap water samples. The action level for lead is 0.015 mg/L and 1.3 mg/L for copper. An exceedance of the of the action level is not a violation; however, the exceedance triggers additional requirements that include water quality parameter monitoring, corrosion control treatment, source water monitoring/treatment, public education, and lead service line replacement.

Ennis has not exceeded the action level for lead and copper. As a result, no additional action has required by the Town. The standard monitoring requirements for groundwater systems is one sample within a three-year compliance period. The monitoring can be extended to every nine years if three consecutive compliance periods do not exceed the maximum permissible limit.

Radionuclides Rule:

The Radionuclides Rule went into effect at the end of 2000 and applies to community water systems regardless of size. The goal of the rule is to reduce the public's exposure to radionuclides in drinking water as to reduce the risk of cancer. The EP expects the exposure reduction to radionuclides will improve public health by reducing uranium exposure for 620,000 persons, protecting against toxic kidney effects of uranium, and reducing cancer risk.

The rule retains the exiting MCLs for combined radium-226 and radium-228 (5 pCi/L), gross alpha particle radioactivity (15 pCi/L), and beta particle and photon activity (4 mrem/yr). The rule set the uranium MCL for the first time at 30 µg/L.

The Town is in compliance with the Radionuclides Rule. If all measurements during initial monitoring were below the detection limit, monitoring is only required every nine years.

Revised Total Coliform Rule:

Published in 2013, the Revised Total Coliform Rule (RTCR) the RTCR is the revision of the 1989 Total Coliform Rule (TCR). The purpose of the RTCR is to increase public health protection by reducing potential pathways of entry for fecal contamination into distribution systems. The RTCR accomplishes its goal by establishing a MCL for Escherichia coli and uses E. coli and total coliforms (TC) to initiate a "find and fix" approach to address fecal contamination that could enter the distribution system. The rule requires all PWSs to perform assessments to identify sanitary defects and undertake subsequent action to correct deficiencies. The EPA expects that the implementation of the RTCR will decrease the pathways by which fecal contamination can enter

a drinking water system and a reduction in fecal contamination. With less fecal contamination, the potential risks from all waterborne pathogens such as pathogenic bacteria, viruses, parasitic protozoa, and their associated illnesses.

Since the Town's water system is fed by groundwater and serves less than 1,000 persons, routine samples are required to taken monthly. If a routine sample has positive result for total coliforms, the sample must be tested for the presence of E. coli. Additionally, a repeat sample from three locations are required to be taken within 24 hours from the TC positive site and within 5 services upstream and downstream of the TC positive site. If any of the repeat samples are positive for TC, the positive samples must be tested for E. coli, and any positive results must be reported to the State. Unless an assessment was triggered and the PWS has notified the state, repeat samples must be collected on any TC positive repeat samples.

The results of routine and repeat samples are used to determine whether or not the Town is in compliance with RTCR. A monthly MCL violation is triggered if one routine or repeat sample tests positive for TC. An acute MCL violation is triggered if the system has an E. coli positive repeat sample or an E. coli positive sample followed by a positive TC repeat sample.

The Town has been compliant with the Revised Total Coliform Rule.

4.2 Aging Infrastructure

The existing steel bolted tank was installed and put into operation in 1995. It is expected that around the 15-to-20-year mark, a tank of this construction would typically require interior and exterior recoating. Minor rusting had been noted during recent inspections at several locations on both the interior and exterior of the tank. In 2023, a leak was discovered in the tank wall. The Town subsequently retained a diving company to isolate and repair the issue. Additional leaks have developed in the tank since that time. Interior and exterior tank maintenance is suggested in the near term as rusting is expected to further spread across the surfaces of the tank.

The typical useful design life of this type of tank is approximately 30 to 40 years. The industry is discovering that gasketed tanks such as the Town's current bolted steel reservoir tend to experience joint issues as they advance in age. The Town should expect to see increased maintenance on the tank in the second half of its life, raising the question of how much longer it will be economically feasible to maintain this tank.

4.3 Reasonable Growth

A reasonable growth capacity necessary to meet Ennis' water system needs during the 20-year planning has been addressed in the planning process for this PER. A 1.0% per year population increase is used to predict year 2042 population, average day demands (ADD), and maximum day demands (MDD). This would result in a population of 1,100.

Project planning is not dependent on population growth or support by new customers, but a reasonable growth rate is used for planning and design purposes.

5.0 ALTERNATIVES CONSIDERED

5.1 Alternative Screening

Various alternatives exist to address the deficiencies that have been identified in the Town's water system. However, there are often alternatives that are not viable because of technical feasibility or capital and operation and maintenance costs. In the case of Ennis' water system improvements, alternatives for water supply improvements, rehabilitation or replacement of its water storage tank, and distribution system improvements have been considered. This section serves to present the alternatives considered that have been determined to be non-viable solutions to the problems at hand.

No Action (Supply)

The Town relies on two wells for its water supply. With the largest capacity well out of service, the second well cannot meet maximum day demands and is marginally sufficient for even average day demands. Without the development of additional redundant water supply, the Town could find itself in a dire situation. The No Action alternative is not a viable option.

No Action (Storage Tank)

The no action alternative consists of leaving the existing water storage tank in its current condition. This alternative does not include any rehabilitation to the tank or other improvements. In addition, the existing tank has inadequate capacity for simultaneous fire flows and daily demand. As such, the no action alternative is not an option for the Town.

5.2 Supply Alternatives

5.2.1 Alt. S-1: New Redundant Water Supply at Rodeo Grounds

In August 2011 and June 2012, the Town completed two exploratory test wells at a 2-acre parcel the Town purchased from the Ennis Rodeo Grounds. The deeper well is a nominal 12-inch diameter well, screened and completed to depth of 220 feet below ground surface (bgs). The shallower well is a nominal 6-inch diameter well with a 4-inch screen completed to a depth of 78 feet bgs. Initial testing of the wells in 2012 did not result in well capacities the Town was hoping for, and the Town elected to not pursue further work on the test wells at that time.

Due to continued water supply concerns, in 2021 the Town moved forward with a Water Supply Hydrogeologic and Exploration Recommendations Report. When locating a redundant groundwater supply source for the Town, several factors need to be considered including, hydrogeology, source protection, proximity to the Town's existing water infrastructure, planned and expected growth and the price and availability of real estate. After the analysis was completed, the recommendation was to complete additional development and testing of the wells at the Rodeo Grounds. The additional development and testing was completed in the summer of 2022. Copies of the preliminary hydrogeologic evaluations can be found in Appendix K.

The deep well at the site can produce 150 gpm, which would allow the Town to use 100 gpm, as DEQ standards only allow for 2/3 usage of total well capacity based on a 24-hour aquifer test. Alternately, a 72-hour aquifer test can be completed to document that a higher sustained flow rate can be utilized. This well should be able to be completed as a Redundant Well by DNRC definition and process.

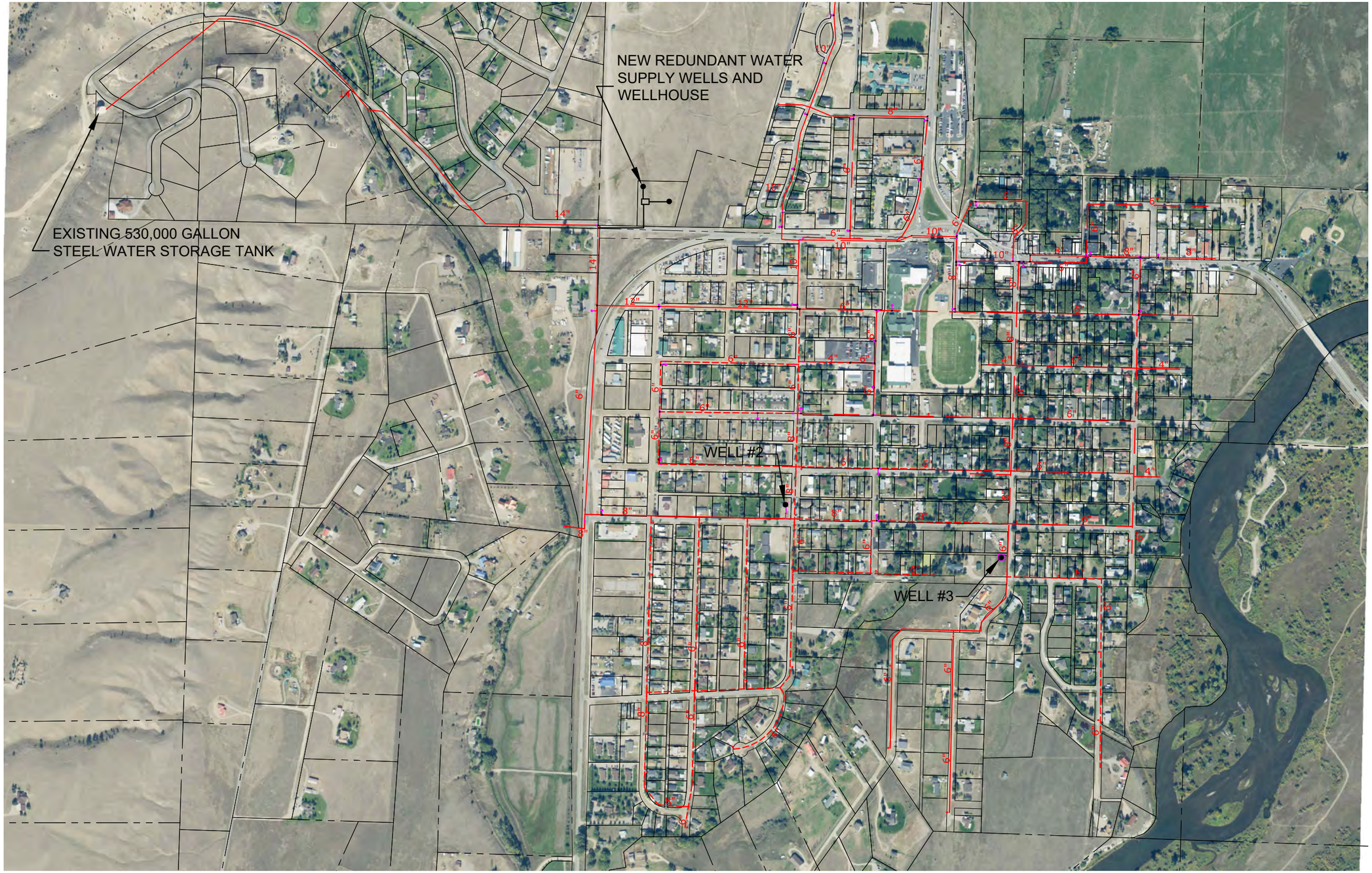
Modeling suggests that drilling another deep well roughly 100' away from the existing deep well could potentially yield 105 gpm, with a net usable capacity of 75 gpm. A second well at the site could also likely be completed as a Redundant Well by DNRC definition and process.

Design Criteria

All water system improvements will comply with those requirements set forth in Circular DEQ 1. All design criteria presented in Circular DEQ 1 is applicable to each alternative considered, but specifically the new supply well will meet the requirements stated in Chapter 3 – Source Development, Chapter 4 – Treatment, and Chapter 8 – Transmission Mains, Distribution Systems, Piping and Appurtenances. For ground water supply source, DEQ requires that the total developed capacity for systems utilizing gravity storage or pumped storage equal or exceed the design maximum day demand with the largest producing source out of service. The design maximum day demand is 751,300 GPD or 522 GPM. All proposed improvements will receive MDEQ approval prior to commencement of construction activity.

Map

Figure 5-1 shows the schematic layout of the S-1 Alternative.



LEGEND

- PVC
- CAST IRON
- ASBESTOS CEMENT

Figure 5-1
Alt S-1 New Water Supply at Rodeo Grounds

TOWN OF ENNIS
WATER SYSTEM PRELIMINARY ENGINEERING REPORT

GreatWest ENGINEERING

Y:\Shared\Helena Projects\1-18184-Ennis On Call 2018\TO 7 - Water PER\CADD 1-18184-TO7\Exhibits\1-18184-TO7-Figure 5-1 New Water Supply at Rodeo Grounds.dwg

Environmental Impacts

There are no significant environmental impacts to floodplains, wetlands, endangered species, historical and archaeological properties, or other important land resources as a result of implementation of this alternative. The proposed well site will be in the vicinity of an existing well in a semi-developed grassland area and the proposed transmission main will likely follow an existing road alignment. Areas of disturbance will be minimal and will be restored to original conditions to the greatest extent possible upon completion of construction. The generation of residuals and waste is expected to be minimal and containment and disposal would be the responsibility of the contractor.

Land Requirements

This alternative will construct a new supply source at a new location as well as a new transmission main. The Town owns a parcel of ground at the proposed site, but this work may require additional land acquisition and easements that would be negotiated during preliminary design of the project.

Potential Construction Problems

It is anticipated that the new wells will be drilled in the same aquifer as the Town's existing supply well #2. This existing well is completed in Tertiary basin-fill deposits. The wells' source aquifer is semi-confined. The water quality is generally good.

Sustainability Considerations

Construction of a new water supply well is considered a sustainable utility management practice that would aid in creating a resilient utility for the Town and provides social, economic, and environmental benefits for local residents. Additionally, the new water supply will provide an adequate capacity of water to handle long-term growth in the Town.

Water and Energy Efficiency

Energy costs would increase with the addition of new wells, due to the need to pump the water supply. The supply will add to the Town's available water sources.

Green Infrastructure

Stormwater management during the project will include temporary erosion and sediment control measures including the installation and maintenance of temporary structural control measures to reduce or eliminate the erosion of soils and transport of sediment offsite as a result of construction activities.

Cost Estimates

Tables 5-1 and 5-2, present estimated project costs and estimated annual operation and maintenance costs, respectively. Given the current uncertain construction, materials, and supply chain market conditions that are anticipated to continue into the foreseeable future, the cost estimate includes a 20% contingency in addition to inflation.

Table 5-1 - Alternative S-1 Opinion of Probable Cost

Opinion of Probable Cost New Water Supply Wells At Rodeo Grounds					
#	Bid Item	Qty	Units	Unit Price [1]	Total
1	Drill New 12" Well	220	LF	$ 185.00	$ 40,700
2	Temporary Surface Casing	1	LS	$ 20,000.00	$ 20,000
3	12" Steel Well Casing	200	LF	$ 145.00	$ 29,000
4	Well Screen	20	LF	$ 350.00	$ 7,000
5	Well Development / Well Pump Test	60	HR	$ 650.00	$ 39,000
6	Well Completion	2	EA	$ 30,000.00	$ 60,000
7	New Wellhouse Building	1	LS	$ 100,000.00	$ 100,000
8	New Wellhouse Piping and Fittings	1	LS	$ 40,000.00	$ 40,000
9	Electrical	1	EA	$ 50,000.00	$ 50,000
10	6" Gate Valve	4	EA	$ 2,800.00	$ 11,200
11	6" PVC Transmission Main	1,100	LF	$ 85.00	$ 93,500
12	Fittings	6	EA	$ 2,000.00	$ 12,000
13	Telemetry System	1	LS	$ 25,000.00	$ 25,000
Direct Construction Subtotal					$ 527,000
Mobilization				10%	$ 53,000
Traffic Control				0.5%	$ 3,000
Construction Subtotal					$ 583,000
Construction Cost Inflated to [2]			2025	3.0%	$ 619,000
Contingency				20%	$ 124,000
Land Acquisition					$ 10,000
Geotechnical Investigation					$ 15,000
Engineering Design				6%	$ 52,000
Engineering Construction				9%	$ 74,000
Grant Admin, Legal, & Administrative				5%	$ 31,000
TOTAL					$ 925,000

[1] Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.

[2] The ENR average Construction Cost Index is +2.32% (as of September 2023), so capital costs are projected to the anticipated construction date using a 3% inflation rate.

Table 5-2 - Alternative S-1 Opinion of Probable O&M Costs

Opinion of Probable Annual Operation & Maintenance Costs New Water Supply Wells at Rodeo Grounds					
#	Item	Qty	Units	Unit Price	Total
1	Labor	60	HR	$ 30.00	$ 1,800.00
2	Spare Parts/Repair/Maintenance	1	LS	$ 1,000.00	$ 1,000.00
3	Administration/Office Supplies	1	LS	$ 500.00	$ 500.00
4	Laboratory Testing Fees	1	LS	$ 500.00	$ 500.00
5	Power	14,200	KWH	$ 0.12	$ 1,704.00
6	Office Expenses/Training	1	LS	$ 200.00	$ 200.00
7	Reserve	1	LS	$ 500.00	$ 500.00
	TOTAL				$ 6,200.00

5.2.2 Alt. S-2: New Backup Generator

This alternative consists of installing a backup generator at Well #2 which will allow the well to be utilized even during power outages and ensure minimal user demands can be met.

Design Criteria

All water system improvements will comply with those requirements set forth in Circular DEQ 1. All proposed improvements will receive MDEQ approval prior to commencement of any construction activity.

Map

Figure 3-1 provides a layout of Ennis' existing water facilities and shows the location of the existing wellhouse where the improvements would occur.

Environmental Impacts

No significant environmental impacts are expected as a result of this alternative.

Land Requirements

The improvements would be constructed at the site of the Town's existing Well #2 site. No additional land acquisition or easements would be required.

Potential Construction Problems

There are no known construction problems or other conditions which may affect the cost of construction for this alternative.

Sustainability Considerations

Adding a backup power source is considered a sustainable utility management practice that would aid in creating a resilient utility for the Town of Ennis.

Water and Energy Efficiency
Not applicable under this alternative.

Green Infrastructure
Not applicable under this alternative.

Cost Estimates

Table 5-3 presents an estimated opinion of probable cost for the recommended water supply improvements. There would be no additional costs related to operation and maintenance of the improvements. Given the current uncertain construction, materials, and supply chain market conditions that are anticipated to continue into the foreseeable future, the cost estimate includes a 20% contingency in addition to inflation.

Table 5-3 - Opinion of Probable Cost Alternative S-2: New Backup Generator

Opinion of Probable Cost Backup Generator At Well #2					
#	Bid Item	Qty	Units	Unit Price [1]	Total
1	New Backup Generator	1	LS	$ 60,000.00	$ 60,000
2	Electrical	1	LS	$ 10,000.00	$ 10,000
Direct Construction Subtotal					$ 70,000
Mobilization				10%	$ 7,000
Traffic Control					$ -
Construction Subtotal					$ 77,000
Construction Cost Inflated to [2]			2025	3.0%	$ 82,000
Contingency				20%	$ 16,000
Engineering					$ 12,000
Grant Admin, Legal, & Administrative				5%	$ 6,000
TOTAL					$ 116,000

[1] Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.
[2] The ENR average Construction Cost Index is +2.32% (as of September 2023), so capital costs are projected to the anticipated construction date using a 3% inflation rate.

5.2.3 Alt. S-3: Security Fencing at Well #3 Site

This alternative includes installing security fencing around the current Well #3 site. The fencing would be 6-foot high chain link fence with three strands of barbed-wire atop the fencing. The fencing will help to deter unauthorized access of the well site.

Design Criteria

All water system improvements will comply with those requirements set forth in Circular DEQ 1.

Map

Figure 3-1 shows the location of the existing Well #3 site.

Environmental Impacts

There are no significant environmental problems associated with this alternative. The tank is existing and minimal disturbance to the surrounding area is anticipated.

Land Requirements

No additional land will be required.

Potential Construction Problems

There are no known construction problems or other conditions which may affect the cost of construction for this alternative.

Sustainability Considerations

Improvements to a water system infrastructure is a sustainable utility management practice that aids in creating a resilient utility and provides social, economic, and environmental benefits.

Water and Energy Efficiency
Not applicable under this alternative.

Green Infrastructure
Not applicable under this alternative.

Cost Estimates

Table 5-4 presents an estimated opinion of probable cost for Alternative S-3. There are no additional costs related to operation and maintenance of the improvements. Given the current uncertain construction, materials, and supply chain market conditions that are anticipated to continue into the foreseeable future, the cost estimate includes a 20% contingency in addition to inflation.

Table 5-4 - Opinion of Probable Cost-Alternative S-3: Security Fencing at Well #3 Site

Opinion of Probable Cost Security Fencing at Well #3							
#	Bid Item	Qty	Units	Unit Price [1]		Total	
1	New Chain-Link Fence at Well #3 Site	80	LF	$	60.00	$	4,800
Direct Construction Subtotal						$	5,000
Mobilization				10%		$	1,000
Traffic Control						$	-
Construction Subtotal						$	6,000
Construction Cost Inflated to [2]		2025		3.0%		$	6,000
Contingency				20%		$	1,000
Engineering						$	4,000
Grant Admin, Legal, & Administrative							
TOTAL						$	11,000

[1] Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.

[2] The ENR average Construction Cost Index is +2.32% (as of September 2023), so capital costs are projected to the anticipated construction date using a 3% inflation rate.

5.3 Meter Alternatives

5.3.1 Alt. M-1: Install New Radio Read Water Meters

The existing service meters in the water system are over 25-years old and have exceeded their service life. This alternative consists of replacing all of the existing service line water meters over a five-year timespan with new radio-read meters. Radio-read meters send a signal remotely to a data collector. During periodic meter reading an electronic data collector communicates with the meters which transmit meter data to the data collector. Radio-read meters are the most efficient method of collecting meter readings.

Design Criteria

All water system improvements will comply with those requirements set forth in Circular DEQ 1.

Environmental Impacts

No significant environmental impacts are expected as a result of this alternative.

Land Requirements

No additional land would be required for this alternative. Each individual user would have to grant access to the Town during construction and meter reading as part of the terms of continued water service.

Potential Construction Problems

There are no known construction problems or other conditions which may affect the cost of construction for this alternative.

Sustainability Considerations

Water and Energy Efficiency

This alternative does not have any measurable energy requirements associated with it. Ensuring properly working water meters will encourage water conservation.

Green Infrastructure

Not applicable under this alternative.

Cost Estimates

Table 5-5 presents an estimated opinion of probable cost for Alternative M-1. There would be no additional costs related to operation and maintenance of the improvements.

Table 5-5 - Opinion of Probable Cost-Alternative M-2: Installation of Radio Read Water Meters

Opinion of Probable Cost Replace 20% of Service Meters Per Year					
#	Bid Item	Qty	Units	Unit Price [1]	Total
1	Inside Meter Installation	95	EA	$ 500.00	$ 47,500
2	Meter Pit Installation	5	EA	$ 2,200.00	$ 11,000
3	Radio Read System and Software	1	LS	$ 50,000.00	$ 50,000
Direct Construction Subtotal					$ 109,000
Mobilization				10%	$ 11,000
Traffic Control					$ -
Construction Subtotal					$ 120,000
Construction Cost Inflated to [2]		2025		3.0%	$ 127,000
Contingency				20%	$ 25,000
Engineering					$ 15,000
Grant Admin, Legal, & Administrative				7%	$ 10,000
TOTAL					$ 177,000

[1] Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.

[2] The ENR average Construction Cost Index is +2.32% (as of September 2023), so capital costs are projected to the anticipated construction date using a 3% inflation rate.

5.4 Treatment Alternatives

5.4.1 Alt. T-1: Add Chlorination at Each Well House

This alternative consists of adding disinfection capabilities at both of the well houses. Although chlorination of the existing water supplies is not currently required, the installation of liquid chlorination equipment will provide a means for the Town to disinfect the water system should the need arise in event of an emergency, such as the one encountered in 2014. Disinfection of groundwater supplies may eventually be required, so this would also put the Town in a position to meet those new regulations.

Design Criteria

All water system improvements will comply with those requirements set forth in Circular DEQ 1. All proposed improvements will receive MDEQ approval prior to commencement of any construction activity.

Map

Figure 3-1 provides a layout of Ennis' existing water facilities and shows the location of the existing well house where the improvements would occur.

Environmental Impacts

No significant environmental impacts are expected as a result of this alternative.

Land Requirements

The improvements would be constructed at the site of the Town's existing supply facilities. No additional land acquisition or easements would be required.

Potential Construction Problems

There are no known construction problems or other conditions which may affect the cost of construction for this alternative.

Sustainability Considerations

Installing new disinfection capabilities is considered a sustainable utility management practice that would aid in creating a resilient utility for the Town of Ennis.

Water and Energy Efficiency
Not applicable under this alternative.

Green Infrastructure
Not applicable under this alternative.

Cost Estimates

Table 5-6 presents an estimated opinion of probable cost for the recommended water supply improvements. As the disinfection equipment would only be utilized in the case of an emergency, there would be no additional costs related to annual operation and maintenance of the improvements. Should the Town be required to provide full-time disinfection in the future, the annual operation and maintenance costs would need to be evaluated at that time. Given the current uncertain construction, materials, and supply chain market conditions that are anticipated

to continue into the foreseeable future, the cost estimate includes a 20% contingency in addition to inflation.

Table 5-6 - Opinion of Probable Cost Alternative S-1: Add Chlorination at Each Well House

Opinion of Probable Cost Add Chlorination at Each Well					
#	Bid Item	Qty	Units	Unit Price [1]	Total
1	Chemical Feed System	2	EA	$ 18,000.00	$ 36,000
2	Chemical and Containment Tanks	2	EA	$ 3,000.00	$ 6,000
3	Misc. Piping, Valves and Equipment	2	EA	$ 6,000.00	$ 12,000
4	Startup and Training	1	LS	$ 1,500.00	$ 1,500
Direct Construction Subtotal					$ 56,000
Mobilization				10%	$ 6,000
Traffic Control					$ -
Construction Subtotal					$ 62,000
Construction Cost Inflated to [2]			2025	3.0%	$ 66,000
Contingency				20%	$ 13,000
Engineering					$ 12,000
Grant Admin, Legal, & Administrative					$ 4,000
TOTAL					$ 95,000

[1] Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.

[2] The ENR average Construction Cost Index is +2.32% (as of September 2023), so capital costs are projected to the anticipated construction date using a 3% inflation rate.

5.5 Storage Alternatives

5.5.1 Alt. R-1: New 150,000 Gallon Glass Lined Steel Bolted Tank and Recoating and Rehabilitation of Existing Tank

This alternative would include both the construction of a new tank to supplement the existing storage capacity and the rehabilitation of the existing tank. A new 150,000 gallon reservoir would be constructed on the same site that the existing tank is built. The proposed new tank would be a glass-lined steel bolted tank that is 40 feet high to match the overflow of the existing tank. The new tank would be approximately 25 feet in diameter. A tank mixer would be included in the project to reduce stagnation and prevent ice formation.

Design Criteria

All water system improvements will comply with those requirements set forth in Circular DEQ 1. All design criteria presented in Circular DEQ 1 is applicable to each alternative considered, but specifically the storage tank alternatives will meet the requirements in Chapter 7 – Finished Water Storage. All proposed improvements will receive MDEQ approval prior to commencement of any construction activity. Other relevant design standards include AWWA D103-19 Factory-Coated Bolted Carbon Steel Tanks for Water Storage.

Map

A map of the proposed location of the new glass-lined bolted steel tank is provided in Figure 5-2.

Environmental Impacts

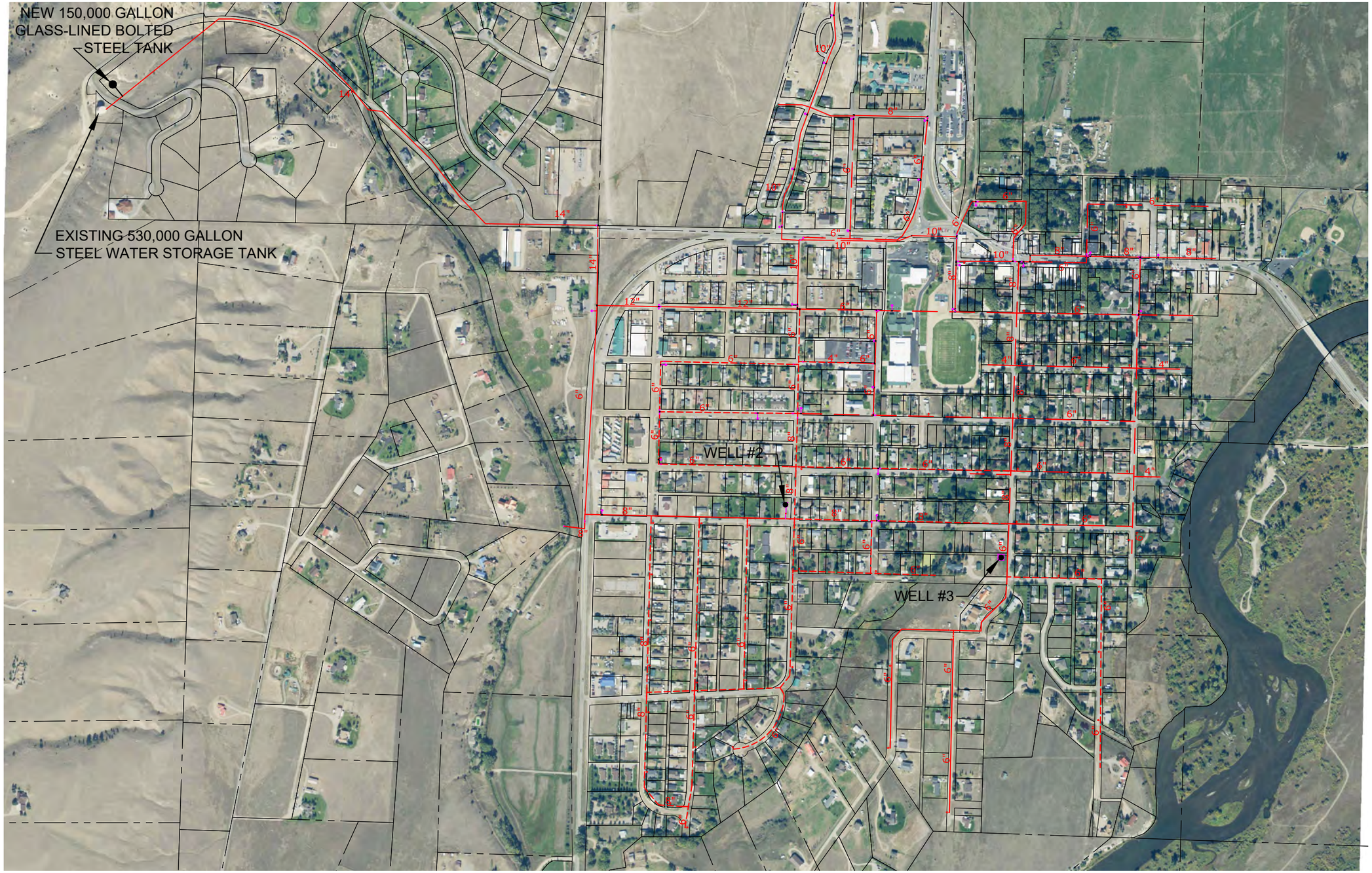
The construction of the new tank is not anticipated to impact any known floodplains, wetlands, or historically significant sites. Dust mitigation may be required during abrasive blasting of the existing tank. Construction may temporarily disturb the area; however, any temporary disturbances would be remediated by the selected Contractor before the completion of the project.

Land Requirements

Construction of a new tank will require land acquisition and easements. Preliminary discussions with Town staff indicate confidence in being able to secure land near the existing tank.

Potential Construction Problems

Few construction problems are anticipated because of the location of the site for the new storage tank. The construction site is away from any major thoroughfare and about a mile from Town. Additionally, groundwater is not anticipated close to the ground surface in the immediate area.



0 300 600
SCALE IN FEET

LEGEND
PVC
CAST IRON
ASBESTOS CEMENT

Figure 5-2
Alt R-1 New 150,000 Gallon Glass-Lined Bolted Steel Tank

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WATER SYSTEM PRELIMINARY ENGINEERING REPORT

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Y:\Shared\Helena Projects\1-18184-Ennis On Call 2018\TO 7 - Water PER\CADD 1-18184-TO7\Exhibits\1-18184-TO7-Figure 5-2 New 150,000 Gallon Glass-Lined Bolted Steel Tank.dwg

Sustainability Considerations

The primary purpose of expanding the Town's finished water storage is to maintain supply and pressure in the distribution system during times of emergency and typical demand. The proposed tank would allow the utility to provide improved service to users during periods of high water use.

Improvements to a water system infrastructure is a sustainable utility management practice that aids in creating a resilient utility and provides social, economic, and environmental benefits.

Water and Energy Efficiency

The proposed storage tank would allow the Town to reduce the occurrence of short cycles of the well pumps. Short run cycles of pumps can lead to premature degradation of the equipment. Employing additional storage would reduce unnecessary wear on the well pumps in Town.

Green Infrastructure

Stormwater management during the project will include temporary erosion and sediment control including the installation and maintenance of temporary structural control measures to reduce or eliminate the erosion of soils and transportation of sediments offsite as a result of construction activities.

Cost Estimates

Table 5-7 presents an estimated opinion of probable cost for Alternative R-1, and Table 5-8 addresses costs related to operation and maintenance of the improvements. Given the current uncertain construction, materials, and supply chain market conditions that are anticipated to continue into the foreseeable future, the cost estimate includes a 20% contingency in addition to inflation.

Table 5-7 - Opinion of Probable Cost-Alternative R-1: New 150,000 Gallon Glass Lined Steel Bolted Tank and Recoating and Rehabilitation of Existing Tank

Opinion of Probable Cost New 150,000 Gallon Glass-Lined Steel Water Storage Tank and Existing Tank Recoating and Rehab					
#	Bid Item	Qty	Units	Unit Price [1]	Total
1	150,000 Gal. Glass Lined Steel Storage Tank and Foundation	1	LS	$ 400,000.00	$ 400,000
2	Site Work & Excavation	1	LS	$ 70,000.00	$ 70,000
3	Site Piping	1	LS	$ 35,000.00	$ 35,000
4	Level Transmitting Manhole	1	LS	$ 20,000.00	$ 20,000
5	Telemetry System	1	LS	$ 25,000.00	$ 25,000
6	14" PVC Transmission Main	200	LF	$ 180.00	$ 36,000
7	Connect to Existing Water Main	1	EA	$ 3,500.00	$ 3,500
8	Fencing	400	LF	$ 65.00	$ 26,000
9	Tank Site Electrical	1	LS	$ 20,000.00	$ 20,000
10	Sandblast Tank Exterior	7,850	SF	$ 5.50	$ 43,175
11	Sandblast Tank Interior	9,650	SF	$ 6.00	$ 57,900
12	Recoat Tank Exterior	7,850	SF	$ 9.00	$ 70,650
13	Recoat Tank Interior	9,650	SF	$ 10.50	$ 101,325
14	Reseal Tank Panel Seams	1	LS	$ 50,000.00	$ 50,000
15	Cathodic Protection	1	LS	$ 20,000.00	$ 20,000
Direct Construction Subtotal					$ 979,000
Mobilization				10%	$ 98,000
Traffic Control					$ 3,000
Construction Subtotal					$ 1,080,000
Construction Cost Inflated to [2]		2025		3.0%	$ 1,146,000
Contingency				20%	$ 229,000
Land Acquisition					$ 25,000
Geotechnical Investigation					$ 20,000
Engineering Design					$ 80,000
Engineering Construction					$ 120,000
Grant Admin, Legal, & Administrative				5%	$ 55,000
TOTAL					$ 1,675,000

[1] Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.

[2] The ENR average Construction Cost Index is +2.32% (as of September 2023), so capital costs are projected to the anticipated construction date using a 3% inflation rate.

Table 5-8 - Opinion of Probable Annual Operation & Maintenance Costs-Alternative R-1: New 150,000 Gallon Steel Water Storage Tank and Recoat Existing Storage Tanks

Opinion of Probable Annual Operation & Maintenance Costs New 150,000 Gallon Glass-Lined Steel Water Storage Tank and Existing Tank Recoating And Rehab					
#	Item	Qty	Units	Unit Price	Total
1	Labor	120	HR	$ 25.00	$ 3,000.00
2	Spare Parts/Maintenance	1	LS	$ 1,000.00	$ 1,000.00
3	Administration/Office Supplies	1	LS	$ 250.00	$ 250.00
4	Training	1	LS	$ 250.00	$ 250.00
5	Vehicle Operation and Maintenance	1	LS	$ 250.00	$ 250.00
6	Tank Cleaning	1	LS	$ 2,000.00	$ 2,000.00
7	Sealant Replacement	1	LS	$ 4,500.00	$ 4,500.00
8	Replace Cathodic Protection	1	LS	$ 300.00	$ 300.00
9	Reserve	1	LS	$ 2,000.00	$ 2,000.00
	TOTAL				$ 13,600.00

5.5.2 Alt. R-2: New 700,000 Glass Lined Bolted Steel Tank

This alternative includes replacing the existing storage tank with a new 700,000 gallon on-grade glass-lined steel tank near the existing tank location. A ground level steel tank is less costly than an elevated tank to construct and provides greater accessibility.

The least costly method of tank construction in the 250,000 to 1,000,000-gallon range is usually a ground level steel tank. The cost of steel tanks is also a function of the dimensions of the tank and the tank coating. Relatively recent improvements in steel tank coatings, including glass-lined interior and/or exterior coatings, has reduced the cost of maintenance. Feedback from tank suppliers indicate that a 700,000-gallon ground level tank with dimension ranges of 58-67 feet in diameter and 28-38 feet high is the most economical size to construct.

Operation and maintenance costs for steel tanks can be considerable with welded and epoxy coated bolted steel tanks because periodic recoating is required to extend the service life. Use of the glass-fused lining for the Ennis tank would eliminate this type of recurring maintenance requirement.

Freezing water can be a problem for steel tanks but can be controlled through design features and operations. A submersible tank mixer is proposed for this project, primarily to control freezing but also offers the benefit of limiting chlorinated stratification and water age.

Design Criteria

All water system improvements will comply with those requirements set forth in Circular DEQ 1. All design criteria presented in Circular DEQ 1 iare applicable to each alternative considered. The storage tank alternatives will meet the requirements in Chapter 7 – Finished Water Storage and transmission and water main improvements will meet the requirements of Chapter 8 – Transmission Mains, Distribution Systems, Piping & Appurtenances. All proposed improvements will be submitted to MDEQ for approval prior to commencement of any construction activity. Additionally, the steel-bolted tank would follow additional design requirements such as AWWA D103-19 Factory-Coated Bolted Carbon Steel Tanks for Water Storage.

Map

Figure 5-3 presents the location of the new 700,000-gallon glass-lined steel storage tank.

Environmental Impacts

The construction of the new tank is not anticipated to impact any known floodplains, wetlands, or historically significant sites. Construction may temporarily disturb the area; however, any temporary disturbances would be remediated by the selected Contractor before the completion of the project.

Land Requirements

Construction of a new tank will require land acquisition and easements. Preliminary discussions with Town staff indicate confidence in being able to secure land near the existing tank.

Potential Construction Problems

Few construction problems are anticipated because of the location of the site for the new storage tank. The construction site is away from any major thoroughfare and about a mile from Town. Additionally, groundwater is not anticipated close to the ground surface in the immediate area.

NORTH

NEW 700,000 GALLON
GLASS-LINED STEEL
WATER STORAGE TANK

WELL #2

WELL #3

0 300 600
SCALE IN FEET

LEGEND
PVC
CAST IRON
ASBESTOS CEMENT

GreatWest ENGINEERING

Figure 5-3
Alt R-2 New 700,000 Gallon Glass-Lined Bolted Steel Tank

TOWN OF ENNIS
WATER SYSTEM PRELIMINARY ENGINEERING REPORT

Y:\Shared\Helena Projects\1-18184-Ennis On Call 2018\TO 7 - Water PER\CADD 1-18184-TO7\Exhibits\1-18184-TO7-Figure 5-3 New 700,000 Gallon Glass-Lined Bolted Steel Tank.dwg

Sustainability Considerations

The primary purpose of expanding the Town's finished water storage is to maintain supply and pressure in the distribution system during times of emergency and typical demand. The proposed tank would allow the utility to provide improved service to users during periods of high water use.

Improvements to a water system infrastructure is a sustainable utility management practice that aids in creating a resilient utility and provides social, economic, and environmental benefits.

Water and Energy Efficiency

The proposed storage tank would allow the Town to reduce the occurrence of short cycles of the well pumps. Short run cycles of pumps can lead to premature degradation of the equipment. Employing additional storage would reduce unnecessary wear on the well pumps in Town.

Green Infrastructure

Stormwater management during the project will include temporary erosion and sediment control including the installation and maintenance of temporary structural control measures to reduce or eliminate the erosion of soils and transportation of sediments offsite as a result of construction activities.

Cost Estimates

Table 5-9 presents an estimated opinion of probable cost for Alternative R-2, and Table 5-10 addresses costs related to operation and maintenance of the improvements. Given the current uncertain construction, materials, and supply chain market conditions that are anticipated to continue into the foreseeable future, the cost estimate includes a 20% contingency in addition to inflation.

Table 5-9 - Opinion of Probable Cost-Alternative R-2: New 700,000 Gallon Glass Lined Bolted Steel Tank

Opinion of Probable Cost New 700,000 Gallon Glass-Lined Steel Water Storage Tank					
#	Bid Item	Qty	Units	Unit Price [1]	Total
1	700,000 Gal. Glass Lined Steel Storage Tank and Foundation	1	LS	$ 1,200,000.00	$ 1,200,000
2	Site Work & Excavation	1	LS	$ 100,000.00	$ 100,000
3	Site Piping	1	LS	$ 50,000.00	$ 50,000
4	Level Transmitting Manhole	1	LS	$ 20,000.00	$ 20,000
5	Telemetry System	1	LS	$ 25,000.00	$ 25,000
6	16" PVC Transmission Main	200	LF	$ 180.00	$ 36,000
7	Connect to Existing Water Main	1	EA	$ 3,500.00	$ 3,500
8	Fencing	400	LF	$ 65.00	$ 26,000
9	Tank Site Electrical	1	LS	$ 20,000.00	$ 20,000
Direct Construction Subtotal					$ 1,481,000
Mobilization				10%	$ 148,000
Traffic Control				0.5%	$ 7,000
Construction Subtotal					$ 1,636,000
Construction Cost Inflated to [2]			2025	3.0%	$ 1,736,000
Contingency				20%	$ 347,000
Land Acquisition					$ 40,000
Geotechnical Investigation					$ 20,000
Engineering Design					$ 130,000
Engineering Construction					$ 191,000
Grant Admin, Legal, & Administrative				5%	$ 103,000
TOTAL					$ 2,567,000

[1] Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.

[2] The ENR average Construction Cost Index is +2.32% (as of September 2023), so capital costs are projected to the anticipated construction date using a 3% inflation rate.

Table 5-10 - Opinion of Probable Annual Operation & Maintenance Costs-Alternative R-2: New 700,000 Gallon Glass Lined Bolted Steel Tank

Opinion of Probable Annual Operation & Maintenance Costs New 700,000 Gallon Glass-Lined Steel Water Storage Tank					
#	Item	Qty	Units	Unit Price	Total
1	Labor	80	HR	$ 30.00	$ 2,400.00
2	Spare Parts/Maintenance	1	LS	$ 500.00	$ 500.00
3	Administration/Office Supplies	1	LS	$ 250.00	$ 250.00
4	Training	1	LS	$ 250.00	$ 250.00
5	Vehicle Operation and Maintenance	1	LS	$ 250.00	$ 250.00
6	Tank Cleaning	1	LS	$ 1,000.00	$ 1,000.00
7	Sealant Replacement	1	LS	$ 4,500.00	$ 4,500.00
8	Replace Cathodic Protection	1	LS	$ 300.00	$ 300.00
9	Reserve	1	LS	$ 2,000.00	$ 2,000.00
	TOTAL				$ 11,500.00

5.5.3 Alt. R-3: New 700,000 Gallon Prestressed Concrete Tank

This alternative includes replacing the existing storage tank with a new 700,000 gallon prestressed concrete tank near the location of the existing tank. The preliminary size for the water tank is 32 feet tall and 60 feet in diameter. A tank mixer is included in the project to reduce stagnation and prevent the formation of isotherms.

Prestressed concrete tanks offer many advantages over steel tanks, including longer service life, better seismic resistance, and minimal operation and maintenance requirements. The only anticipated operation and maintenance would include an inspection every few years by a dive team to examine the tank for cracks, and periodic removal of sediment buildup.

The design of concrete storage tanks is based on the hoop stresses realized around the circumference of the tank. Generally, the actual strength of the tank is determined by the steel within the walls, as concrete works well under compression while steel works well under tension. Concrete tanks typically use pre-tensioned (or pre-stressed) steel wires to wrap the tank and provide this strength. These tanks are generally built by specialists such as DN Tanks.

Design Criteria

The design standards for the new concrete storage tank would follow, again, Chapter 7 Montana Department of Environmental Quality's *Circular 1*. Additionally, AWWA design standards for

concrete storage tanks include D110-13(R18) for Wire- and Strand-wound, Circular, Prestressed Concrete Water Tanks and D115-20 Tendon-Prestressed Concrete Water Tanks.

Map

Figure 5-4 presents the location of the new 700,000 gallon concrete storage tank.

Environmental Impacts

The construction of the new tank is not anticipated to impact any known floodplains, wetlands, or historically significant sites. Construction may temporarily disturb the area; however, any temporary disturbances would be remediated by the selected Contractor before the completion of the project.

Land Requirements

Construction of a new tank will require land acquisition and easements. Preliminary discussions with Town staff indicate confidence in being able to secure land near the existing tank.

Potential Construction Problems

Few construction problems are anticipated because of the location of the site for the new storage tank. The construction site is away from any major thoroughfare and about a mile from Town. Additionally, groundwater is not anticipated close to the ground surface in the immediate area.

Sustainability Considerations

The primary purpose of expanding the Town's finished water storage is to maintain supply and pressure in the distribution system during times of emergency and typical demand. The proposed tank would allow the utility to provide improved service to users during periods of high water use.

Improvements to a water system infrastructure is a sustainable utility management practice that aids in creating a resilient utility and provides social, economic, and environmental benefits.

NORTH

NEW 700,000 GALLON
PRESTRESSED CONCRETE
WATER STORAGE TANK

WELL #2

WELL #3

0 300 600
SCALE IN FEET

LEGEND
PVC
CAST IRON
ASBESTOS CEMENT

GreatWest ENGINEERING

Figure 5-4
Alt R-3 New 700,000 Gallon Prestressed Concrete Tank

TOWN OF ENNIS
WATER SYSTEM PRELIMINARY ENGINEERING REPORT

Y:\Shared\Helena Projects\1-18184-Ennis On Call 2018\TO 7 - Water PER\CADD 1-18184-TO7\Exhibits\1-18184-TO7-Figure 5-4 New 700,000 Gallon Prestressed Concrete Tank.dwg

Water and Energy Efficiency

The proposed storage tank would allow the Town to reduce the occurrence of short cycles of the well pumps. Short run cycles of pumps can lead to premature degradation of the equipment. Employing additional storage would reduce unnecessary wear on the well pumps in Town.

Green Infrastructure

Stormwater management during the project will include temporary erosion and sediment control measures including the installation and maintenance of temporary structural control measures to reduce or eliminate the erosion of soils and transport of sediment offsite as a result of construction activities.

Cost Estimates

Table 5-11 presents an estimated opinion of probable cost for Alternative R-3, and Table 5-12 addresses costs related to operation and maintenance of the improvements. Given the current uncertain construction, materials, and supply chain market conditions that are anticipated to continue into the foreseeable future, the cost estimate includes a 20% contingency in addition to inflation.

Table 5-11 - Opinion of Probable Cost-Alternative R-3: New 700,000 Gallon Prestressed Concrete Tank

Opinion of Probable Cost New 700,000 Gallon Prestressed Concrete Water Storage Tank					
#	Bid Item	Qty	Units	Unit Price [1]	Total
1	700,000 Gal. Prestressed Concrete Storage Tank and Foundation	1	LS	$ 1,500,000.00	$ 1,500,000
2	Site Work & Excavation	1	LS	$ 100,000.00	$ 100,000
3	Site Piping	1	LS	$ 50,000.00	$ 50,000
4	Level Transmitting Manhole	1	LS	$ 20,000.00	$ 20,000
5	Telemetry System	1	LS	$ 25,000.00	$ 25,000
6	16" PVC Transmission Main	200	LF	$ 180.00	$ 36,000
7	Connect to Existing Water Main	1	EA	$ 3,500.00	$ 3,500
8	Fencing	400	LF	$ 65.00	$ 26,000
9	Tank Site Electrical	1	LS	$ 20,000.00	$ 20,000
Direct Construction Subtotal					$ 1,781,000
Mobilization				10%	$ 178,000
Traffic Control				0.5%	$ 9,000
Construction Subtotal					$ 1,968,000
Construction Cost Inflated to [2]			2025	3.0%	$ 2,088,000
Contingency				20%	$ 418,000
Land Acquisition					$ 40,000
Geotechnical Investigation					$ 25,000
Engineering Design					$ 157,000
Engineering Construction					$ 230,000
Grant Admin, Legal, & Administrative				5%	$ 125,000
TOTAL					$ 3,083,000

[1] Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.

[2] The ENR average Construction Cost Index is +2.32% (as of September 2023), so capital costs are projected to the anticipated construction date using a 3% inflation rate.

Table 5-12 - Opinion of Probable Annual Operation & Maintenance Costs-Alternative R-3

Opinion of Probable Annual Operation & Maintenance Costs New 700,000 Gallon Prestressed Concrete Water Storage Tank					
#	Item	Qty	Units	Unit Price	Total
1	Labor	60	HR	$ 30.00	$ 1,800.00
2	Spare Parts/Maintenance and Repair	1	LS	$ 500.00	$ 500.00
3	Administration/Office Supplies	1	LS	$ 250.00	$ 250.00
4	Training	1	LS	$ 250.00	$ 250.00
5	Tank Cleaning	1	LS	$ 1,000.00	$ 1,000.00
6	Patching and Renovating Concrete	1	LS	$ 300.00	$ 300.00
7	Reserve	1	LS	$ 2,000.00	$ 2,000.00
	TOTAL				$ 6,100.00

5.6 Pumping Station Alternatives

No pumping station alternatives are considered in this analysis. Ennis does not operate any pumping stations.

5.7 Distribution System Alternatives

5.7.1 Alt. D-1: New Valves in Distribution System

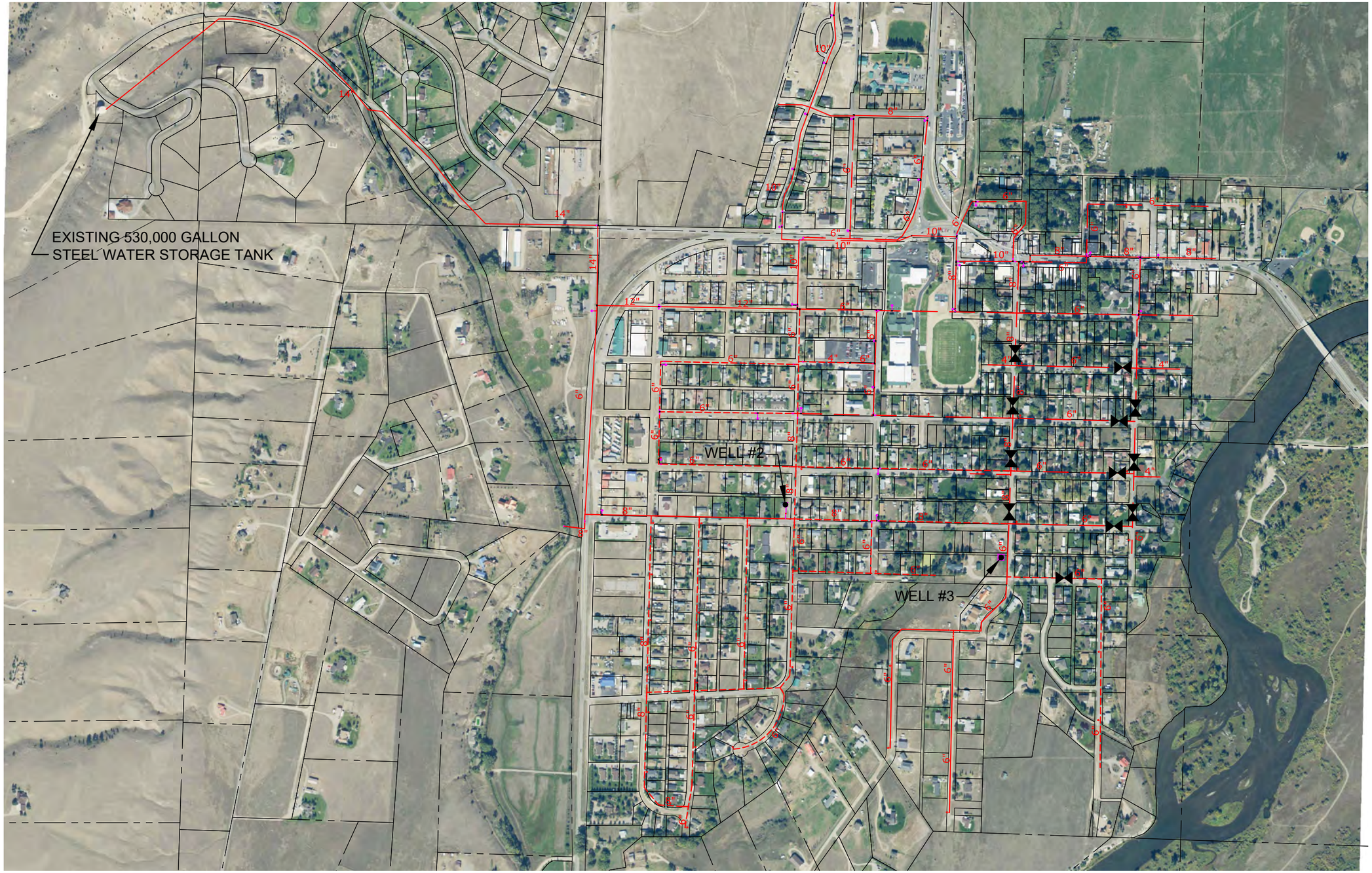
This alternative consists of installing new gate valves in portions of the distribution system to allow for improved operation of the water system. The new valves will allow the Town to isolate smaller sections of the distribution system for maintenance and repairs.

Design Criteria

All water system improvements will comply with those requirements set forth in Circular DEQ 1. All design criteria presented in Circular DEQ 1 is applicable to each alternative considered, but specifically the distribution alternatives will meet the requirements in Chapter 8 – Transmission Mains, Distribution Systems, Piping & Appurtenances.

Map

Figure 5-5 presents a map of the proposed new valve locations.



NORTH

0 300 600
SCALE IN FEET

LEGEND

- PVC
- CAST IRON
- ASBESTOS CEMENT
- NEW GATE VALVE

GreatWest ENGINEERING

Figure 5-5
New Gate Valve Locations

TOWN OF ENNIS
WATER SYSTEM PRELIMINARY ENGINEERING REPORT

Y:\Shared\Helena Projects\1-18184-Ennis On Call 2018\TO 7 - Water PER\CADD 1-18184-TO7\Exhibits\1-18184-TO7-Figure 5-5 New Gate Valve Locations.dwg

Environmental Impacts

There are no environmental problems associated with this alternative. The valves will be installed in areas disturbed previously as a result of street construction.

Land Requirements

The installation of new valves will occur in the Town of Ennis rights-of-way and no land acquisition is expected.

Potential Construction Problems

There are no known construction problems or other conditions which may affect the cost of construction for this alternative.

Sustainability Considerations

Maintaining water system infrastructure is a sustainable utility management practice that aids in creating a resilient utility and provides social, economic, and environmental benefits.

Water and Energy Efficiency
This alternative does not have any additional energy requirements associated with it.

Green Infrastructure
Stormwater management during the project will include temporary erosion and sediment control measures including the installation and maintenance of temporary structural control measures to reduce or eliminate the erosion of soils and transport of sediment offsite as a result of construction activities.

Cost Estimates

Table 5-13 presents an estimated opinion of probable cost for Alternative D-1.

Table 5-13 - Opinion of Probable Cost-Alternative D-1: New Valves in Distribution System

Opinion of Probable Cost New Valves In Distribution System					
#	Bid Item	Qty	Units	Unit Price [1]	Total
1	8" Gate Valve with Valve Box	4	EA	$ 4,500.00	$ 18,000
2	6" Gate Valve with Valve Box	8	EA	$ 4,000.00	$ 32,000
3	Exploratory Excavation	10	HR	$ 275.00	$ 2,750
4	Pavement Removal and Replacement	140	SY	$ 75.00	$ 10,500
Direct Construction Subtotal					$ 63,000
Mobilization				10%	$ 6,000
Traffic Control				3.0%	$ 2,000
Construction Subtotal					$ 71,000
Construction Cost Inflated to [2]			2025	3.0%	$ 75,000
Contingency				20%	$ 15,000
Engineering					$ 15,000
Grant Admin, Legal, & Administrative				5%	$ 6,000
TOTAL					$ 111,000

[1] Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.

[2] The ENR average Construction Cost Index is +2.32% (as of September 2023), so capital costs are projected to the anticipated construction date using a 3% inflation rate.

6.0 SELECTION OF AN ALTERNATIVE

Each of the technically feasible alternatives considered meets the design criteria and applicable regulations identified in the alternative description. This section will examine advantages and disadvantages of each of the storage alternatives in terms of life cycle costs, operational and maintenance considerations, permitting concerns, social impacts, environmental impacts, and other non-monetary considerations. A comparative analysis between alternatives will be completed and a preferred alternative selected to address the deficiencies identified in the storage component of the water system.

A comparative analysis of the supply, meter, treatment, and distribution alternatives is not warranted. For these alternatives, the options are to either make the improvements or not and a comparative analysis is not needed. These alternatives presented are priorities to be set by the Town.

6.1 Life Cycle Cost Analysis

The cost of large capital improvements to meet minimum health and safety requirements, to adhere to applicable regulations, and to minimize environmental impacts is a concern for communities with limited budgets and resources. At the same time, some alternatives may have a low capital cost but high O&M costs that could put an undue financial burden on the Town. A life cycle cost analysis provides a method to compare costs of each alternative equitably to one another.

The anticipated O&M costs, salvage value of components, and capital costs contribute to a project's net present value. A salvage cost was determined using a straight-line depreciation of each component over a 20-year design period. The O&M costs and salvage values are converted to present-day dollars using the "real" discount rate from Appendix C of OMB A-94, which is currently 2.5 percent. The net present value is then calculated for each alternative by adding the estimated capital cost and the present work of the O&M, and this sum then has the present worth of the salvage value subtracted from the sum. Table 6-1 summarizes the net present value for each considered storage alternative.

Table 6-1 - Summary of net present values for storage alternatives

Alternative	Capital Cost	Annual O&M	Present Worth of O&M	20-year Salvage Value	Present Worth of Salvage	Net Present Value
R-1	$ 1,675,000	$ 13,600	$212,013	$ 297,000	$181,250	$ 1,705,762
R-2	$ 2,567,000	$ 11,500	$179,275	$ 726,000	$443,057	$ 2,303,219
R-3	$ 3,083,000	$ 6,100	$95,094	$ 1,026,000	$626,138	$ 2,551,956

6.2 Ranking Criteria

A matrix to compare each alternative objectively against the other will be developed to select the preferred alternative. Each alternative will be given a score ranging from 0 to 10 for a number of criteria, with 0 representing a negative impact and 10 representing the maximum benefit to the community. The alternatives will begin with a score of 5 for each criterion, and then the score will be adjusted up or down relative to the benefit of the particular alternative in relation to the other alternatives.

In addition to scoring each alternative, the criteria themselves with be weighted in relation to one another. Weighting factors ranging from 1 to 10 will be used to give greater importance to items such as cost. This is appropriate, as often times higher investments are made to overcome many other problems such as reliability or to mitigate problems with technical feasibility or environmental concerns.

6.2.1 Life Cycle Costs

The cost of extensive capital improvements to meet minimum health and safety requirements, applicable regulations, and environmental impacts is a great concern to small communities with limited budgets and resources. Life cycle costs also include anticipated increases to ongoing O&M costs.

Accordingly, this criterion will be provided with the maximum weighting factor of 10. This represents over 30% of the total weighting, and Public Opinion is closely tied to cost also, giving the cost for each alternative even more weight.

In addition to providing the maximum emphasis on costs, a method must be utilized to provide an objective comparison of costs for each alternative relative to one another and not just an overall comparison. Given a range of costs for various alternatives, the relative cost of any alternative

can be determined using the lowest cost and the highest cost from the range of costs and the following equation.

$$5 \times [(\text{Lowest Cost}) / (\text{Cost}) + (\text{Highest Cost} - \text{Cost}) / (\text{Highest Cost})]$$

For example, if a number of alternatives were compared having costs of $500,000, $1,000,000 and $2,000,000, the above equation would provide scores of 8.8, 5.0, and 1.3, respectively. The utilization of a formula to score the 20-year life cycle costs in the matrix eliminates any subjectivity and provides a consistent, relative comparison of costs.

6.2.2 Operational and Maintenance Considerations

Operation and maintenance are important issues when considering any large capital improvements within a small community. The costs for O&M associated with the alternatives are included in the 20-year life cycle costs compared under the financial feasibility, but there are other considerations that must be weighed for the O&M associated with each alternative.

The Town has limited resources and manpower, and some alternatives may have O&M requirements that drastically tax those limited resources creating deficiencies in other areas. Town personnel also have a much more intrinsic knowledge of the system than the average resident or even Council members. Priorities identified by the operators to facilitate the efficient operation of the system must be given some weight.

This criterion will be provided with a weighting factor of 7.

6.2.3 Permitting Issues

Some alternatives may encounter permitting issues that would significantly delay the project and/or result in additional expenses for the community. Consideration of these concerns will be given under this criterion.

This criterion will be provided with a weighting factor of 4.

6.2.4 Social Impacts

Social impacts will be considered in the final alternative selection as a project poorly supported by the community will have a limited chance of success. Efforts such as public hearings are ways

to identify public opinion and perceptions. Costs are always a concern with consumers, but the health and safety of their families is just as important.

This criterion will be provided with a weighting factor of 10.

6.2.5 Environmental Impacts

Environmental impacts for each alternative, whether detrimental or beneficial, need to be considered in the final selection of a preferred alternative.

This criterion will be provided with a weighting factor of 5.

6.2.6 Public Health and Safety

Alternatives that do not meet the public health and safety requirements as required by the state and federal governments were eliminated during the Alternative Development. The alternatives retained for the Alternative Analysis are designed to meet public health and safety laws, so the scoring for each alternative under this criterion would be expected to be fairly high. However, addressing public health and safety concerns is the main purpose of the entire report, so this category will be given the maximum weighting.

This criterion would be provided with a weighting factor of 10.

6.2.7 Land Acquisition

Issues with land acquisition often supersede the black-and-white world of engineering. This ranking category will include the feasibility of acquiring sufficient land in terms of lease, right-of-way, and/or land purchases. Although these are not strict engineering issues, problems with land acquisition can greatly impact a project's overall feasibility and require that land issues be given consideration.

This criterion will be provided with a weighting factor of 3.

6.3 Scoring of Storage Alternatives

The storage alternatives were evaluated based on the previously described factors. Each section provides a score and narrative describing the assigned score.

6.3.1 Life Cycle Costs

The life cycle costs score was evaluated using the previously described formula. The scores for life cycle costs are shown below.

- Alt: R-1: 6.7
- Alt. R-2: 4.2
- Alt. R-3: 3.3

6.3.2 Operational and Maintenance Considerations

The operation and maintenance considerations for the prospective projects include the time and effort that is required from the Town to maintain operation. Alternative R-1 keeps the existing tank while constructing an additional 150,000 gallon tank. The existing steel bolted epoxy-lined tank will require periodic maintenance during the design period to reseal the interior of the tank. The new glass-lined tank, however, will require less maintenance. The discrepancy in maintenance requirements results in a score of 3.

For the new 700,000 gallon steel bolted glass-lined tank, the glass lining coating system results in limited maintenance of the new storage tank. Expected maintenance for this alternative includes periodic inspection of the outside of the tank for leaks and replacement of the sealant on the seams. Additionally, any damage to the glass coating system would be repaired as needed. The maintenance effort results in a score of 6.

The concrete storage tank (R-3) requires minimal maintenance over the design period. The required maintenance that is anticipated is periodic inspection of the interior of the tank for cracks and leakage. If any cracks or leaks are discovered, they would be resealed. The minimal maintenance requirement scores this alternative as 8.

- Alt. R-1: 3
- Alt: R-2: 6
- Alt. R-3: 8

6.3.3 Permitting Issues

No major permitting effort is anticipated for any of the proposed projects. Any construction will require a Stormwater Pollution Prevention Plan (SWPPP) that the selected Contractor will be

required to obtain and maintain. Since no project requires variably different permitting, all alternatives received a score of 5.

- Alt. R-1: 5
- Alt: R-2: 5
- Alt. R-3: 5

6.3.4 Social Impacts

The primary scoring of the social impacts for this analysis is the willingness for the community and Town to accept the proposed project.

Each of the alternatives provides additional capacity to the system which allows for the Town to have enough storage to meet average daily demand and fire flow. Adding a second tank and continuing to maintain an existing, aging tank is less desirable than other alternatives. Concrete tanks provide a longer service life and require less annual operation and maintenance and are more desirable from a social perspective. Based on these considerations, the concrete tank received a score of 8, the 700,000 gallon bolted steel tank scored 7, and the 150,000 gallon steel tank received 3.

- Alt. R-1: 3
- Alt: R-2: 7
- Alt. R-3: 8

6.3.5 Environmental Impacts

Limited environmental impacts are anticipated from any of the alternatives. There are no known environmental resources within the area of impact. All construction requires rehabilitation of the site to preconstruction conditions. Since there are no substantial impacts to the environment from any alternative, all projects received an equal score of 5.

- Alt. R-1: 5
- Alt: R-2: 5
- Alt. R-3: 5

6.3.6 Public Health and Safety

Each storage alternative will improve public health and safety by improving fire protection. The alternatives are scored as follows:

- Alternative R-1 5
- Alternative R-2 5
- Alternative R-3 5

6.3.7 Land Acquisition

Each of the alternatives would require similar land acquisition efforts and as such, they are each given a median score of 5.

6.4 Decision Matrix and Selection of Preferred Alternative

The scores and weighted scores for each alternative were compiled to provide a comparison using a decision matrix, presented in Table 6-2. At this time, the Town has selected a new concrete tank to address the storage deficiencies. A detailed description of the preferred alternative is provided in Chapter 7.

Table 6-2 - Decision matrix for preferred alternative

Decision Matrix															
Alternative	Life Cycle Costs		Operation and Maintenance		Permitting		Social Impacts		Environmental Impacts		Public Health and Safety		Land Acquisition		TOTAL
	Weight:	10	Weight:	7	Weight:	4	Weight:	10	Weight:	5	Weight:	10	Weight:	3	
	Score	Wtd.	Score	Wtd.	Score	Wtd.	Score	Wtd.	Score	Wtd.	Score	Wtd.	Score	Wtd.	
Storage Alternatives															
R-1	6.7	67	3.0	21	5.0	20	3.0	30	5.0	25	5.0	50	5.0	15	228
R-2	4.2	42	6.0	42	5.0	20	7.0	70	5.0	25	5.0	50	5.0	15	264
R-3	3.3	33	8.0	56	5.0	20	8.0	80	5.0	25	5.0	50	5.0	15	279

It is important to note that the above scoring and weighting are subjective. Alternatives that score overall within 10 pts of each other may essentially hold the same degree of preference.

6.5 Recommended Improvement Program

The alternatives presented have been compiled into a recommended improvement program with priorities established by the Town. Priorities #1 and #2 will be the immediate focus of the Town. The remaining projects will be completed as funds allow. Table 6-3 presents a priority list of the recommended improvements. The Town may wish to reprioritize the improvements over time as the need arises.

Table 6-3 - Recommended Improvement Program

Recommended Improvement Program		
Item	Description	Estimated Cost
Priority #1	New Redundant Water Supply Wells at Rodeo Grounds	$ 925,000
Priority #2	New 700,000 Gallon Prestressed Concrete Storage Tank	$ 3,083,000
Priority #3	Replace 20% of Water Meters	$ 117,000
Priority #4	Install New Backup Generator at Well #2	$ 116,000
Priority #5	New Valves in Distribution System	$ 111,000
Priority #6	Add Chlorination at Each Well House	$ 95,000
Priority #7	Security Fencing at Well #3	$ 11,000

7.0 PROPOSED PROJECT

As discussed in Chapter 6, the preferred alternative includes development of two new redundant water supply wells and construction of a new wellhouse. The proposed project also includes construction of a new 700,000 gallon prestressed concrete water storage tank. The selected project will be discussed more in this chapter.

7.1 Preliminary Project Design

7.1.1 Water Supply

The proposed project includes development of redundant water supply capacity for the Town's water system and consists of drilling a new well and completing a previously drilled well near the Rodeo Grounds. A new wellhouse will be constructed at the site to house piping and controls for operation of the two new wells. The new wells will ensure the Town continues to have a reliable water supply and will improve the operation and management of the water system.

7.1.1 Water Meters

The proposed project will not include any water meter improvements.

7.1.2 Treatment

The proposed project will not include any water treatment improvements.

7.1.3 Storage

The proposed project includes abandonment of the existing steel tank and construction of a new prestressed concrete tank near the existing storage tank. The preliminary tank size is 32 feet tall with a diameter of 60 feet, which will provide the required storage of 700,000 gallons.

7.1.4 Pumping Stations

The proposed project will not include any pumping stations.

7.1.5 Distribution System

The proposed project will not include work on the Town's distribution system.

7.2 Project Schedule

The preliminary project schedule includes funding applications and awards, design, and construction associated with the preferred alternative. The Town will submit applications to grant funding programs in May of 2024 (MCEP, DNRC, SRF). The Town will utilize previously committed ARPA Minimum Allocation Grant funding to initiate design in August of 2024. If grant funding is to be awarded, bidding of the project will take place in late spring of 2025. Construction would likely begin in July of 2025 and be completed by December 2025. A detailed breakdown of the preliminary schedule can be found in Chapter 8.

7.3 Permit Requirements

A Stormwater Pollution Prevention Plan (SWPPP). is needed during the construction of the project. The SWPPP, however, will be the responsibility of the selected Contractor to obtain and maintain during construction of the water tank.

The Town will need to file Redundant Well Completion Notices with the DNRC. The Contractor will need to secure an electrical permit for the work on the system electrical components. No other permits will be required.

7.4 Sustainability Considerations

Maintaining water system infrastructure is a sustainable utility management practice that aids in creating a resilient utility and provides social, economic, and environmental benefits.

7.4.1 Water and Energy Efficiency

Additional storage does not provide a benefit to water efficiency; however, a new storage tank will improve energy efficiency. The additional storage allows for less pump cycles during periods of high demand. Pumps are generally more efficient when running during longer periods instead of frequent startups and shutdowns.

7.4.2 Green Infrastructure

Stormwater runoff management during the project will be required by the selected Contractor. This management will include temporary erosion and sediment control measures to be installed

that reduce or eliminate the erosion of soils and transport of sediments offsite as a result of construction activities.

7.5 Total Project Cost Estimate

Table 7-1 provides an itemized estimate of the project cost based on the stated period of construction. This estimate includes construction, legal, engineering, construction administration, funding administration, land acquisition, construction contingency, and other costs associated with the proposed project. The construction subtotal is separated out from the non-construction costs. The non-construction subtotal is included and added to the construction subtotal to establish the total project cost. An appropriate construction contingency of 20% is added as part of the non-construction subtotal.

Table 7-1 - Opinion of Probable Cost-Proposed Project (Alternatives S-1 +R-3)

Opinion of Probable Cost New Water Supply Wells at Rodeo Grounds And New 700,000 Gallon Prestressed Concrete Water Storage Tank					
#	Bid Item	Qty	Units	Unit Price [1]	Total
1	Drill New 12" Well	220	LF	$ 185.00	$ 40,700
2	Temporary Surface Casing	1	LS	$ 20,000.00	$ 20,000
3	12" Steel Well Casing	200	LF	$ 145.00	$ 29,000
4	Well Screen	20	LF	$ 350.00	$ 7,000
5	Well Development / Well Pump Test	60	HR	$ 650.00	$ 39,000
6	Well Completion	2	EA	$ 30,000.00	$ 60,000
7	New Wellhouse Building	1	LS	$ 100,000.00	$ 100,000
8	New Wellhouse Piping and Fittings	1	LS	$ 40,000.00	$ 40,000
9	Electrical	1	EA	$ 50,000.00	$ 50,000
10	6" Gate Valve	4	EA	$ 2,800.00	$ 11,200
11	6" PVC Transmission Main	1,100	LF	$ 85.00	$ 93,500
12	Fittings	6	EA	$ 2,000.00	$ 12,000
13	Telemetry System	1	LS	$ 50,000.00	$ 50,000
14	700,000 Gal. Prestressed Concrete Storage Tank and Foundation	1	LS	$ 1,500,000.00	$ 1,500,000
15	Site Work & Excavation	1	LS	$ 100,000.00	$ 100,000
16	Site Piping	1	LS	$ 50,000.00	$ 50,000
17	Level Transmitting Manhole	1	LS	$ 20,000.00	$ 20,000
18	16" PVC Transmission Main	200	LF	$ 180.00	$ 36,000
19	Connect to Existing Water Main	1	EA	$ 3,500.00	$ 3,500
20	Fencing	400	LF	$ 65.00	$ 26,000
21	Tank Site Electrical	1	LS	$ 20,000.00	$ 20,000
Direct Construction Subtotal					$ 2,308,000
Mobilization				10%	$ 231,000
Traffic Control				0.5%	$ 12,000
Construction Subtotal					$ 2,551,000
Construction Cost Inflated to [2]		2025		3.0%	$ 2,706,000
Contingency				20%	$ 551,000
Land Acquisition					$ 50,000
Geotechnical Investigation					$ 35,000
Engineering Design					$ 209,000
Engineering Construction					$ 304,000
Grant Admin, Legal, & Administrative				5%	$ 153,000
TOTAL					$ 4,008,000

[1] Estimated unit costs are based upon estimates from suppliers and bid tabs for similar projects throughout Montana.

[2] The ENR average Construction Cost Index is +2.32% (as of September 2023), so capital costs are projected to the anticipated construction date using a 3% inflation rate.

7.6 Annual Operating Budget

The annual operating budget of the Town of Ennis was determined by reviewing the Annual Financial Reports (AFRs) for the past three fiscal years. These years include 2021, 2022, and 2023.

Table 7-2 - Revenues and Expenditures of Ennis, MT from FY 2021-2023

Revenues and Expenditures (FY 2021-2023)				
Item	FY 2021	FY 2022	FY 2023	Average
Revenues				
Charges for Services	$302,927	$281,570	$332,639	$305,712
Intergovernmental Revenue	$3,664	$5,310	$2,188	$3,721
Interest Revenue	$2,363	$2,736	$40,286	$15,128
TOTAL REVENUES	$308,954	$289,796	$375,113	$324,621
Expenditures				
Personal services	$74,939	$113,895	$58,976	$82,603
Supplies	$11,269	$26,076	$89,664	$42,336
Purchased services	$68,985	$78,850	$171,940	$106,592
Fixed charges	$5,536	$6,184	$10,281	$7,334
Depreciation and amortization	$33,156	$31,279	$31,978	$32,138
TOTAL EXPENDITURES	$193,885	$256,284	$362,818	$270,996
OPERATING INCOME	$115,069	$33,512	$12,295	$53,625

7.6.1 Income

The Town of Ennis charges a base rate of $18.43 and an additional $1.92 per 1,000 gallons of water used. The monthly rate is the primary source of income for the Town's water account, with permits, miscellaneous fees, service charges, and investment earnings also making small contributions. The projected income as a result of user rate increases that are proposed to service the debt for the project is approximately $18 per month per equivalent dwelling unit (EDU), or approximately $154,200 annually.

7.6.2 Annual O&M Costs

Table 7-3 provides the estimated O&M costs for the proposed project. The total annual O&M related to the project is $8,500. The existing water system expenses are approximately $330,841.

Therefore, the total annual expenses for operation and maintenance of the water system after implementation of the project are expected to be approximately $339,341.

Table 7-3 - Opinion of Probable Annual O & M Costs

Opinion of Probable Annual Operation & Maintenance Costs New Water Supply Wells At Rodeo Grounds and New 700,000 Gallon Prestressed Concrete Tank					
#	Item	Qty	Units	Unit Price	Total
1	Labor	60	HR	$ 30.00	$ 1,800
2	Spare Parts/Repair/Maintenance	1	LS	$ 1,000.00	$ 1,000
3	Administration/Office Supplies	1	LS	$ 500.00	$ 500
4	Laboratory Testing Fees	1	LS	$ 500.00	$ 500
5	Power	14,200	KWH	$ 0.12	$ 1,704
6	Office Expenses/Training	1	LS	$ 200.00	$ 200
7	Patching and Renovating Concrete	1	LS	$ 300.00	$ 300
8	Reserve	1	LS	$ 2,500.00	$ 2,500
	TOTAL				$ 8,500

7.6.3 Debt Repayments

The Town does not currently have any outstanding debt on the water system. The proposed funding package (discussed in Chapter 8) for the project includes a combination of grants with a SRF loan. The total debt service required is estimated at $2,183,000 and the estimated amount of annual debt repayment is $154,200.

7.6.4 Reserves

Debt Service Reserve

The Town does not currently have any debt reserves for the water system fund. The preferred funding scenario for the proposed alternative requires a debt reserve of $67,895 for the SRF loan.

Short-Lived Asset Reserve

Short-lived assets were included as part of the O&M costs. Therefore, there are no additional reserve requirements to be included as part of the project costs.

8.0 CONCLUSIONS AND RECOMMENDATIONS

The previous chapters of this report have focused on the need for the project, physical and socioeconomic characteristics of the community, project costs and the technical viability. This chapter discusses financial strategy and project implementation schedule. This chapter will discuss available funding sources and develop various funding scenarios. A preferred funding scenario will be selected and analyzed along with an implementation plan.

8.1 Funding

To pay for the high cost of the proposed project, Ennis plans to seek outside funding through grants and loans. Before different funding options can be considered, financial need must be evaluated. The Montana Department of Commerce (MDOC) established the target rate to ensure that a municipality is paying an equitable portion of a project's cost. For the Town to apply for loans or grants through MDOC, the users' rates after completion of the project must meet or exceed the target rate.

The target rates are calculated as a percentage of the median household income (MHI) from the American Community Survey (ACS) for the municipality. The target rate is calculated as 1.4% of the communities MHI when only water service is provided, 0.9% in communities providing only sewer service, or 2.3% for communities providing water and sewer services.

According to MDOC's website, the MHI for the Ennis is $46,280. Calculating 2.3% of the MHI, the combined target rate for water and sewer is $88.70 per user per month. The average water rate per connection, including metered usage, is approximately $37.54 per month. The average sewer rate per connection is approximately $47.43 per month. The combined existing rate is approximately $84.97, which is 96% of the target rate. The estimated rate at the end of the project is $103.16, or 116% of the target rate.

8.1.1 Funding Sources

The following sections provide a brief description of the potential funding sources and whether or not the Town of Ennis would be eligible for those funds.

Montana Coal Endowment Program (MCEP)

MCEP is a state funded grant program, which is administered by the Montana Department of Commerce (MDOC). MCEP provides financial assistance to local governments for infrastructure improvements. Grants can be obtained from MCEP for up to $500,000 if the projected user rates are less than 125% of the target rate, for up to $625,000 if projected user rates are between 125% and 150% of the target rate, and for up to $750,000 if the projected user rates are over 150% of the target rate. MCEP grant recipients are required to match the grant dollar for dollar, but the match may come from a variety of sources including other grants, loans, or cash contributions.

The Town of Ennis is eligible for MCEP funding and the next deadline for applications is May of 2024.

Renewable Resource Grant and Loan Program (RRGL)

RRGL is a state program that is funded through interest accrues on the Resource Indemnity Trust Fund and the sale or Coal Severance Tax Bonds and is administered by the Montana Department of Natural Resources and Conservation (DNRC). The primary purpose of the RRGL is to enhance Montana's renewable resources. For public facilities projects that conserve, manage, develop, or protect renewable resources, grants of up $125,000 are available.

The Town would be eligible for RRGL funding, and the next application deadline is May of 2024.

Community Development Block Grant (CDBG)

CDBG is a federally funded program that is also administered by the Montana Department of Commerce (MDOC). Montana's CDBG Public and Community Facilities grants help local governments fund infrastructure improvements that primarily benefit low- to moderate-income Montanans. Projects can target LMI residents and provide a direct benefit, or they can provide an area-wide benefit to an entire community if at least 51% of the project's beneficiaries are LMI. This is usually determined by the current Census; however, under certain circumstances, (such as there have been major economic changes since the Census or if a community is only slightly under the required LMI percentage) the MDOC may allow an income survey to be completed.

The CDBG grant funds can be applied for in an amount of up to $750,000 with a limit of $20,000 per LMI household, so a community needs 38 LMI households to apply for the maximum grant funds. The use of CDBG funds requires a 25% local match that can be provided through cash

funds, loans, or a combination thereof. Montana cities, towns, and counties are eligible to apply for CDBG funding assistance.

The Town of Ennis has an LMI percentage is 37.1%, therefore the Town is not eligible for CDBG

State Revolving Fund (SRF)

SRF provides low-interest loan funds for both water and wastewater projects through the Drinking Water State Revolving Fund (DWSRF) and the Water Pollution Control State Revolving Fund (WPCSRF), respectively. The SRF program is administered by the Montana Department of Environmental Quality. Current loan terms include an interest rate of 2.5% for a for a maximum term of 30-years.

The SRF program has also provided grants referred to as “loan principal forgiveness” on some projects. The amount of loan forgiveness varies year-to-year and is dependent on the availability of funds and the financial need of the community as determined by SRF. Discussions with SRF program staff indicate it is reasonable to assume 50% in loan forgiveness for the proposed project. All projects planning to use SRF funds must be on the SRF Intended Use Plan (IUP). To get a project on the IUP, an SRF priority list survey form must be submitted. A copy of the Priority List Survey for Ennis can be found in Appendix Q.

The Town will be applying for a loan through the Drinking Water SRF program for the remainder of the project funds to supplement the ARPA funding and other grant funding that is being applied for.

USDA Rural Development (RD)

RD provides grant and loan funding to municipalities for water and wastewater projects that improve the quality of life and promote economic development in Rural America. Municipalities with a population of less than 10,000 are eligible to apply, though; priority is given to those with a population of less than 5,500.

Grant eligibility and loan interest rates are based on the community’s median household income (MHI) and user rates. A community's qualification for grant funding is based on its MHI compared to Montana's non-metropolitan median household income, which is $63,617 (2021 American Community Survey data). The threshold for RD's intermediate loan rate, as well as up to 45% of its project cost being grant-funded, is $50,893. In other words, a community with an MHI that is

less than $63,617 but greater than $50,894 qualifies for the intermediate rate. If the MHI is less than $50,894, it qualifies for the poverty rate, and up to 75% of the project cost is grant-funded. However, the project must address a severe public health or sanitation concern to allow for the 75% grant contribution. Without a severe public health or sanitation concern, the applicant qualifies for the 45% grant contribution. Ennis, with an MHI of $46,280, currently qualifies for the Poverty Rate, which is 2.125%. The Market Rate is currently 3.5%, while the Intermediate Rate is 2.75%. Rural Development adjusts its rates every quarter.

The longer 40-year loan repayment period, which is typically required for a grant allocation, can be a deterrent. Rural Development could be a fall-back option for funding should the Town not be successful in obtaining grant funds and SRF funding.

Montana Coal Board

The Coal Board provides grant funding to municipalities to adequately provide for the expansion of public services or facilities needed as a direct consequence of coal development activities. There is no maximum limit to the amount the Coal Board can fund, but available funding is very limited so it can be difficult to receive any funds from the Coal Board, especially large sums.

At this time the Town will not pursue Montana Coal Board funds because of the limited funding available and the low likelihood of success.

Economic Development Administration (EDA)

EDA is designed to help distressed communities revamp and enhance their physical infrastructure. By acquiring land, developing, and improving infrastructure, and establishing or expanding industrial or commercial enterprises, this program can help communities attract new industries, encourage business expansion, and diversify local economies. Additionally, public works program investments can create or retain long-term jobs by developing critical public infrastructure such as water and sewer system improvements, roads, rail spurs, industrial parks, business incubator facilities, technology-based facilities, multi-tenant manufacturing facilities, port and harbor expansions, and more. The EDA determines a community's eligibility for funding by using the Measuring Distress Tool on the StatsAmerica website, which can be found at https://www.statsamerica.org/distress/. The EDA program provides grant funding for projects that are demonstrated to be needed for the placement of a new business and the amount of grant is dependent on the number of jobs created.

Because the proposed project would not create a large number of jobs, the Town has opted not to apply for an EDA grant.

INTERCAP

INTERCAP provides loan funds at a low cost, variable interest rate to local governments. INTERCAP is administered by the Montana Board of Investments and is very flexible in the variety of funding which would include both water and wastewater projects. There is no funding cycle (funds are always available), however, the maximum loan term is 10 years.

Due to the relatively large amount of loan financing required, an INTERCAP loan with the shorter loan term would cause an unacceptable increase in user rates for the residents and is not recommended for long-term funding.

American Rescue Plan Act (ARPA)

ARPA funding was made available to Montana communities through the March 11, 2021, American Rescue Act (H.R. 1319). The act provided assistance to Montana communities in three different ways:

- ARPA Local Fiscal Recovery Funds (LFR) – The act provided direct assistance from Treasury to towns, cities, and counties. Direct assistance was given to local governments in two tranches. The first tranche became available in June 2021, and the second will be available in June 2022. The funds can be used for various purposes, including water and sewer infrastructure.

- ARPA Minimum Allocation Grants (MAG) – The act appropriated $463 million to the State of Montana. The State of Montana, through House Bill 632, allocated $150 million of the appropriation to towns, cities, districts, and counties through the Minimum Allocation grant process that was developed in Montana's 2021 legislative session through House Bill 632. Minimum Allocation Grants can be used for water and sewer infrastructure and must be committed by January 1, 2023. A commitment of funds requires local governments to have all matching funds for the proposed project in place by January 1, 2023.

- ARPA Competitive Grants – Montana House Bill 632 allocated $315 million to towns, cities, districts, and counties through a competitive grant process. The grants could be used for water and sewer infrastructure projects providing a necessary investment in water

or sewer infrastructure as defined by the American Rescue Plan Act. The first round of applications for competitive grants was due July 2021, and the second round of applications was due January 14, 2022.

Madison County has committed $225,000 of its MAG funding to the Town for water system improvements. The Town has committed $214,133 of its MAG to the project.

8.1.2 Funding Strategy

Numerous options have been identified as potential funding sources for the Town. Due to the nature of the project and anticipated user rates, the Town would have a good chance of obtaining funds through MCEP, DNRC, and SRF. The Town's preferred funding package and that recommended by this PER includes:

- $500,000 MCEP Grant
- $125,000 DNRC-RRGL Grant
- $214,133 Town of Ennis ARPA MAG
- $225,000 Madison County ARPA MAG
- $500,000 SRF Loan Forgiveness
- $2,183,000 SRF Loan
- $10,867 Town Reserves

Consideration of various combinations of the above funding strategy is depicted in Table 8.1, along with the resulting user rates. Using the preferred Scenario #1 as a basis, a detailed project budget is presented in Table 8.2, which provides a breakdown of each of the line item costs by funding source.

Table 8-1 - Funding Scenarios for Ennis

Town of Ennis Funding Options for Water System Improvements				
Item	Scenario #1 MCEP, DNRC, County and Town MAG, Town Reserves SRF Loan, Loan Forgiveness (2.50% / 20 yrs)	Scenario #2 DNRC, County and Town MAG, Town Reserves SRF Loan, Loan Forgiveness (2.50% / 20 yrs)	Scenario #3 MCEP, County and Town MAG, Town Reserves SRF Loan, Loan Forgiveness (2.50% / 20 yrs)	Scenario #4 County and Town MAG, Town Reserves SRF Loan, Loan Forgiveness (2.50% / 20 yrs)
Water System Improvements	$1,998,000	$1,998,000	$1,998,000	$1,998,000
Rounded Total	$1,998,000	$1,998,000	$1,998,000	$1,998,000
Madison County MAG	$225,000	$225,000	$225,000	$225,000
Town MAG	$214,133	$214,133	$214,133	$214,133
Town Reserves	$10,867	$10,867	$10,867	$10,867
SRF Loan	$2,115,100	$2,615,100	$2,240,100	$3,490,100
SRF Loan Forgiveness	$750,000	$750,000	$750,000	
RRGL Grant	$125,000	$125,000		
MCEP Grant	$500,000		$500,000	
Total Project Funds	$3,940,100	$3,940,100	$3,940,100	$3,940,100
SRF Bond Reserve (1/2 year payment)	$67,895	$83,945	$71,907	$112,032
Total Loan Amount	$2,182,995	$2,699,045	$2,312,007	$3,602,132
Annual Loan Payment	$140,150	$173,280	$148,440	$231,260
Total Loan Payments Over Life of Loan	$2,803,000	$3,465,600	$2,968,800	$4,625,200
Total Interest Paid Over Life of Loan	$620,005	$766,555	$656,793	$1,023,068
Annual Loan Coverage	$14,015	$17,328	$14,844	$23,126
Total Annual Capital Debt Service Cost	$154,165	$190,608	$163,284	$254,386
User Capital Cost/Month	*$17.41*	*$21.52*	*$18.44*	*$28.72*
Current Annual O&M [1]	$330,841	$330,841	$330,841	$330,841
Current Annual Debt Service	$0	$0	$0	$0
Additional O&M Due To Project	$8,500	$8,500	$8,500	$8,500
Total Annual O&M Costs	$339,341	$339,341	$339,341	$339,341
User O&M Cost/Month	*$38.32*	*$38.32*	*$38.32*	*$38.32*
User Cost/Month for Project [2]	$55.73	$59.84	$56.76	$67.04
Existing Average User Cost/Month/EDU	$37.54	$37.54	$37.54	$37.54
Cost/Month Increase/EDU	$18.19	$22.30	$19.22	$29.50
Existing Other System Cost/Month	$47.43	$47.43	$47.43	$47.43
Total Proposed Combined Cost/Month	$103.16	$107.27	$104.19	$114.47
Combined System Target Rate	$88.70	$88.70	$88.70	$88.70
Percent of Combined Target Rate	116%	121%	117%	129%

[1] Based on 2023 Annual Financial Report
[2] Table is based on an estimated 738 EDU's

Table 8-2 - Detailed Project Budget

Administrative/Finance Costs	Madison County MAG	Town of Ennis MAG	Town Reserves	SRF Loan Forgiveness	SRF Loan	MCEP	DNRC	Total:
Grant & Loan Administration Services	$15,000			$10,000	$10,000			$35,000
Legal Costs	$10,000							$10,000
Audit Fees					$15,000			$15,000
Loan Reserves					$67,900			$67,900
Bond Counsel and Related Costs					$20,000			$20,000
Total Admin/Finance Costs:	$25,000			$10,000	$115,500			$147,900
Activity Costs								
Geotechnical Investigation		$35,000						$35,000
Engineering - Basic Services	$200,000	$97,133	$10,867					$308,000
Engineering - Resident Project Representative. Services				$51,500	$153,500			$205,000
Construction		$32,000		$546,300	$1,502,700	$500,000	$125,000	$2,706,000
Land Acquisition		$50,000						$50,000
Contingency				$142,200	$413,900			$556,100
Total Activity Costs	$200,000	$214,133	$10,867	$740,000	$100,000	$500,000	$125,000	$3,860,100
Total Project Costs	$225,000	$214,133	$10,867	$750,000	$2,183,000	$500,000	$125,000	$4,008,000

8.2 Implementation

Prior to full implementation of the project, all funding must be in place. As noted earlier, the proposed funding package for the Ennis water project uses MCEP, and DNRC grant funds along with Madison County and Town of Ennis ARPA funding and an SRF loan package. Grant applications for MCEP and DNRC are due in May 2024. The results of those applications are expected around April 2025. SRF funds are available on an open cycle and do not have a strict deadline. The ARPA funds have already been committed and can be spent at any time. Using the ARPA funds, the Town intends to initiate design and land acquisition activities in July 2024.

If it appears the grant funding will be successful, the project would be bid in May 2025. The project start-up for the grant programs is expected to be about a two-month process. It is anticipated that grant funding would be finalized in June 2025. Commencement of construction activities is anticipated to start in July 2025. Table 8-3 provides a summary of the Project Implementation Schedule.

Table 8-3 - Project Implementation Schedule

Project Implementation Schedule	
Action	Date
Public Hearing on Draft PER & EA	April 2024
Prepare Final PER	May 2024
Apply for DNRC & MCEP Grants	May 2024
Submit SRF Application	July 2024
Begin Design	July 2024
Design Basis Report/Cost Estimates to the Town	August 2024
Submit Design Plans and Specifications to MDEQ	September 2024
MDEQ Review & Approval	October 2024
Finalize Grant Financing	May/June 2025
Advertise for Bids	May 2025
Finalize SRF Loan Financing	June 2025
Start Construction	July 2025
Complete Construction	December 2025

9.0 REFERENCES

Montana Bureau of Mines and Geology (MBMG). Montana Groundwater Information Center Water Well Data. Helena, Montana: Montana State Library. https://mslservices.mt.gov/Geographic_Information/Data/DataList/datalist_Details.aspx?did={B40FCBD4-DA34-483A-A8C9-F9C1E95F7A21}

Montana Department of Commerce, Census and Economic Information Center (CEIC). U.S. Census Bureau 1990 Census and 2000 Census data. https://ceic.mt.gov/Maps/Demographics/Population

Montana Department of Environmental Quality. Circular DEQ 1: Standards for Water Works. 2018 Edition. http://deq.mt.gov/Portals/112/Water/WQInfo/Documents/Circulars/Circulars/2018DEQ-1.pdf

Montana Department of Environmental Quality Source Water Protection Program. Town of Ennis Public Water System PWSID # MT0000208 Source Water Protection Plan. 03/2066. http://deq.mt.gov/Water/DrinkingWater/SourceWater

Montana Natural Heritage Program (MTNHP). Montana Land Cover/Land Use Theme. 2016. Helena, Montana. http://mtnhp.org/mapviewer/?t=1

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Natural Heritage Program. Montana Plant Species of Concern Report. Retrieved on 4/9/2020, from http://mtnhp.org/SpeciesOfConcern/?AorP=p

Montana Sage Grouse Habitat Conservation Program. Montana Sage Grouse Habitat Conservation Map. https://sagegrouse.mt.gov/ProgramMap

Montana State Library. Geographic Information Clearinghouse. http://geoinfo.msl.mt.gov/

United States Census Bureau, Population Division. Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2018. American Fact Finder. http://factfinder.census.gov

United States Department of Agriculture Natural Resources Conservation Service. Web Soil Survey. http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

United States Fish and Wildlife Service. National Wetlands Inventory NWI Mapper. https://www.fws.gov/wetlands/Data/Mapper.html

APPENDIX A

Uniform Environmental Checklist and Agency Correspondence

Environmental Checklist

Environmental Checklist Prepared by: On: 1/29/2024

Joel Pilcher, PE	Great West Engineering
Name of Person 1	Organization
406-495-6186	jpilcher@greatwesteng.com
Phone Number	Email
Click or tap here to enter text.	Click or tap here to enter text.
Name of Person 2	Organization
Click or tap here to enter text.	Click or tap here to enter text.
Phone Number	Email

Click or tap here to enter text.
List additional people above. Include organization, phone number and email for all.

As the engineer that prepared the preliminary engineering report, I _Joel Pilcher, PE_____,
(print name of engineer)
have reviewed the information presented in this checklist and believe that it accurately identifies the environmental resources in the area and the potential impacts that the project could have on those resources. In addition, the required state and federal agencies were provided with the required information about the project and requested to provide comments on the proposed public facility project. Their comments have been incorporated into and attached to the Preliminary Engineering Report.

Engineer's Signature: _____
Date: 1/29/24

Physical Environment			
Impact Code	**Impact Type**	**Permits/ Mitigation Required?**	**Explanation of Impact to Resource**
1. Soil Suitability, Topographic and/or Geologic Constraints (example: soil slump, steep slopes, subsidence, seismic activity)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: NRCS web soil survey indicates soils consisting of Brocko-Crago complex, 8 to 45 percent slopes, Scravo very cobbly sand, 0 to 4 percent slopes and Varney clay loam, 2 to 8 percent slopes. Preferred Alternative Environmental Narrative: Soils in the area are suitable for buried water lines and structures. Topography is appropriate for pipeline installation and construction of the water storage tank, and will not result in environmental damage. There are no identified geological constraints on the proposed project. - *Great West Engineering* - *NRCS*

2. Hazardous Facilities (example: power lines, hazardous waste sites, acceptable distance from explosive and flammable hazards including chemical/petrochemical storage tanks, underground fuel storage tanks, and related facilities such as natural gas storage facilities and propane storage tanks)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: Montana DEQ Underground tanks, petroleum releases, and release compensation sites indicate the area of improvements contain no hazardous areas of concern. Preferred Alternative Environmental Narrative: No hazardous areas of concern are identified in the area of proposed improvements. - *Great West Engineering* - **DEQ**
3. Surrounding Air Quality (example: dust, odors, emissions)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☐ NA	Current Conditions: No surrounding air quality concerns exist. Preferred Alternative Environmental Narrative: A temporary negative impact on air quality due to dust is expected during construction. Reasonable efforts will be taken during construction to minimize the temporary impacts. - *Great West Engineering*
4. Groundwater Resources and Aquifers (example: quantity, quality, distribution, depth to groundwater, sole source aquifers)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☒Permit ☐Mitigation ☐ NA	Current Conditions: Groundwater in the area is generally of high quality as a potable water source. Groundwater depth is below 10 feet in most parts of town. The Town relies on two wells for its water supply. The wells are 142 feet and 165 feet deep. Both wells tap the same aquifer and produce between 250 and 350 gpm. Preferred Alternative Environmental Narrative: The project will develop two new water supply wells but will not impact existing groundwater resources. The construction of the new storage tank will have no impact on groundwater resources. - Great West Engineering -MBMG Groundwater Information Center
5. Surface Water/Water Quality, Quantity and Distribution (example: streams, lakes, storm runoff, irrigation systems, canals)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☒Permit ☐Mitigation ☐ NA	Current Conditions: Surface water resources in the area are limited to Moores Creek in the center of town and the Madison River on the eastern boundary of the planning area. Preferred Alternative Environmental Narrative: Project improvements will not occur within close proximity to surface water. - *Great West Engineering*

6. Floodplains and Floodplain Management (Identify any floodplains within one mile of the boundary of the project.)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: The Zone A4 100-year floodplain lies outside of the proposed project area . Preferred Alternative Environmental Narrative: None of the proposed project is located within a designated floodplain. - *Great West Engineering* - *FEMA*
7. Wetlands (Identify any wetlands within one mile of the boundary of the project and state potential impacts.)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: Wetlands are limited to the fringe area of Moores Creek and the Madison River.. Preferred Alternative Environmental Narrative: No impacts to wetlands will occur as a result of proposed water system improvements. - *Great West Engineering* - *U.S. FWS*
8. Agricultural Lands, Production, and Farmland Protection (example: grazing, forestry, cropland, prime or unique agricultural lands) Identify any prime or important farm ground or forest lands within one mile of the boundary of the project.			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: No lands currently used for farming will be taken out of production. Preferred Alternative Environmental Narrative: No prime farmland will be impacted. . - *Great West Engineering* - *NRCS*
9. Vegetation and Wildlife Species and Habitats, Including Fish (example: terrestrial, avian and aquatic life and habitats)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: A MTNHP search indicated the presence of 168 animals and 77 plants in the area surrounding Ennis. Over 100 animal species are avian. Other wildlife consist of grizzly bear, deer, antelope, small mammals, reptiles, amphibians and fish. Preferred Alternative Environmental Narrative: All improvements will occur within existing Town limits or at the Town's tank site. Limited, temporary impacts to vegetation are anticipated. No impacts to habitat are anticipated. - *Great West Engineering* - *Montana Natural Heritage Program*

10. Unique, Endangered, Fragile, or Limited Environmental Resources, Including Endangered Species (example: plants, fish or wildlife)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: A MTNHP search revealed 13 species of concern including grizzly, bald eagle, great blue heron, other bird species, along with some vascular plants. Most of these species do not frequent the habitat found within the community of Ennis. Preferred Alternative Environmental Narrative: Proposed improvements will have no impact on unique, endangered, fragile or limite environmental resources.
11. Unique Natural Features (example: geologic features)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: No known unique natural features are known in the project area. Preferred Alternative Environmental Narrative: The project is located in previously disturbed areas and will not impact unique natural features. - *Great West Engineering*
12. Access to, and Quality of, Recreational and Wilderness Activities, Public Lands and Waterways (including Federally Designated Wild & Scenic Rivers), and Public Open Space			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: The project is not located in areas of access to public lands or waterways. Preferred Alternative Environmental Narrative: The project is in previously disturbed area and is not located in areas where access to public lands or waterways could be impacted. - *Great West Engineering*
Human Environment			
Impact Code	**Impact Type**	**Resource**	
1. Visual Quality – Coherence, Diversity, Compatibility of Use and Scale, Aesthetics			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: The project area is mostly residential. Preferred Alternative Environmental Narrative: The project will not impact visual quality. Any disturbance during construction will be temporary. These may consist of some heavy equipment, trucks and work crews. - *Great West Engineering*
2. Nuisances (example: glare, fumes)			
☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: No existing glare, fumes, or other nuisances are known at or around the project area. Preferred Alternative Environmental Narrative: Temporary nuisances such as noise and exhause fumes may occur during construction. Efforts will be made to minimize nuisances and address specific problems as they occur. No permanent adverse impacts are anticipated. - *Great West Engineering*

3. Noise – Suitable Separation Between Housing and Other Noise Sensitive Activities and Major Noise Sources (example: aircraft, highways and railroads.)			
☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: No aircraft, highways, railroads, or other major noise sources will result from this project. Preferred Alternative Environmental Narrative: Nearby residences may be temporarily affected by noise from construction activity; however, once construction is complete no long-term impacts are anticipated. - *Great West Engineering*
4. Historic Properties, Cultural, and Archaeological Resources			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: SHPO was contacted and determined eleven recorded historic sites are within the Ennis area. Preferred Alternative Environmental Narrative: No historic sites will be disturbed by the proposed project and as long as there is no disturbance or alteration to structures over fifty years of age, there is a low likelihood cultural properties will be impacted. A recommendation for a cultural resource inventory is unwarranted at this time. - *Great West Engineering* - *SHPO*
5. Changes in Demographic (Population) Characteristics (example: quantity, distribution, density)			
☐ No Impact ☒ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☒ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: The Town of Ennis continues to grow. Preferred Alternative Environmental Narrative: The implementation of an improved, reliable water system will be critical to keep up with the growth. - *Great West Engineering*
6. General Housing Conditions – Quality, Quantity, Affordability			
☐ No Impact ☒ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☒ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: The project will take place in residential areas. Preferred Alternative Environmental Narrative: Improved infrastructure for the water system improves the community's ability to handle growth and additional housing as well as continue to serve existing housing in the area. - *Great West Engineering*
7. Businesses or Residents (example: loss of, displacement, or relocation)			
☒ No Impact ☐ Beneficial ☐ Adverse	☒ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: The project will take place in existing residential areas. Preferred Alternative Environmental Narrative: No long term impact to businesses or residents will occur. Some residence/business owners may be temporarily affected by construction activity. The construction contractor will be required to maintain access to residents and businesses. - *Great West Engineering*

8. Public Health and Safety			
☐ No Impact ☒ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☒ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: Public health and safety is currently at risk due to the insufficient water supply and storage capacity. Preferred Alternative Environmental Narrative: The project improves water system reliability and fire flow availability for residents and businesses in the community. - *Great West Engineering*
9. Local Employment – Quantity or Distribution of Employment, Economic Impact			
☐ No Impact ☒ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☒ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: Local employment occurs at businesses in the community. Preferred Alternative Environmental Narrative: An updated water system results in significant direct capital expenditures in the local economy. During construction, workers strengthen the econom by spending money on food, lodging, and other recreational activities. The contractor may also look to hire local help for various construction positions. Sound infrastructure has a direct tie to economic growth and vitality in a community. - *Great West Engineering*
10. Income Patterns – Economic Impact			
☐ No Impact ☐ Beneficial ☒ Adverse	☐ Direct ☐ Indirect ☒ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: The median household income in Ennis is $46,280. Preferred Alternative Environmental Narrative: The proposed improvements will require an increase in user rates. - *Great West Engineering*
11. Local and State Tax Base and Revenues			
☐ No Impact ☒ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☒ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: Property taxes make up 50% of general fund revenues. Gas tax provides revenue to offset wages and costs associated with repair and maintenance of streets. Preferred Alternative Environmental Narrative: Commercial and residential growth would stimulate the economy and would increase the tax base. This growth is supported/encouraged by adequate infrastructure. - *Great West Engineering*
12. Community and Government Services and Facilities (example: educational facilities; health and medical services and facilities; police; emergency medical services; and parks, playgrounds and open space)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: Community and government services and facilities are provided by the Town of Ennis. Preferred Alternative Environmental Narrative: Community and government services and facilities will continue to operate as they currently do and will not be impacted by the project. - *Great West Engineering*

13. Commercial and Industrial Facilities – Production and Activity, Growth or Decline			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: Ennis has some commercial areas, which are surrounded by the residential areas in town. Preferred Alternative Environmental Narrative: The project will not impact production, growth or decline of commercial or industrial facilities. - *Great West Engineering*
14. Social Structures and Mores (example: standards of social conduct/social conventions)			
☐ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: Ennis does host social conventions/events throughout the community. Preferred Alternative Environmental Narrative: No impact to social structure will occur as a result of this project. - *Great West Engineering*
15. Land Use Compatibility (example: growth, land use change, development activity, adjacent land uses and potential conflicts)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: Land use in Ennis includes commercial and residential development. Preferred Alternative Environmental Narrative: The project will not result in a change to existing land use. - *Great West Engineering*
16. Energy Resources – Consumption and Conservation			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: The water system requires some energy for operation, mostly associated with well pumps and buildings. Preferred Alternative Environmental Narrative: The project will not impact any energy resources. - *Great West Engineering*
17. Solid Waste Management			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: The community does not provide solid waste services. Preferred Alternative Environmental Narrative: The water improvements have no impact on solid waste. - *Great West Engineering*
18. Wastewater Treatment – Sewage System			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: Ennis utilizes a wastewater collection system and wastewater treatment facility. Preferred Alternative Environmental Narrative: The water improvements will not impact the wastewater system. - *Great West Engineering*

19. Storm Water – Surface Drainage			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: The community does not have a stormwater system. Preferred Alternative Environmental Narrative: No impact to surface drainage will occur. The project areas will be returned to match existing conditions. - *Great West Engineering*
20. Community Water Supply			
☐ No Impact ☒ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☒ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: The Town of Ennis owns and operates a public water supply. Preferred Alternative Environmental Narrative: The project will improve the overall reliability of the system. - *Great West Engineering*
21. Fire Protection – Hazards			
☐ No Impact ☒ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☒ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: Fire protection is provided by the public water system. Preferred Alternative Environmental Narrative: Providing additional water supply and increasing storage capacity will improve fire protection for the community. - *Great West Engineering*
22. Cultural Facilities, Cultural Uniqueness and Diversity			
☐ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: N/A Preferred Alternative Environmental Narrative: No impact.
23. Transportation Networks and Traffic Flow Conflicts (example: rail; auto including local traffic; airport runway clear zones – avoidance of incompatible land use in airport runway clear zones)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: Ennis has local streets and highways in the community to serve local traffic. Preferred Alternative Environmental Narrative: During construction traffic flow will be impacted and may be rerouted. The site will return to existing conditions and no long term impacts are anticipated. - *Great West Engineering*
24. Consistency with Local Ordinances, Resolutions, or Plans (example: conformance with local comprehensive plans, zoning, or capital improvement plans.)			
☐ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: Click or tap here to enter text. Preferred Alternative Environmental Narrative:
25. Private Property Rights (example: a regulatory action or project activity that reduces, minimizes, or eliminates the use of private property.)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: The project does not take place on private property. Preferred Alternative Environmental Narrative: No impacts to private property will occur. - *Great West Engineering*

26. Environmental Justice (example: does the project avoid placing lower income households in areas where environmental degradation has occurred, such as adjacent to brownfield sites?)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☐Mitigation ☒ NA	Current Conditions: The project is not located in areas where environmental degradation has occurred. Preferred Alternative Environmental Narrative: No impact to environmental justice will occur. - *Great West Engineering*
27. Lead Based Paint and/or Asbestos (example: does the project replace asbestos-lined pipes? Do any structures qualify as containing lead-based paint?)			
☒ No Impact ☐ Beneficial ☐ Adverse	☐ Direct ☐ Indirect ☐ Cumulative	☐Permit ☒Mitigation ☐ NA	Current Conditions: The project does not include the replacememnt of asbestos-lined pipes and no structures that contain lead-based paints will be impacted. Preferred Alternative Environmental Narrative: No impact. - *Great West Engineering*

Additional Information

List all sources of information used to complete the Environmental Checklist. Sources may include studies, plans, documents, or the individuals, organizations, or agencies contacted for assistance. For individuals, groups, or agencies, please include a contact person and phone number. List any scoping documents or meetings and/or public meetings during project development.

NRCS
MT DEQ Data Mapper
GWIC
FEMA
Madison County Planning Department
USFWS National Wetlands Inventory
MTNHP
SHPO
U.S. Census Bureau
FWP
DNRC
MDT
USFWS

Below is a list of electronic resources available for data gathering to aid in the development of the Environmental Checklist:

Abandoned Mines (DEQ): https://deq.mt.gov/cleanupandrec/Programs/aml

Agricultural Statistics (USDA): USDA - National Agricultural Statistics Service - Data and Statistics

Air Quality

- Nonattainment Areas: Plan and Rule Development | Montana DEQ (mt.gov)

- Opening Burning Guidelines: Open Burning | Montana DEQ (mt.gov)

Army Corps of Engineers: http://www.usace.army.mil/Home.aspx

Bureau of Business and Economic Research, UM: http://www.bber.umt.edu/

Cadastral (for property ownership info): http://svc.mt.gov/msl/mtcadastral

Census Information, MT Dept. of Commerce: http://ceic.mt.gov

Conservation Districts, MT: http://macdnet.org/

Cultural Records

- Montana Historical Society: https://mhs.mt.gov/Shpo/CulturalRecords

DEQ data search tools: Montana DEQ's GIS Portal (mt.gov)

- Including Clean Water Act Info Center, Hazardous Waste Handlers, Petroleum Release Fund Claims, Unpermitted Releases, Underground Storage Tanks, Source Water Protection

EPA Enforcement and Compliance History Online http://echo.epa.gov/

Farmland Classification: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

Fish (Also See Wildlife)

- Montana Fisheries Information System: Montana Fish, Wildlife & Parks GIS Data (arcgis.com)
- Aquatic Invasive Species: Montana FWP AIS Surveys Dashboard 2021 (arcgis.com)

Floodplain Maps, FEMA: https://msc.fema.gov/portal

Geographic Information, Natural Resources Information System: http://nris.mt.gov/gis

Geologic Information - MBMG - Publications - Download Geologic Maps (mtech.edu)

Maps of Montana for species observations, land cover, wetland and riparian areas, land management: Montana Natural Heritage Program (mtnhp.org); http://mtnhp.org/mapviewer/?t=6

Montana Department of Transportation: https://www.mdt.mt.gov/

- Environmental Manual: http://www.mdt.mt.gov/publications/docs/manuals/env/preface.pdf
- Environmental Manual - Chapter 29, Permits Required: https://www.mdt.mt.gov/publications/docs/manuals/env/Chapter%2029%20PERMITS%20REQUIRED.pdf

Montana Board of Oil and Gas Conservation Information System:

- http://bogc.dnrc.mt.gov/webApps/DataMiner/

Plants

- Plant database, USDA Natural Resources Conservation Service: http://plants.usda.gov/java
- Plant Species, MT Field Guide: http://fieldguide.mt.gov/default.aspx

- Plant Species of Concern: http://mtnhp.org/SpeciesOfConcern/Default.aspx?AorP=p
- Threatened, Endangered and Rare Plants, USDA: https://plants.usda.gov/home/raritySearch

Soils

- USDA Natural Resource Conservation Service database: https://websoilsurvey.nrcs.usda.gov/app/
- Montana soil and water conservation districts: http://swcdmi.org/

State Historic Preservation Office: http://mhs.mt.gov/Shpo

Tourism, UM – Institute of Tourism & Recreation Research: http://www.itrr.umt.edu

Tribal Resources:

- Blackfeet Tribal Environmental Permits: http://www.blackfeetenvironmental.com
- CSKT Natural Resources Department: http://nrd.csktribes.org/
- Montana Office of Indian Affairs: http://tribalnations.mt.gov/
- Tribal Historic Preservation Officer List: Search - NATHPO
- Tribal Directory Assessment Tool (TDAT): https://egis.hud.gov/tdat/

Vehicle Traffic Count (MDT): http://www.mdt.mt.gov/publications/datastats/traffic.shtml

Water

- Stream Record Extension Facilitator, USGS: USGS | National Water Dashboard
- Streamstats basin characteristics, USGS: http://water.usgs.gov/osw/streamstats/
- Water Resources Division, DNRC: http://dnrc.mt.gov/divisions/water ; ArcGIS Web Application (mt.gov)
- Water Rights Bureau, DNRC: http://dnrc.mt.gov/divisions/water/water-rights
- Water Right Query System, DNRC: DNRC Water Right Query System (mt.gov)
- Wetlands database, USFWS: http://www.fws.gov/wetlands/Data/mapper.html

Wild and Scenic Rivers: http://www.rivers.gov/montana.php

Wildlife

- Animal Species, MT Field Guide: http://fieldguide.mt.gov/default.aspx
- Animal Species of Concern: http://mtnhp.org/SpeciesOfConcern/Default.aspx?AorP=a
- Aquatic Invasive Species: Montana FWP AIS Surveys Dashboard 2021 (arcgis.com)
- Critical Habitat Mapper, USFWS: http://ecos.fws.gov/crithab/
- Crucial Areas Planning System/Habitat Assessment Tool: Habitat MT (HB 526) Funded Lands (arcgis.com)

- FWP Contact Map: http://fwp.mt.gov/gis/maps/contactUs/ (includes biologist responsibility areas)
- Maps and GIS Data, FWP: Montana Fish, Wildlife & Parks GIS Data (arcgis.com)
- Sage grouse management, FWP: Montana Fish, Wildlife & Parks GIS Data : Sage-grouse Habitat/Current Distribution (Montana) : Sage-grouse Habitat/Current Distribution (Montana) (arcgis.com)
- Sage grouse habitat conservation program, DNRC: http://sagegrouse.mt.gov/
- Sage grouse habitat map: https://sagegrouse.mt.gov/ProgramMap

See what's possible.

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F: (406) 449-8631

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Ph: (509) 413-1430

GreatWest ENGINEERING

February 16, 2023

Department of Commerce, Census and Economic Information Center
PO Box 200505
Helena MT 59620-0505

RE: Town of Ennis, Montana, Water System Improvements

Dear Department of Commerce, Census and Economic Information Center:

The purpose of this letter is to solicit comments regarding issues of concern that may result from the construction of improvements to the water system in the Town of Ennis. Ennis is a town of 917 residents and is located in central Madison County. The Town is situated at the junction of U.S. Highway 287 and Montana Highway 287. The project area is more specifically located at:

Township/Range/Section:	Township 5S, Range 1W, Sections: 32 & 33, and Township 6S, Range 1W, Section 4
Latitude/Longitude:	45° 20' 57" North Latitude, 111° 43' 58" West Longitude
Elevation:	4,941 Feet

Enclosed is a map of the Planning Area (Figure 2.1) to help illustrate our proposed project locations.

The water supply capacity from the Town's two existing wells is insufficient for current and future demands and does not comply with DEQ standards. Additional source capacity is needed to ensure the Town can meet projected demands and DEQ standards. The Town's current 500,000-gallon bolted steel water storage tank is nearly 30 years old, is undersized for current demands and would require significant rehabilitation and repair to extend its service life.

The proposed project will likely include the construction of two new water supply wells at Town owned property near the rodeo grounds, and replacement of the existing storage tank with a new 700,000 gallon pretressed concrete storage tank. The majority of the work will most likely be done within the public right of way and in existing easements.

Please take a few moments to review the site and the proposed project. Please provide a written response detailing any comments you may have regarding the project and any potential environmental impacts that should be considered in the project design, and any avoidance or mitigation measures.

We would appreciate feedback and comments from Department of Commerce, Census and Economic Information Center. Please send your responses and/or confirmation that there is no comment, back to me by March 1, 2023, at jpilcher@greatwesteng.com or the following address:

Great West Engineering, Inc.
Attn: Joel Pilcher, PE
2501 Belt View Drive
Helena, MT 59601
(406) 495-6186

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Attached: Figure 2-1 – Planning Area

[ ] Department of Commerce, Census and Economic Information Center has reviewed the enclosed information and has no comment on the project at this time.

_____ _____
Signature Date

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GreatWest ENGINEERING

February 16, 2023

Department of Labor and Industry
PO Box 1728
Helena MT 59624

RE: Town of Ennis, Montana, Water System Improvements

Dear Department of Labor and Industry:

The purpose of this letter is to solicit comments regarding issues of concern that may result from the construction of improvements to the water system in the Town of Ennis. Ennis is a town of 917 residents and is located in central Madison County. The Town is situated at the junction of U.S. Highway 287 and Montana Highway 287. The project area is more specifically located at:

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Great West Engineering, Inc.
Attn: Joel Pilcher, PE
2501 Belt View Drive
Helena, MT 59601
(406) 495-6186

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Attached: Figure 2-1 – Planning Area

[ ] Department of Labor and Industry has reviewed the enclosed information and has no comment on the project at this time.

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GreatWest ENGINEERING

February 16, 2023

Department of Environmental Quality
Permitting and Compliance Division
PO Box 200901
Helena MT 59620-0901

RE: Town of Ennis, Montana, Water System Improvements

Dear Department of Environmental Quality:

The purpose of this letter is to solicit comments regarding issues of concern that may result from the construction of improvements to the water system in the Town of Ennis. Ennis is a town of 917 residents and is located in central Madison County. The Town is situated at the junction of U.S. Highway 287 and Montana Highway 287. The project area is more specifically located at:

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Great West Engineering, Inc.
Attn: Joel Pilcher, PE
2501 Belt View Drive
Helena, MT 59601
(406) 495-6186

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Attached: Figure 2-1 – Planning Area

[ ] Department of Environmental Quality has reviewed the enclosed information and has no comment on the project at this time.

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GreatWest ENGINEERING

February 16, 2023

Department of Fish, Wildlife and Parks
1420 E. 6th Ave.
Helena MT 59620

RE: Town of Ennis, Montana, Water System Improvements

Dear Department of Fish, Wildlife and Parks:

The purpose of this letter is to solicit comments regarding issues of concern that may result from the construction of improvements to the water system in the Town of Ennis. Ennis is a town of 917 residents and is located in central Madison County. The Town is situated at the junction of U.S. Highway 287 and Montana Highway 287. The project area is more specifically located at:

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Please take a few moments to review the site and the proposed project. Please provide a written response detailing any comments you may have regarding the project and any potential environmental impacts that should be considered in the project design, and any avoidance or mitigation measures.

We would appreciate feedback and comments from Department of Fish, Wildlife and Parks. Please send your responses and/or confirmation that there is no comment, back to me by March 1, 2023, at jpilcher@greatwesteng.com or the following address:

Great West Engineering, Inc.
Attn: Joel Pilcher, PE
2501 Belt View Drive
Helena, MT 59601
(406) 495-6186

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Attached: Figure 2-1 – Planning Area

[ ] Department of Fish, Wildlife and Parks has reviewed the enclosed information and has no comment on the project at this time.

_____ _____
Signature Date

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GreatWest ENGINEERING

February 16, 2023

Department of Natural Resources and Conservation
Attn: Resource Development Bureau Engineer
PO Box 201601
Helena MT 59620-1601

RE: Town of Ennis, Montana, Water System Improvements

Dear Department of Natural Resources and Conservation:

The purpose of this letter is to solicit comments regarding issues of concern that may result from the construction of improvements to the water system in the Town of Ennis. Ennis is a town of 917 residents and is located in central Madison County. The Town is situated at the junction of U.S. Highway 287 and Montana Highway 287. The project area is more specifically located at:

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Great West Engineering, Inc.
Attn: Joel Pilcher, PE
2501 Belt View Drive
Helena, MT 59601
(406) 495-6186

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Attached: Figure 2-1 – Planning Area

[ ] Department of Natural Resources and Conservation has reviewed the enclosed information and has no comment on the project at this time.

_____ _____
Signature Date

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GreatWest ENGINEERING

February 16, 2023

Department of Transportation
PO Box 201001
Helena MT 59620

RE: Town of Ennis, Montana, Water System Improvements

Dear Department of Transportation:

The purpose of this letter is to solicit comments regarding issues of concern that may result from the construction of improvements to the water system in the Town of Ennis. Ennis is a town of 917 residents and is located in central Madison County. The Town is situated at the junction of U.S. Highway 287 and Montana Highway 287. The project area is more specifically located at:

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We would appreciate feedback and comments from Department of Transportation. Please send your responses and/or confirmation that there is no comment, back to me by March 1, 2023, at jpilcher@greatwesteng.com or the following address:

Great West Engineering, Inc.
Attn: Joel Pilcher, PE
2501 Belt View Drive
Helena, MT 59601
(406) 495-6186

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Attached: Figure 2-1 – Planning Area

[ ] Department of Transportation has reviewed the enclosed information and has no comment on the project at this time.

_____ _____

Signature Date

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GreatWest ENGINEERING

February 16, 2023

State Historic Preservation Office
PO Box 201202
Helena MT 59620

RE: Town of Ennis, Montana, Water System Improvements

Dear State Historic Preservation Office:

The purpose of this letter is to solicit comments regarding issues of concern that may result from the construction of improvements to the water system in the Town of Ennis. Ennis is a town of 917 residents and is located in central Madison County. The Town is situated at the junction of U.S. Highway 287 and Montana Highway 287. The project area is more specifically located at:

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Please take a few moments to review the site and the proposed project. Please provide a written response detailing any comments you may have regarding the project and any potential environmental impacts that should be considered in the project design, and any avoidance or mitigation measures.

We would appreciate feedback and comments from State Historic Preservation Office. Please send your responses and/or confirmation that there is no comment, back to me by March 1, 2023, at jpilcher@greatwesteng.com or the following address:

Great West Engineering, Inc.
Attn: Joel Pilcher, PE
2501 Belt View Drive
Helena, MT 59601
(406) 495-6186

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Attached: Figure 2-1 – Planning Area

[ ] State Historic Preservation Office has reviewed the enclosed information and has no comment on the project at this time.

_____ _____

Signature Date

See what's possible.

SHPO Project #:

File Search Request Form

Contact Name:	Joel Pilcher
Organization:	Great West Engineering
Address:	2501 Belt View Drive
City/State/Zip:	Helena, MT 59601
Telephone:	406-495-6186
Email:	jpilcher@greatwesteng.com

MONTANA HISTORICAL SOCIETY

Historic Preservation Office
1301 E. Lockey, PO Box 201202
Helena, MT 59620-1202

SEND TO: Damon Murdo
dmurdo@mt.gov (406) 444-7767

Project Name:	Town of Ennis - Water System Improvements
Describe the proposed project:	The proposed project will likely include the construction of two new water supply wells at Town owned property near the rodeo grounds, and replacement of the existing storage tank with a new 700,000 gallon pretressed concrete storage tank. The majority of the work will most likely be done within the public right of way and in existing easements.

Land Use:	Commercial/Residential	**County:**	**Madison**
Agency Involved: (Private,FWP,BLM)	Town of Ennis	**Land Ownership:**	**Public right-of-way and existing easements.**

Project Area Location Information

Township(N/S)	Range (E/W)	Section(s)
5S	1W	32, 33
6S	1W	4

File Search Fee Structure

$35 / section

Please complete this form and attach a map showing the proposed project location. Feel free to attach additional project information if available.

All fields must be completed in order to process your request.

All sections must be added up and entered in to the box below before a file search will take place.

An invoice will be sent with your file search results.

Total Sections to be searched:	1
Total amount to be paid to SHPO:	**$35.00**

See what's possible.

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GreatWest ENGINEERING

February 16, 2023

Madison County
Floodplain Manager
PO Box 278
Virginia City MT 59755

RE: Town of Ennis, Montana, Water System Improvements

Dear Madison County:

The purpose of this letter is to solicit comments regarding issues of concern that may result from the construction of improvements to the water system in the Town of Ennis. Ennis is a town of 917 residents and is located in central Madison County. The Town is situated at the junction of U.S. Highway 287 and Montana Highway 287. The project area is more specifically located at:

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Attn: Joel Pilcher, PE
2501 Belt View Drive
Helena, MT 59601
(406) 495-6186

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Attached: Figure 2-1 – Planning Area

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_____ _____

Signature Date

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GREAT FALLS
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Great Falls, MT 59405
Ph: (406) 952-1109

SPOKANE
9221 N Division Street
Suite F
Spokane, WA 99218
Ph: (509) 413-1430

GreatWest ENGINEERING

February 16, 2023

US Environmental Protection Agency
Montana Office
Federal Building
10 West 15th Street, Suite 3200
Helena MT 59625

RE: Town of Ennis, Montana, Water System Improvements

Dear US Environmental Protection Agency:

The purpose of this letter is to solicit comments regarding issues of concern that may result from the construction of improvements to the water system in the Town of Ennis. Ennis is a town of 917 residents and is located in central Madison County. The Town is situated at the junction of U.S. Highway 287 and Montana Highway 287. The project area is more specifically located at:

Township/Range/Section:	Township 5S, Range 1W, Sections: 32 & 33, and Township 6S, Range 1W, Section 4
Latitude/Longitude:	45° 20' 57" North Latitude, 111° 43' 58" West Longitude
Elevation:	4,941 Feet

Enclosed is a map of the Planning Area (Figure 2.1) to help illustrate our proposed project locations.

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We would appreciate feedback and comments from US Environmental Protection Agency. Please send your responses and/or confirmation that there is no comment, back to me by March 1, 2023, at jpilcher@greatwesteng.com or the following address:

Great West Engineering, Inc.
Attn: Joel Pilcher, PE
2501 Belt View Drive
Helena, MT 59601
(406) 495-6186

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Attached: Figure 2-1 – Planning Area

[ ] US Environmental Protection Agency has reviewed the enclosed information and has no comment on the project at this time.

_____ _____

Signature Date

See what's possible.

See what's possible.

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2501 Belt View Drive
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GreatWest ENGINEERING

February 16, 2023

US Fish and Wildlife Service
Ecological Services
585 Shepherd Way
Helena MT 59601

RE: Town of Ennis, Montana, Water System Improvements

Dear US Fish and Wildlife Service:

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February 16, 2023

US Forest Service
Lisa Timchak
420 Barett Street
Dillon MT 593725-3572

RE: Town of Ennis, Montana, Water System Improvements

Dear US Forest Service:

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GreatWest ENGINEERING

February 16, 2023

National Park Service
PO Box 25287
Denver CO 80225-0287

RE: Town of Ennis, Montana, Water System Improvements

Dear National Park Service:

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GreatWest ENGINEERING

February 16, 2023

Federal Aviation Administration
Airport District Office
2725 Skyway Drive
Suite 2
Helena MT 59602

RE: Town of Ennis, Montana, Water System Improvements

Dear Federal Aviation Administration:

The purpose of this letter is to solicit comments regarding issues of concern that may result from the construction of improvements to the water system in the Town of Ennis. Ennis is a town of 917 residents and is located in central Madison County. The Town is situated at the junction of U.S. Highway 287 and Montana Highway 287. The project area is more specifically located at:

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Great West Engineering, Inc.
Attn: Joel Pilcher, PE
2501 Belt View Drive
Helena, MT 59601
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GreatWest ENGINEERING

February 16, 2023

Bureau of Land Management
5001 Southgate Drive
Billings MT 59101

RE: Town of Ennis, Montana, Water System Improvements

Dear Bureau of Land Management:

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GreatWest ENGINEERING

February 16, 2023

Bureau of Indian Affairs
2021 4th Ave N.
Billings MT 59101

RE: Town of Ennis, Montana, Water System Improvements

Dear Bureau of Indian Affairs:

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GreatWest ENGINEERING

February 16, 2023

Natural Resource Conservation Service
10 E. Babcock St.
Bozeman MT 59771

RE: Town of Ennis, Montana, Water System Improvements

Dear Natural Resource Conservation Service:

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GreatWest ENGINEERING

February 16, 2023

Occupational Safety and Health Administration
2900 4th Ave. N
Billings MT 59101

RE: Town of Ennis, Montana, Water System Improvements

Dear Occupational Safety and Health Administration:

The purpose of this letter is to solicit comments regarding issues of concern that may result from the construction of improvements to the water system in the Town of Ennis. Ennis is a town of 917 residents and is located in central Madison County. The Town is situated at the junction of U.S. Highway 287 and Montana Highway 287. The project area is more specifically located at:

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February 16, 2023

US Department of Transportation
585 Shephard Way
Helena MT 59601

RE: Town of Ennis, Montana, Water System Improvements

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HELENA
2501 Belt View Drive
Helena, MT 59601
Ph: (406) 449-8627
F: (406) 449-8631

BILLINGS
6780 Trade Center Avenue
Billings, MT 59101
Ph: (406) 652-5000
F: (406) 248-1363

BOISE
3050 N Lakeharbor Lane
Suite 201
Boise, ID 83703
Ph: (208) 576-6646

GREAT FALLS
702 2nd Street S, #2
Great Falls, MT 59405
Ph: (406) 952-1109

SPOKANE
9221 N Division Street
Suite F
Spokane, WA 99218
Ph: (509) 413-1430

GreatWest ENGINEERING

February 16, 2023

Department of Natural Resources and Conservation Water Resources Regional Office
Bozeman Regional Office
2273 Boot Hill Court, Ste 110
Bozeman MT 59715

RE: Town of Ennis, Montana, Water System Improvements

Dear Department of Natural Resources and Conservation Water Resources Regional Office:

The purpose of this letter is to solicit comments regarding issues of concern that may result from the construction of improvements to the water system in the Town of Ennis. Ennis is a town of 917 residents and is located in central Madison County. The Town is situated at the junction of U.S. Highway 287 and Montana Highway 287. The project area is more specifically located at:

Township/Range/Section:	Township 5S, Range 1W, Sections: 32 & 33, and Township 6S, Range 1W, Section 4
Latitude/Longitude:	45° 20' 57" North Latitude, 111° 43' 58" West Longitude
Elevation:	4,941 Feet

Enclosed is a map of the Planning Area (Figure 2.1) to help illustrate our proposed project locations.

The water supply capacity from the Town's two existing wells is insufficient for current and future demands and does not comply with DEQ standards. Additional source capacity is needed to ensure the Town can meet projected demands and DEQ standards. The Town's current 500,000-gallon bolted steel water storage tank is nearly 30 years old, is undersized for current demands and would require significant rehabilitation and repair to extend its service life.

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Please take a few moments to review the site and the proposed project. Please provide a written response detailing any comments you may have regarding the project and any potential environmental impacts that should be considered in the project design, and any avoidance or mitigation measures.

We would appreciate feedback and comments from Department of Natural Resources and Conservation Water Resources Regional Office. Please send your responses and/or confirmation that there is no comment, back to me by March 1, 2023, at jpilcher@greatwesteng.com or the following address:

Great West Engineering, Inc.
Attn: Joel Pilcher, PE
2501 Belt View Drive
Helena, MT 59601
(406) 495-6186

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Attached: Figure 2-1 – Planning Area

[ ] Department of Natural Resources and Conservation Water Resources Regional Office has reviewed the enclosed information and has no comment on the project at this time.

_____ _____
Signature Date

See what's possible.

See what's possible.

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GreatWest ENGINEERING

February 16, 2023

Apache Tribe of Oklahoma
Bobby Komardley, Chairman
PO Box 1330
Anadarko OK 73005

RE: Town of Ennis, Montana, Water System Improvements

Dear Apache Tribe of Oklahoma:

The purpose of this letter is to solicit comments regarding issues of concern that may result from the construction of improvements to the water system in the Town of Ennis. Ennis is a town of 917 residents and is located in central Madison County. The Town is situated at the junction of U.S. Highway 287 and Montana Highway 287. The project area is more specifically located at:

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We would appreciate feedback and comments from Apache Tribe of Oklahoma. Please send your responses and/or confirmation that there is no comment, back to me by March 1, 2023, at jpilcher@greatwesteng.com or the following address:

Great West Engineering, Inc.
Attn: Joel Pilcher, PE
2501 Belt View Drive
Helena, MT 59601
(406) 495-6186

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Attached: Figure 2-1 – Planning Area

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_____ _____

Signature Date

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GreatWest ENGINEERING

February 16, 2023

Fort Belknap Indian Community of the Fort Belknap Reservation of Montana
Michael Blackwolf, THPO
656 Agency Main Street
Harlem MT 59526-9455

RE: Town of Ennis, Montana, Water System Improvements

Dear Fort Belknap Indian Community of the Fort Belknap Reservation of Montana:

The purpose of this letter is to solicit comments regarding issues of concern that may result from the construction of improvements to the water system in the Town of Ennis. Ennis is a town of 917 residents and is located in central Madison County. The Town is situated at the junction of U.S. Highway 287 and Montana Highway 287. The project area is more specifically located at:

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We would appreciate feedback and comments from Fort Belknap Indian Community of the Fort Belknap Reservation of Montana. Please send your responses and/or confirmation that there is no comment, back to me by March 1, 2023, at jpilcher@greatwesteng.com or the following address:

Great West Engineering, Inc.
Attn: Joel Pilcher, PE
2501 Belt View Drive
Helena, MT 59601
(406) 495-6186

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Attached: Figure 2-1 – Planning Area

[ ] Fort Belknap Indian Community of the Fort Belknap Reservation of Montana has reviewed the enclosed information and has no comment on the project at this time.

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Signature Date

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GreatWest ENGINEERING

February 16, 2023

Fort Belknap Indian Community of the Fort Belknap Reservation of Montana
Jeffery (Jeff) Stiffarm, President
RR1, Box 66
Harlem MT 59526-9455

RE: Town of Ennis, Montana, Water System Improvements

Dear Fort Belknap Indian Community of the Fort Belknap Reservation of Montana:

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Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

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GreatWest ENGINEERING

February 16, 2023

Shoshone-Bannock Tribes of the Fort Hall Reservation
Tino Batt, Chairman
PO Box 306
Fort Hall ID 83203-0306

RE: Town of Ennis, Montana, Water System Improvements

Dear Shoshone-Bannock Tribes of the Fort Hall Reservation:

The purpose of this letter is to solicit comments regarding issues of concern that may result from the construction of improvements to the water system in the Town of Ennis. Ennis is a town of 917 residents and is located in central Madison County. The Town is situated at the junction of U.S. Highway 287 and Montana Highway 287. The project area is more specifically located at:

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We would appreciate feedback and comments from Shoshone-Bannock Tribes of the Fort Hall Reservation. Please send your responses and/or confirmation that there is no comment, back to me by March 1, 2023, at jpilcher@greatwesteng.com or the following address:

Great West Engineering, Inc.
Attn: Joel Pilcher, PE
2501 Belt View Drive
Helena, MT 59601
(406) 495-6186

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Attached: Figure 2-1 – Planning Area

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_____ _____
Signature Date

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Spokane, WA 99218
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GreatWest ENGINEERING

February 16, 2023

Little Shell Tribe
Gerald Gray, Chairman
615 Central Ave W
Great Falls MT 59404

RE: Town of Ennis, Montana, Water System Improvements

Dear Little Shell Tribe:

The purpose of this letter is to solicit comments regarding issues of concern that may result from the construction of improvements to the water system in the Town of Ennis. Ennis is a town of 917 residents and is located in central Madison County. The Town is situated at the junction of U.S. Highway 287 and Montana Highway 287. The project area is more specifically located at:

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We would appreciate feedback and comments from Little Shell Tribe. Please send your responses and/or confirmation that there is no comment, back to me by March 1, 2023, at jpilcher@greatwesteng.com or the following address:

Great West Engineering, Inc.
Attn: Joel Pilcher, PE
2501 Belt View Drive
Helena, MT 59601
(406) 495-6186

Sincerely,

Great West Engineering, Inc.

Joel Pilcher, PE
Project Manager

Attached: Figure 2-1 – Planning Area

[ ] Little Shell Tribe has reviewed the enclosed information and has no comment on the project at this time.

_____ _____

Signature Date

See what's possible.

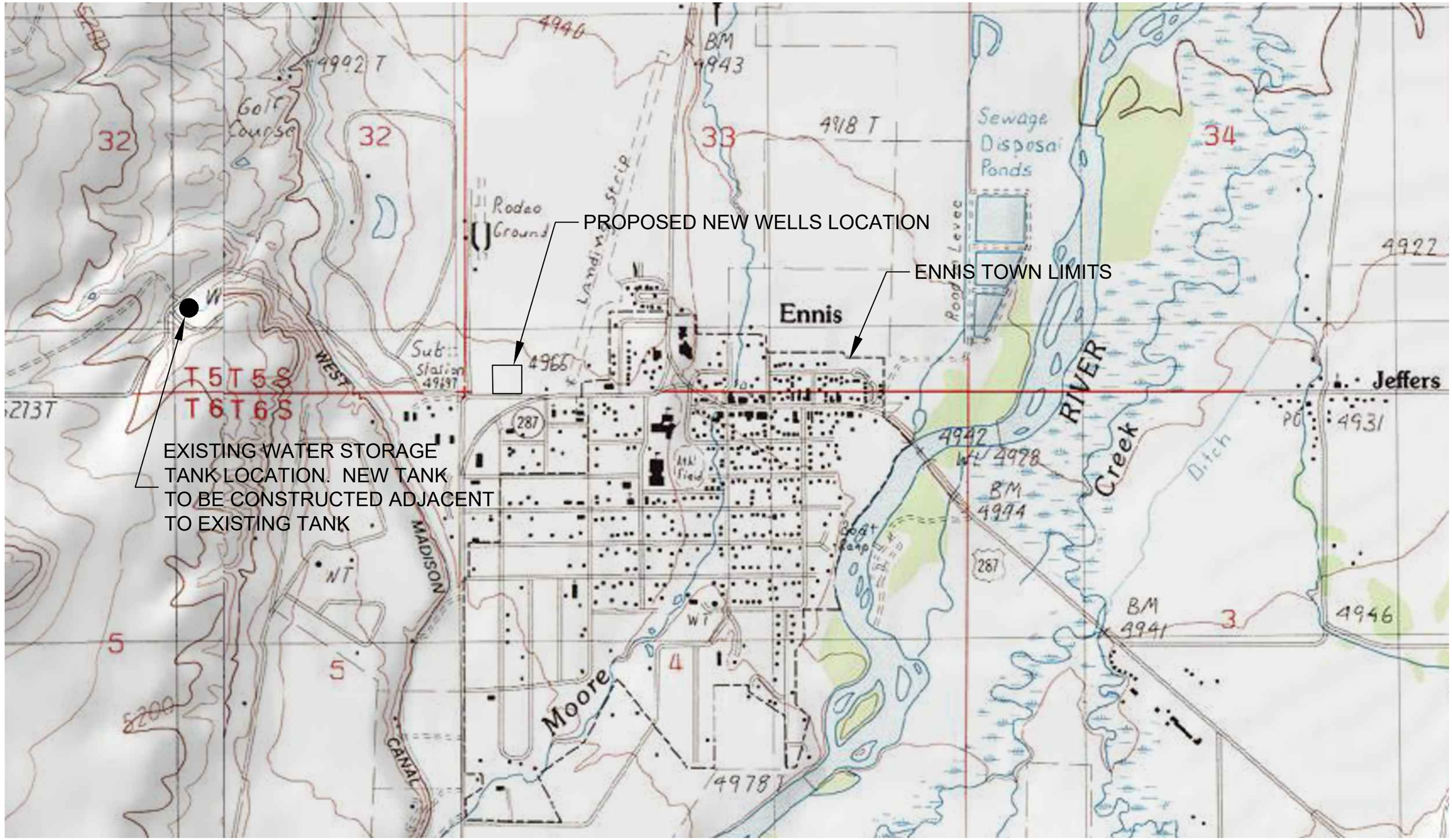


Figure 2-1
Planning Area

TOWN OF ENNIS
WATER SYSTEM IMPROVEMENTS

GreatWest ENGINEERING

Y:\Shared\Helena Projects\1-18184-Ennis On Call 2018\TO 7 - Water PER\CADD 1-18184-T07\Exhibits\1-18184-T07-Planning Area.dwg

From: Murdo, Damon
To: Joel Pilcher
Subject: TOWN OF ENNIS WATER SYSTEM IMPROVEMENTS
Date: Wednesday, February 22, 2023 11:28:37 AM
Attachments: image001.png
image003.png
Reports.pdf
Sites.pdf
2023022202.pdf

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

February 22, 2023

Joel Pilcher
Great West Engineering
2501 Belt View Drive
Helena MT 59601

RE: TOWN OF ENNIS WATER SYSTEM IMPROVEMENTS. SHPO Project #: 2023022202

Dear Mr. Pilcher:

I have conducted a cultural resource file search for the above-cited project located in Sections 32, 33, T5S R1W, and Section 4, T6S R1W. According to our records there have been a few previously recorded sites within the designated search locale. In addition to the sites there have been a few previously conducted cultural resource inventories done in the area. I've attached a list of the sites and reports. If you would like any further information regarding the sites or reports, you may contact me at the number listed below.

It is SHPO's position that any structure over fifty years of age is considered historic and is potentially eligible for listing on the National Register of Historic Places. If any structures are within the Area of Potential Effect, and are over fifty years old, we would recommend that they be recorded, and a determination of their eligibility be made prior to any disturbance taking place.

As long as there will be no disturbance or alteration to structures over fifty years of age, we feel that there is a low likelihood cultural properties will be impacted. We, therefore, feel that a recommendation for a cultural resource inventory is unwarranted at this time. However, should structures need to be altered or if cultural materials are inadvertently discovered during this project, we would ask that our office be contacted, and the site investigated.

If you have any further questions or comments, you may contact me at (406) 444-7767 or by e-mail at dmurdo@mt.gov. I have attached an invoice for the file search. Thank you for consulting with us.

Sincerely,

Damon Murdo
Cultural Records Manager
State Historic Preservation Office

File: DEQ/AWWM/2023

STATE HISTORIC PRESERVATION OFFICE
Montana Cultural Resource Database
CRABS Township,Range,Section Results
Report Date:2/22/2023

Township:5 S Range:1 W Section: 33

HERBORT DALE P., ET AL.

4/1/1989 CULTURAL RESOURCE EVALUATION: ENNIS NORTH FEDERAL AID PROJECT

CRABS Document Number: MA 4 5544 Agency Document Number: F13-1(10)49

Township:6 S Range:1 W Section: 4

CAYWOOD JANENE M., ET AL.

3/11/1991 EVALUATION OF REGION 1 FOREST SERVICE-OWNED BUILDINGS FOR ELIGIBILITY TO THE NATIONAL REGISTER OF HISTORIC PLACES

CRABS Document Number: ZZ 1 13017 Agency Document Number:

Township:5 S Range:1 W Section: 33

FANDRICH BLAIN W.

5/21/1997 SOUTHEAST OF ENNIS, MONTANA: A CULTURAL RESOURCE INVENTORY ALONG PORTIONS OF US HIGHWAY 287

CRABS Document Number: MA 4 19306 Agency Document Number:

Township:6 S Range:1 W Section: 4

FANDRICH BLAIN W.

5/21/1997 SOUTHEAST OF ENNIS, MONTANA: A CULTURAL RESOURCE INVENTORY ALONG PORTIONS OF US HIGHWAY 287

CRABS Document Number: MA 4 19306 Agency Document Number:

Township:6 S Range:1 W Section: 4

FANDRICH BLAIN W.

5/21/1997 SOUTHEAST OF ENNIS, MONTANA: A CULTURAL RESOURCE INVENTORY ALONG PORTIONS OF US HIGHWAY 287

CRABS Document Number: MA 4 19306 Agency Document Number:

Township:6 S Range:1 W Section: 4

BRUMLEY JOHN H.

1/1/2001 A CULTURAL RESOURCE INVENTORY OF THE PROPOSED BIG SKY TO ENNIS TELEPHONE CABLE ROUTE IN MADISON COUNTY MONTANA

CRABS Document Number: MA 6 23882 Agency Document Number:

Township:6 S Range:1 W Section: 4

FULBRIGHT ZANE L

2/2/2003 BEAVERHEAD-DEERLODGE NATIONAL FOREST SOUTH ZONE 2002 ANNUAL HERITAGE REPORT IN BEAVERHEAD COUNTY MONTANA

CRABS Document Number: BE 1 26351 Agency Document Number: ANNUAL REPORT-2002

Township:6 S Range:1 W Section: 4

RYAN J. MICHAEL

3/27/2007 OLD MADISON DISTRICT WAREHOUSE RE-EVALUATION

CRABS Document Number: MA 1 35968 Agency Document Number: 06-BD-6-4

STATE HISTORIC PRESERVATION OFFICE
Cultural Resource Information Systems
CRIS Township, Range, Section Report
Report Date:2/22/2023

Site #	Twp	Rng	Sec	Qs	Site Type 1	Site Type 2	Time Period	Owner	NR Status
24MA1702	6S	1W	4	NE	Historic Residence		Historic Period	Private	Eligible
24MA1027	6S	1W	4	NE	Combo Prehistoric/Historic		Prehistoric More Than One Period	Private	Ineligible
24MA1204	6S	1W	4	NE	Historic Architecture		Historic More Than One Decade	State Owned	Ineligible
24MA1696	6S	1W	4	NE	Historic Railroad Bridge		Historic More Than One Decade	MDOT	Ineligible
24MA1697	6S	1W	4	NE	Historic Railroad Bridge		Historic More Than One Decade	MDOT	Ineligible
24MA1703	6S	1W	4	NE	Historic Commercial Development		Historic More Than One Decade	Private	Ineligible
24MA1704	5S	1W	33	SE	Historic Commercial Development		Historic More Than One Decade	Private	Eligible
24MA1704	6S	1W	4	NE	Historic Commercial Development		Historic More Than One Decade	Private	Eligible
24MA1705	6S	1W	4	NE	Historic Architecture		Historic More Than One Decade	Private	Ineligible
24MA1706	6S	1W	4	NE	Historic Trash Dump		Historic Period	Private	Ineligible
24MA2041	6S	1W	4	Comb	Historic Road		Historic More Than One Decade	BLM and Other	Undetermined*

From: Strasheim, Kerri
To: Joel Pilcher
Subject: Town of Ennis Water System Improvements
Date: Tuesday, February 21, 2023 5:17:22 PM

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Joel –

I just received the request for comments on the Town of Ennis water system improvements. I am wondering if you are lead contact regarding water rights planning, and does Ennis have water rights planning in place for this increase in supply?

Thank you for any assistance with this,
Kerri

_____
Kerri Strasheim
Regional Manager – Gallatin, Madison, and Park Counties
MT DNRC Water Resources
2273 Boot Hill Court, Suite 110
Bozeman, MT 59715
Ph: 406-556-4504

From: Martin, Jacob
To: Joel Pilcher
Subject: Town of Ennis, Montana, water system improvements
Date: Wednesday, February 22, 2023 3:15:56 PM

CAUTION: This email originated from outside your organization. Exercise caution when opening attachments or clicking links, especially from unknown senders.

Dear Mr. Pilcher:

Thank you for your February 16, 2023, letter, requesting U.S. Fish and Wildlife Service (USFWS) comment on proposed improvements to the subject water system in Ennis, Madison County, Montana. The Town of Ennis is considering construction of two additional supply wells and replacement of an existing storage tank. Construction would take place in generally open areas nearby and west of Ennis.

The USFWS reviewed your letter. The project would be constructed in areas where the federally threatened grizzly bear may be present. The Service therefore recommends implementation of the following (or similar) conservation measures to manage potential bear attractants and reduce the risk of human-grizzly bear conflicts related to this project:

0. Promptly clean up any project related spills, litter, garbage, debris, etc.
1. No overnight camping within the project vicinity, except in designated campgrounds, by any crew member or other personnel associated with this project.
2. Store all food, food related items, petroleum products, antifreeze, garbage, personal hygiene items, and other attractants inside a closed, hard-sided vehicle or commercially manufactured bear resistant container.
3. Remove garbage from the project site daily and dispose of it in accordance with all applicable regulations.
4. Notify the Project Manager of any animal carcasses found in the area.
5. Notify the Project Manager of any bears observed in the vicinity of the project.

Based on the information provided, we have no comments regarding other federally listed or proposed threatened or endangered species or other trust species. Additional information regarding listed species that may occur within the project footprint may be obtained using the IPaC project-planning tool, which streamlines the USFWS environmental review process at https://ecos.fws.gov/ipac/.

Thank you for the opportunity to comment. If you have any questions or comments about this correspondence, please contact me via reply email or at the address or phone numbers, below.

Sincerely,

Jacob M. (Jake) Martin
Deputy Field Supervisor
Montana Ecological Services Office
585 Shephard Way, Suite 1
Helena, Montana 59601
(406) 422-8524 (cell, preferred, I'm probably teleworking)
(406) 430-9007 (office)
jacob_martin@fws.gov

DEPARTMENT OF THE ARMY
U.S. CORPS OF ENGINEERS, OMAHA DISTRICT
MONTANA REGULATORY OFFICE
100 NEILL AVENUE
HELENA, MONTANA 59601-3329

June 6, 2023

SUBJECT: Town of Ennis (Great West Engineering) Water System Improvements (Madison County), File No. **NWO-2023-00292-MT**

Kasia Bothman-Little
Great West Engineering
2501 Belt View Drive
Helena, Montana 59601

Dear Ms. Bothman-Little:

This letter is in response to correspondence we received requesting comments or permitting information regarding the above-referenced project. Specifically, the project involves water system improvements. Including the construction of two new water supply wells at town owned property near the rodeo grounds, and replacement of the existing storage tank with a new 700,000-gallon prestressed concrete storage tank. . The project is located on or near Moore Creek, at Latitude 45.349166°, Longitude -111.732777°, in Section 33, Township 5 S, Range 1 W, Ennis, Madison County, Montana.

This letter contains our initial comments on this project for your consideration. The purpose of this letter is to inform you that based on the information provided in your submittal, we are unable to ascertain if regulated activities are proposed or if jurisdictional waters of the U.S. are present within the project area. A Department of the Army (DA) permit may be required for the proposed activity. In lieu of a specific response, please consider the following general information concerning our regulatory program that may apply to the proposed project.

If the proposal involves activity in navigable waters of the United States, it may be subject to the U.S. Army Corps of Engineers (USACE) jurisdiction under Section 10 of the Rivers and Harbors Act of 1899 (RHA). Within the state of Montana, portions of the Kootenai River, the Missouri River, and the Yellowstone River[1] are considered a navigable water of the U.S. Section 10 prohibits the construction, excavation, or deposition of materials in, over, or under navigable waters of the United States unless the work has been authorized by a DA permit. Structures or work outside the limits defined for navigable waters of the United States require a Section 10 permit if the

[1] Section 10 waters in Montana are the Kootenai River (from the International Border between the United States and Canada downstream to Jennings Rapids near Jennings, Montana), the Missouri River and its impoundments (from its headwaters near Three Forks to the North Dakota state line), and the Yellowstone River (from Emigrant to the North Dakota state line).

structure or work affects the course, location, or condition of the water body. The law applies to any dredging or disposal of dredged materials, excavation, filling, rechannelization, or any other modification of a navigable water of the United States, and applies to all structures, from the smallest floating dock to the largest commercial undertaking.

If the proposal involves a discharge of dredged or fill material into waters of the United States, it may be subject to USACE jurisdiction under Section 404 of the Clean Water Act (CWA). Discharges of fill material generally include, without limitation: placement of fill that is necessary for the construction of any structure, or impoundment requiring rock, sand, dirt, or other material for its construction; site-development fills for recreational, industrial, commercial, residential, and other uses; causeways or road fills; dams and dikes; property protection or reclamation devices such as riprap, weirs, bulkheads, and revetments; levees or berms; fill for intake and outfall pipes and trenched utility lines; fill associated with the creation of ponds; and any other work involving the discharge of fill or dredged material. A DA permit is required whether the work is permanent or temporary. Waters of the U.S. include the area below the ordinary high water mark of stream channels, lakes or ponds connected to the tributary system, and wetlands adjacent to these waters (33 CFR § 328.3). Isolated waters and wetlands, as well as man-made channels, may be waters of the U.S. in certain circumstances, which must be determined on a case-by-case basis. CWA Section 301(a) prohibits discharges of dredged or fill material into waters of the United States, unless the work has been authorized by a Department of the Army permit under Section 404. Information about the USACE permitting process can be obtained online at http://www.nwo.usace.army.mil/Missions/RegulatoryProgram/Montana.

The mission of the USACE Regulatory Program is to protect the Nation’s aquatic resources while allowing reasonable development through fair, flexible and balanced permit decisions. Under Section 404 of the Clean Water Act, we work to protect the biological, physical, and chemical integrity of the Nation’s aquatic resources. Projects are evaluated on a case-by-case basis to determine the potential benefits and detriments that may occur as a result of the proposal.

Before a permit is issued or verified, the Corps must ensure that we've met all our obligations under any related federal and state laws. For all projects, the Corps will consult with other state and federal agencies and Native American tribes, as appropriate. USACE evaluation of a Section 10 and/or a Section 404 permit application involves multiple analyses; please see the attached document for additional information and resources for permitting.

Useful documents, links, and information about Jurisdictional Determinations, Pre-Application Meetings, Permit Exemptions, Nationwide Permits, Regional Permits, Individual Permits, and Permit Applications and Permit Resources are available on our webpage: http://www.nwo.usace.army.mil/Missions/RegulatoryProgram/Montana.

Prior to applying for a DA permit, the project proposer may request a pre-application consultation meeting with USACE (virtual or in-person, on or off-site) to obtain information regarding the information needed, alternatives, and options for permitting before an applicant makes irreversible commitments of resources (funds, detailed designs, materials, etc.). A pre-application meeting is strongly recommended if the proposal has substantial impacts to waters of the U.S., or if it is a large, unique, or controversial project.

USACE Section 10/404 permits do not cover other potential authorizations that are often required. Others may include state or local permits such as a 310 Permit, SPA 124 Permit, 318 Authorization or 401 Water Quality Certification, Navigable Rivers Land Use License, or Floodplain Permit. Local and state governments issue permits or other authorizations to ensure compliance with local and state laws and regulations. The Corps permitting program is in place to ensure your project is in compliance with federal laws and regulations.

Note that this letter is not a DA authorization to proceed. It only informs you of the need to obtain a DA permit if waters of the U.S. will be affected. If the final design includes the placement of fill material in any jurisdictional area described above, or otherwise requires authorization by a DA permit, please submit a Montana Joint Permit Application to this office prior to starting any work. After a review of the materials submitted, we will determine what type of permit, if any, will be required. If waters of the U.S. will not be affected by a jurisdictional activity a DA permit will not be required for the project.

Please refer to identification number **NWO-2023-00292-MT** in any correspondence concerning this project. If you have any questions, please contact the Montana Regulatory Office by email at Montana.Reg@usace.army.mil, or by telephone at (406) 441-1375.

Sincerely,

Montana
Regulatory Team

Enclosure

The Omaha District, Regulatory Branch is committed to providing quality and timely service to our customers. In an effort to improve customer service, please take a moment to complete our Customer Service Survey found on our website at: https://regulatory.ops.usace.army.mil/customer-service-survey/. Paper copies of the survey are also available upon request for those without Internet access.

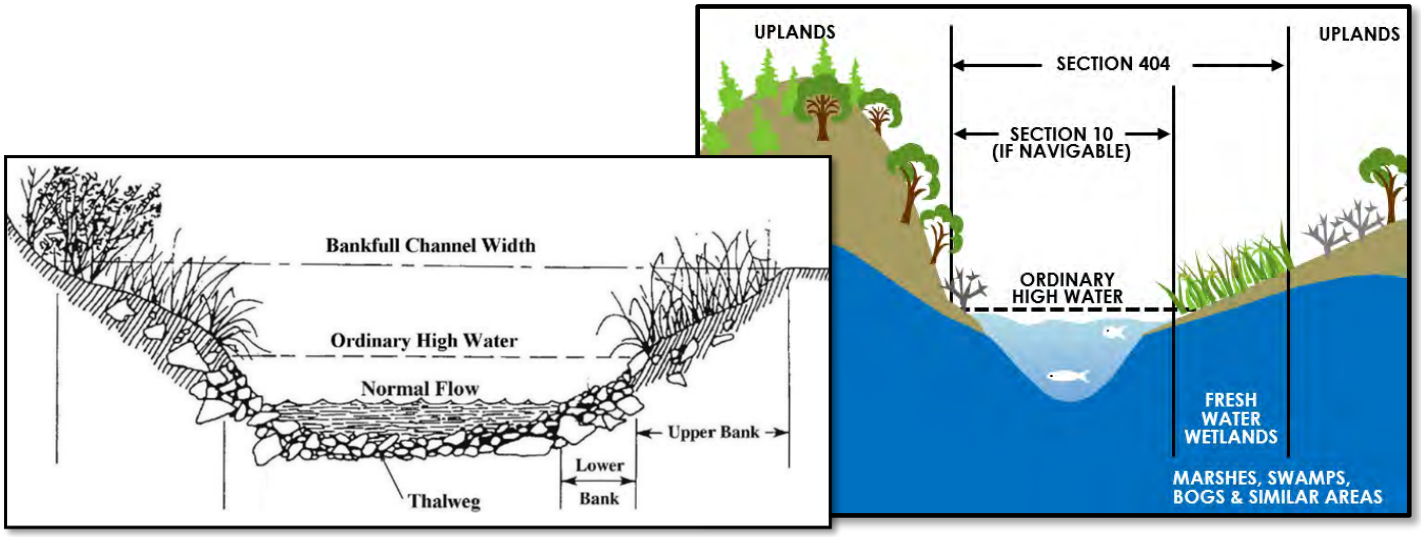
U.S. Army Corps of Engineers – Omaha District, Montana
Additional Information and Resources for Permitting

1. Geographic and Activity Jurisdiction: The U.S. Army Corps of Engineers (USACE) Regulatory Program, administers and enforces **Section 10 of the Rivers and Harbors Act of 1899 (RHA)** and **Section 404 of the Clean Water Act (CWA).**

Under **Section 10 of the RHA**, a permit is required to do **any work in, over or under** a navigable water of the United States or to do **any work that affects the course, location or condition** of the waterbody in such a manner as to impact on its navigable capacity. Navigable waters in Montana include the Missouri River, most of the Yellowstone River and a portion of the Kootenai River, their impoundments and side channels.

Under **Section 404 of the CWA**, a permit is required for the **discharge of dredged or fill material** into waters of the United States (WOTUS). WOTUS includes the area below the ordinary high water mark of river and stream channels, lakes or ponds connected to the tributary system, and wetlands adjacent to these waters. Isolated waters and wetlands, as well as man-made ditches and channels, may be WOTUS in certain circumstances, which must be determined by the Corps on a case-by-case basis.

There are some activities that have been determined to be exempt from USACE regulation. For example, discharges resulting from normal farming, silviculture, and ranching activities (plowing, seeding, cultivating, etc.) are generally not subject to regulation under Section 404 of the CWA. To be considered exempt, these activities must occur in the context of established (on-going) farming operations. You should obtain confirmation from the Corps to avoid a potential violation of federal law before conducting any discharge you believe is exempt.



2. Pre-Application Meeting: Applicants can request a pre-application consultation or meeting – virtual or in-person, on or off-site. This is an optional step, but helpful in determining the information needed for permitting, additional authorizations that may be needed, alternatives, and options for permitting before an applicant makes irreversible commitments of resources (funds, detailed designs, materials, etc.). Send requests for Pre-App meetings to Montana.Reg@usace.army.mil and include information on point of contacts, location, and preliminary project details.

3. Application Submission: Applicants should submit their application package, including maps, plans and drawings to Montana.Reg@usace.army.mil. Submit complete, detailed, and thorough information regarding the project. Processing time cannot begin until the Corps receives complete application information, including proper drawings. We need to be able to locate the project (detailed location map) and easily determine and verify dimensions and position of the project (site plan and cross section drawings).

4. Aquatic Resource Inventory: The application package must include a delineation of waters of the United States and special aquatic sites, including wetlands or pool and riffle complexes, and other waters, such as lakes, ponds and ditches, and perennial, intermittent, and ephemeral streams, on the project site. Wetland delineations must be prepared in accordance with the current method required by USACE to include the use of the 1987 Wetland Delineation Manual and appropriate Regional Supplements. USACE can perform the delineation upon request; however, this may take time to schedule due to often high workloads in USACE District Regulatory offices. Therefore, delineations are typically performed by a consultant hired by the property owner and verified by USACE personnel.

5. Project Evaluations & Alternatives: USACE evaluation of a Section 10 and/or a Section 404 permit application involves multiple analyses, including (1) evaluating the proposal's impacts in accordance with the National Environmental Policy Act (NEPA) (33 CFR part 325), (2) determining whether the proposal is contrary to the public interest (33 CFR § 320.4), and (3) in the case of a Section 404 permit, determining whether the proposal complies with the Section 404(b)(1) Guidelines (Guidelines) (40 CFR part 230). If the proposal requires a Section 404 permit application, the Guidelines specifically require that "no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences" (40 CFR § 230.10(a)). Time and money spent on the proposal prior to applying for a Section 404 permit cannot be factored into the Corps' decision whether there is a less damaging practicable alternative to the proposal.

6. Endangered Species and Critical Habitat: The Endangered Species Act requires Federal agencies to consult with the U.S. Fish and Wildlife Service (Service) and the National Marine Fisheries Service, as appropriate, if an activity that requires Federal authorization (such as a USACE permit) may affect endangered or threatened species or critical habitat. For non-Federal permittees, if any listed species or designated critical habitat might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat, the application must include the name(s) of those endangered or threatened species that might be affected by the proposed activity or utilize the designated critical habitat that might be affected by the proposed activity. The Service has developed an online system that allows users to find information about sensitive resources that may occur within the vicinity of a proposed project. The "Information, Planning and Conservation System," (IPaC), is located at: https://ipac.ecosphere.fws.gov/.

7. Historic and Cultural Resources: Section 106 of the National Historic Preservation Act (NHPA) requires the Corps to take into account the effects that activities authorized by Department of the Army permits are likely to have on historical properties listed in, or eligible for listing in, the National Register of Historic Places (NRHP). Any structure over fifty years of age is considered historic and is potentially eligible for listing on the NRHP unless it has been previously determined ineligible. State Historic Preservation Officers (SHPO) and Tribal Historic Preservation Officers (THPO) are provided the opportunity to review and comment on all individual permit activities and certain general permit activities. For non-Federal permittees, if the activity might have the potential to cause effects to a historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the NRHP, the application must state which historic property might have the potential to be affected by the proposed activity or include a vicinity map indicating the location of the historic property. Inquiry with the Montana SHPO is recommended to determine the presence of any associated historic resources in the area. Contact information can be found at http://mhs.mt.gov/shpo.

8. Water Quality Certification: Section 401 of the Clean Water Act requires any applicant for a permit for an activity that may result in the discharge of a pollutant into WOTUS to obtain a certification that the discharge will comply with applicable effluent limitations and water quality standards. Applications for water quality certifications are reviewed by states, Tribes, or the U.S. Environmental Protection Agency (EPA). Water quality certifications are required for USACE permits that authorize discharges of

dredged or fill materials into WOTUS. Some of the Nationwide Permits (NWP) or Regional General Permits (RGP) have WQC granted for them already; individual permits and other NWP/RGP will require individual certification. Contact our office to determine the appropriate Water Quality Agency for your project.

9. Mitigation: Mitigation consists of avoidance, minimization, and compensation. USACE requires that applicants consider and use all reasonable and practical measures to avoid and minimize impacts to aquatic resources. You are required to submit a mitigation plan/statement with an application if impacts will occur to 0.10 acre of wetlands and/or 0.03 acre of stream.

Compensatory mitigation is the restoration, establishment, enhancement, and in certain circumstances, preservation of aquatic resources to offset unavoidable adverse impacts. Compensatory mitigation is accomplished through purchase of credits from a mitigation bank or in-lieu fee program, or permittee-responsible mitigation. During the application review process, the Corps will determine whether compensatory mitigation is necessary, and may require the applicant submit a plan for conducting proposed compensatory mitigation.

10. Activities Affecting Structures or Works Built by the United States: If any aspect of your proposed project is located within the vicinity of an existing USACE federally authorized Civil Works project (a "USACE project"), you may be required to seek permission from USACE pursuant to 33 U.S.C. 408 (Section 408) and/or real estate related permissions. Alterations/modifications to completed USACE projects requires a USACE permission pursuant to Section 408. In addition, real estate permissions may be necessary if the proposed project would affect United States real estate interests managed by USACE. For information on our Section 408 request process or to determine whether a Section 408 or real estate permission is required, please contact: Section408NWO@usace.army.mil

11. United States Coast Guard (USCG): In Montana, the Missouri River, portions of the Kootenai River, and the majority of the Yellowstone River are considered navigable waters of the U.S. as determined by USACE. The state of Montana considers additional waterways to be navigable waterways. The USCG is the agency with the authority to regulate the construction, operation, and maintenance of bridges and causeways in or across navigable waters under Section 9 of the Rivers and Harbors Act. Aerial trams and conveyors, aqueducts, utility lines, overhead pipelines, and similar structures that are affixed to a bridge span over waters of the U.S., are themselves considered a bridge structure. If the proposed work involves bridging or crossing of a navigable water the work may be regulated by the USCG.

To determine USCG requirements, please contact:

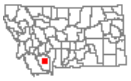
Mr. Steven Fischer
Commander, Thirteenth Coast Guard District (dpw)
Federal Building
915 Second Avenue
Seattle, Washington 98174-1067
(206) 220-7282 | Steven.M.Fischer3@uscg.mil

12. Other Federal, State, or Local Permits: A USACE Section 10/404 permit does not cover other potential authorizations that may be required. Others may include state or local permits such as a 310 Permit, SPA 124 Permit, 318 Authorization or 401 Water Quality Certification, Navigable Rivers Land Use License, or Floodplain Permit. Local and state governments issue permits or other authorizations to ensure compliance with local and state laws and regulations. The Corps permitting program is in place to ensure your project is in compliance with federal laws and regulations.

See the Montana Department of Natural Resources & Conservation – Stream Permitting website for details: http://dnrc.mt.gov/divisions/cardd/conservation-districts/the-310-law

APPENDIX B

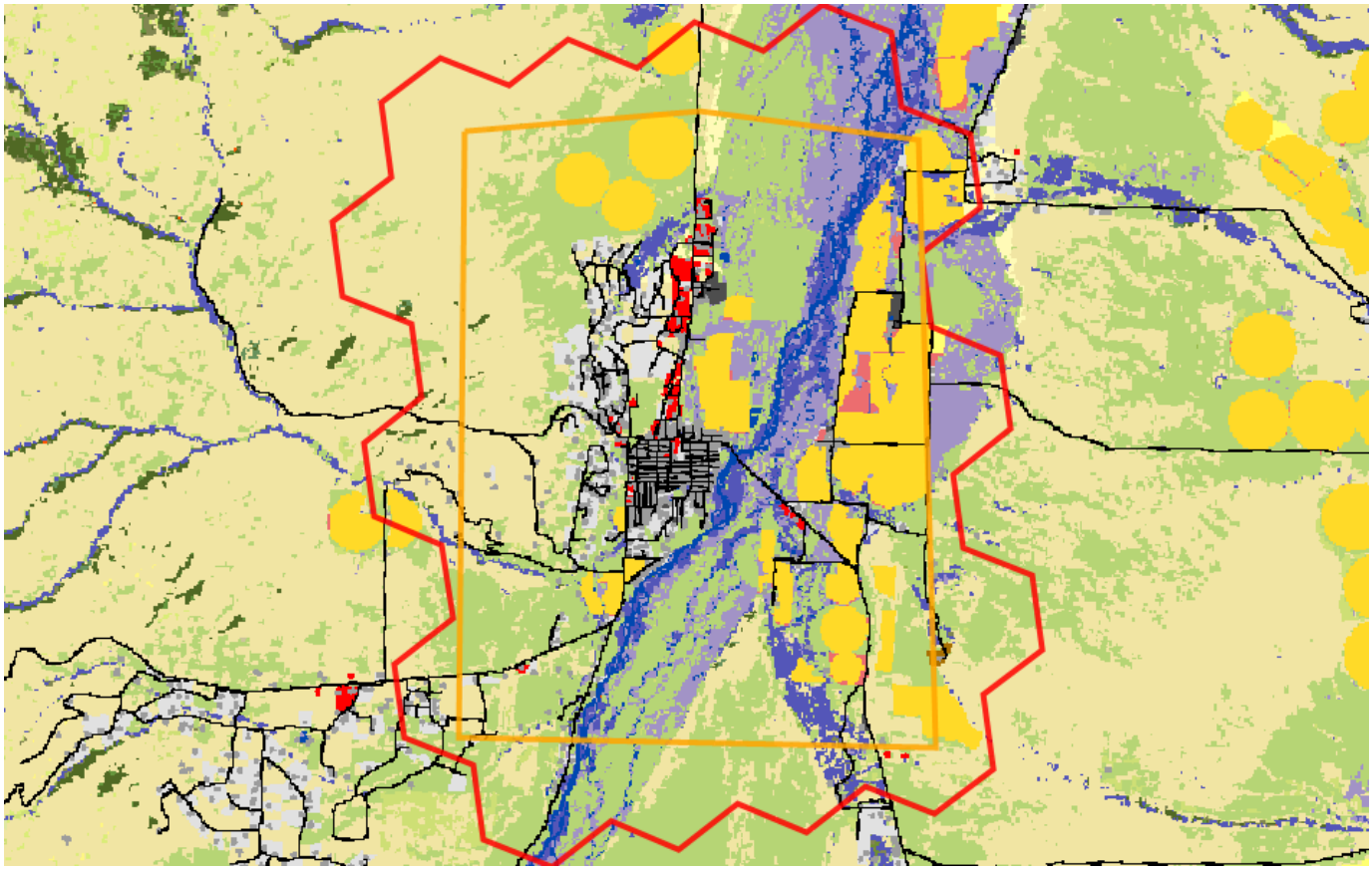
MTNHP Land Cover and Resources



Latitude Longitude
45.29632 -111.67233
45.40295 -111.78961

Land Cover

Summarized by: *(Custom Area of Interest)*





31% (*6,246 Acres*)

Grassland Systems
Montane Grassland

Rocky Mountain Lower Montane, Foothill, and Valley Grassland

This grassland system of the northern Rocky Mountains is found at lower montane to foothill elevations in mountains and valleys throughout Montana. These grasslands are floristically similar to Big Sagebrush Steppe but are defined by shorter summers, colder winters, and young soils derived from recent glacial and alluvial material. They are found at elevations from 548 - 1,650 meters (1,800-5,413 feet). In the lower montane zone, they range from small meadows to large open parks surrounded by conifers; below the lower treeline, they occur as extensive foothill and valley grasslands. Soils are relatively deep, fine-textured, often with coarse fragments, and non-saline. Microphytic crust may be present in high-quality occurrences. This system is typified by cool-season perennial bunch grasses and forbs (>25%) cover, with a sparse shrub cover (<10%). Rough fescue (*Festuca campestris*) is dominant in the northwestern portion of the state and Idaho fescue (*Festuca idahoensis*) is dominant or co-dominant throughout the range of the system. Bluebunch wheatgrass (*Pseudoroegneria spicata*) occurs as a co-dominant throughout the range as well, especially on xeric sites. Western wheatgrass (*Pascopyrum smithii*) is consistently present, often with appreciable coverage (>10%) in lower elevation occurrences in western Montana and virtually always present, with relatively high coverages (>25%), on the edge of the Northwestern Great Plains region. Species diversity ranges from a high of more than 50 per 400 square meter plot on mesic sites to 15 (or fewer) on xeric and disturbed sites. Most occurrences have at least 25 vascular species present. Farmland conversion, noxious species invasion, fire suppression, heavy grazing and oil and gas development are major threats to this system.



26% (*5,242 Acres*)

Shrubland, Steppe and Savanna Systems
Sagebrush Steppe

Montane Sagebrush Steppe

This system dominates the montane and subalpine landscape of southwestern Montana from valley bottoms to subalpine ridges and is found as far north as Glacier National Park. It can also be seen in the island mountain ranges of the north-central and south-central portions of the state. It primarily occurs on deep-soiled to stony flats, ridges, nearly flat ridgetops, and mountain slopes. In general, this system occurs in areas of gentle topography, fine soils, subsurface moisture or mesic conditions, within zones of higher precipitation and areas of snow accumulation. It occurs on all slopes and aspects, variable substrates and all soil types. The shrub component of this system is generally dominated by mountain big sagebrush (*Artemisia tridentata ssp. vaseyana*). Other co-dominant shrubs include silver sagebrush (*Artemisia cana ssp. viscidula),* subalpine big sagebrush (*Artemisia tridentata ssp. spiciformis*), three tip sagebrush (*Artemisia tripartita* ssp. *tripartita*) and antelope bitterbrush (*Purshia tridentata*). Little sagebrush (*Artemisia arbuscula ssp. arbuscula*) shrublands are only found in southwestern Montana on sites with a perched water table. Wyoming big sagebrush (*Artemisia tridentata ssp. wyomingensis*) sites may be included within this system if occurrences are at montane elevations, and are associated with montane graminoids such as Idaho fescue (*Festuca idahoensis),* spike fescue (*Leucopoa kingii*), or poverty oatgrass (*Danthonia intermedia)*. In ares where sage has been eliminated by human activities like burning, disking or poisoning, other shrubs may be dominant, especially rubber rabbitbrush (*Ericameria nauseosa*), and green rabbitbrush (*Chrysothamnus viscidiflorus*). Because of the mesic site conditions, most occurrences support a diverse herbaceous undergrowth of grasses and forbs. Shrub canopy cover is extremely variable, ranging from 10 percent to as high as 40 or 50 percent.



12% (*2,305 Acres*)

Human Land Use
Agriculture
Cultivated Crops

These areas used for the production of crops, such as corn, soybeans, small grains, sunflowers, vegetables, and cotton, typically on an annual cycle. Agricultural plant cover is variable depending on season and type of farming. Other areas include more stable land cover of orchards and vineyards.



9% (*1,865 Acres*)

Wetland and Riparian Systems
Wet meadow
Alpine-Montane Wet Meadow

These moderate-to-high-elevation systems are found throughout the Rocky Mountains, dominated by herbaceous species found on wetter sites with very low-velocity surface and subsurface flows. Occurrences range in elevation from montane to alpine at 1,000 to 3,353 meters (3,280-11,000 feet). This system typically occurs in cold, moist basins, seeps and alluvial terraces of headwater streams or as a narrow strip adjacent to alpine lakes (Hansen et al., 1996). Wet meadows are typically found on flat areas or gentle slopes, but may also occur on sub-irrigated sites with slopes up to 10 percent. In alpine regions, sites are typically small depressions located below late-melting snow patches or on snowbeds. The growing season may only last for one to two months. Soils of this system may be mineral or organic. In either case, soils show typical hydric soil characteristics, including high organic content and/or low chroma and redoximorphic features. This system often occurs as a mosaic of several plant associations, often dominated by graminoids such as tufted hairgrass (*Deschampsia caespitosa*), and a diversity of montane or alpine sedges such as small-head sedge (*Carex illota*), small-winged sedge (*Carex microptera*), black alpine sedge (*Carex nigricans*), Holmâ€™s Rocky Mountain sedge (*Carex scopulorum*) shortstalk sedge (*Carex podocarpa*) and Paysonâ€™s sedge (*Carex paysonis*). Drummondâ€™s rush (*Juncus drummondii*), Mertenâ€™s rush (*Juncus mertensianus*), and high elevation bluegrasses (*Poa arctica* and *Poa alpina*) are often present. Forbs such as arrow-leaf groundsel (*Senecio triangularis*), slender-sepal marsh marigold (*Caltha leptosepala*), and spreading globeflower (*Trollius laxus*) often form high cover in higher elevation meadows. Wet meadows are associated with snowmelt and are usually not subjected to high disturbance events such as flooding.



5% (*964 Acres*)

Wetland and Riparian Systems
Floodplain and Riparian
Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland

This ecological system is found throughout the Rocky Mountain and Colorado Plateau regions. In Montana, it ranges from approximately 945 to 2,042 meters (3,100 to 6,700 feet), characterristically occuring as a mosaic of multiple communities that are tree-dominated with a diverse shrub component. It is dependent on a natural hydrologic regime, especially annual to episodic flooding. Occurrences are found within the flood zone of rivers, on islands, sand or cobble bars, and on immediate streambanks. It can form large, wide occurrences on mid-channel islands in larger rivers or narrow bands on small, rocky canyon tributaries and well-drained benches. It is also typically found in backwater channels and other perennially wet but less scoured sites, such as floodplains swales and irrigation ditches. In some locations, occurrences extend into moderately high intermountain basins where the adjacent vegetation is sage steppe. Dominant trees may include boxelder maple (*Acer negundo*), narrowleaf cottonwood (*Populus angustifolia*), Plains cottonwood (*Populus deltoides*), Douglas-fir (*Pseudotsuga menziesii*), peachleaf willow (*Salix amygdaloides*), or Rocky Mountain juniper (*Juniperus scopulorum*). Dominant shrubs include Rocky Mountain maple (*Acer glabrum*), thinleaf alder (*Alnus incana*), river birch (*Betula occidentalis*), redoiser dogwood (*Cornus sericea*), hawthorne (*Crataegus spp.*), chokecherry (*Prunus virginiana*), skunkbush sumac (*Rhus trilobata*), Drummondâ€™s willow (*Salix drummondiana*), sandbar willow (*Salix exigua*), Pacific willow (*Salix lucida*), rose (*Rosa* species), silver buffaloberry (*Shepherdia argentea*), or snowberry (*Symphoricarpos* species). Exotic trees of Russian olive (*Elaeagnus angustifolia*) and saltcedar (*Tamarix* species) may invade some stands in southeastern and south-central Montana.

No Image

4% (*742 Acres*)

Human Land Use
Developed
Other Roads

County, city and or rural roads generally open to motor vehicles.



3% (*652 Acres*)

Human Land Use
Developed
Low Intensity Residential

Includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20-50% of total cover. These areas most commonly include single-family housing units in rural and suburban areas. Paved roadways may be classified into this category.



3% (*524 Acres*)

Human Land Use
Developed
Developed, Open Space

Vegetation (primarily grasses) planted in developed settings for recreation, erosion control, or aesthetic purposes. Impervious surfaces account for less than 20% of total cover. This category often includes highway and railway rights of way and graveled rural roads.



2% (*477 Acres*)

Wetland and Riparian Systems
Open Water
Open Water

All areas of open water, generally with less than 25% cover of vegetation or soil

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Additional Limited Land Cover

1% (*199 Acres*) Rocky Mountain Subalpine-Montane Mesic Meadow
1% (*182 Acres*) Major Roads
1% (*112 Acres*) Commercial / Industrial
<1% (*97 Acres*) Introduced Upland Vegetation - Annual and Biennial Forbland
<1% (*82 Acres*) Big Sagebrush Steppe
<1% (*48 Acres*) High Intensity Residential
<1% (*40 Acres*) Rocky Mountain Montane Douglas-fir Forest and Woodland
<1% (*14 Acres*) Pasture/Hay
<1% (*13 Acres*) Quarries, Strip Mines and Gravel Pits
<1% (*10 Acres*) Rocky Mountain Montane-Foothill Deciduous Shrubland
<1% (*9 Acres*) Aspen Forest and Woodland
<1% (*7 Acres*) Rocky Mountain Foothill Limber Pine - Juniper Woodland

<1% (*1 Acres*) Emergent Marsh

<1% (*1 Acres*) Rocky Mountain Lodgepole Pine Forest

<1% (*1 Acres*) Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland

<1% (*1 Acres*) Rocky Mountain Cliff, Canyon and Massive Bedrock

<1% (*0 Acres*) Insect-Killed Forest

<1% (*0 Acres*) Low Sagebrush Shrubland

<1% (*0 Acres*) Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest

<1% (*0 Acres*) Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland

Introduction to Land Cover

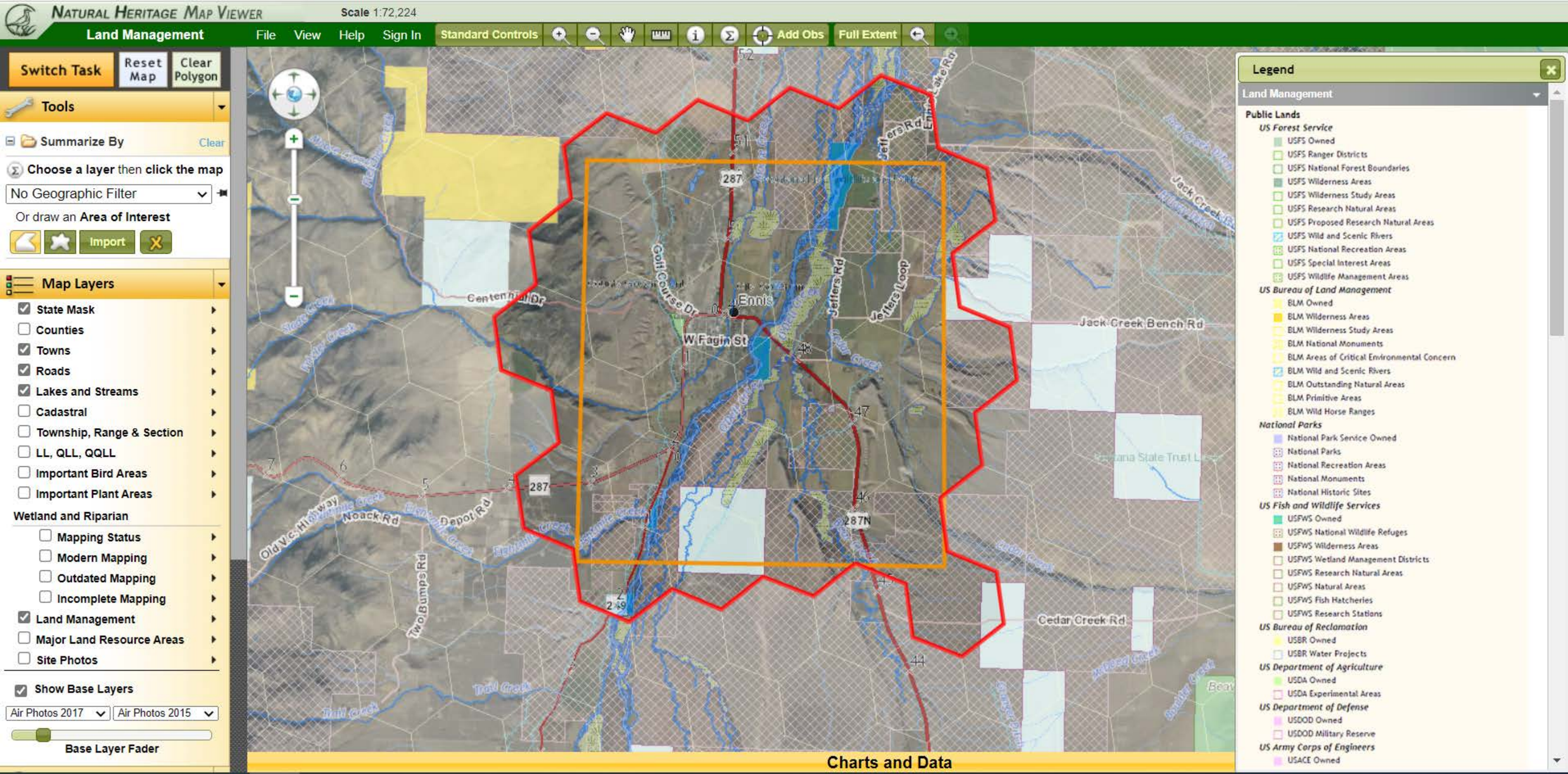
Land Use/Land Cover is one of 15 Montana Spatial Data Infrastructure framework layers considered vital for making statewide maps of Montana and understanding its geography. The layer records all Montana natural vegetation, land cover and land use, classified from satellite and aerial imagery, mapped at a scale of 1:100,000, and interpreted with supporting ground-level data. The baseline map is adapted from the Northwest ReGAP (NWGAP) project land cover classification, which used 30m resolution multi-spectral Landsat imagery acquired between 1999 and 2001. Vegetation classes were drawn from the Ecological System Classification developed by NatureServe (Comer et al. 2003). The land cover classes were developed by Anderson et al. (1976). The NWGAP effort encompasses 12 map zones. Montana overlaps seven of these zones. The two NWGAP teams responsible for the initial land cover mapping effort in Montana were Sanborn and NWGAP at the University of Idaho. Both Sanborn and NWGAP employed a similar modeling approach in which Classification and Regression Tree (CART) models were applied to Landsat ETM+ scenes. The Spatial Analysis Lab within the Montana Natural Heritage Program was responsible for developing a seamless Montana land cover map with a consistent statewide legend from these two separate products. Additionally, the Montana land cover layer incorporates several other land cover and land use products (e.g., MSDI Structures and Transportation themes and the Montana Department of Revenue Final Land Unit classification) and reclassifications based on plot-level data and the latest NAIP imagery to improve accuracy and enhance the usability of the theme. Updates are done as partner support and funding allow, or when other MSDI datasets can be incorporated. Recent updates include fire perimeters and agricultural land use (annually), energy developments such as wind, oil and gas installations (2014), roads, structures and other impervious surfaces (various years): and local updates/improvements to specific ecological systems (e.g., central Montana grassland and sagebrush ecosystems). Current and previous versions of the Land Use/Land Cover layer with full metadata are available for download at the Montana State Library's Geographic Information Clearinghouse

Within the report area you have requested, land cover is summarized by acres of Level 1, Level 2, and Level 3 Ecological Systems.

Literature Cited

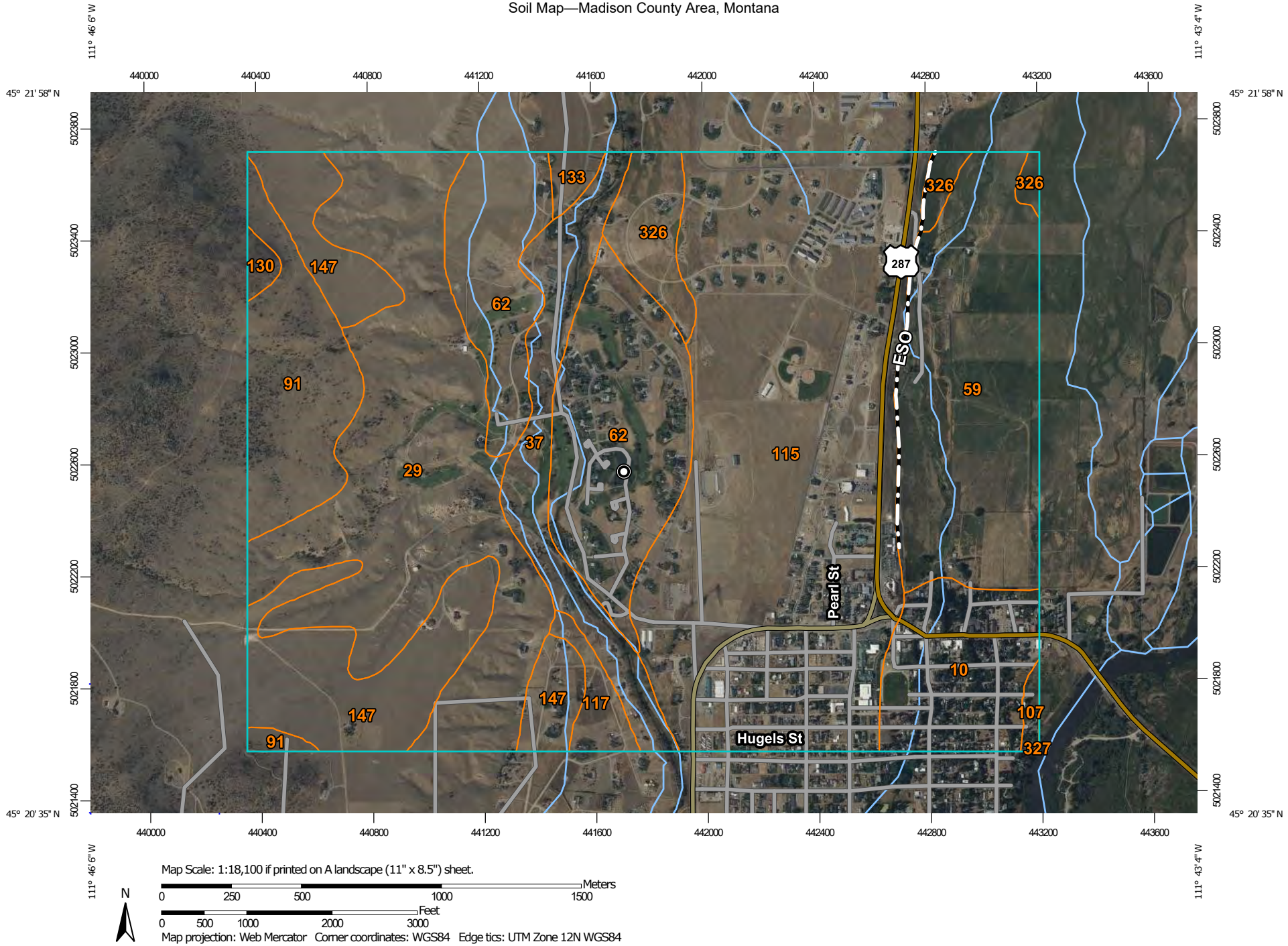
Anderson, J.R. E.E. Hardy, J.T. Roach, and R.E. Witmer. 1976. A land use and land cover classification system for use with remote sensor data. U.S. Geological Survey Professional Paper 964.

Comer, P., D. Faber-Langendoen, R. Evans, S. Gawler, C. Josse, G. Kittel, S. Menard, M. Pyne, M. Reid, K. Schulz, K. Snow, and J. Teague. 2003. Ecological systems of the United States: A working classification of U.S. terrestrial systems. NatureServe, Arlington, VA.


Natural Heritage Map Viewer
Scale 1:72,224
Land Management
File
View
Help
Sign In
Standard Controls
Add Obs
Full Extent
Switch Task
Reset Map
Clear Polygon
Tools
Summarize By
Clear
Choose a layer then click the map
No Geographic Filter
Or draw an Area of Interest
Import
Map Layers
State Mask
Counties
Towns
Roads
Lakes and Streams
Cadastral
Township, Range & Section
LL, QLL, QQLL
Important Bird Areas
Important Plant Areas
Wetland and Riparian
Mapping Status
Modern Mapping
Outdated Mapping
Incomplete Mapping
Land Management
Major Land Resource Areas
Site Photos
Show Base Layers
Air Photos 2017
Air Photos 2015
Base Layer Fader
Ennis
W Fagin St
Centennial Dr
Gold Course Dr
Jeffers Rd
Jeffers Loop
Jack Creek Bench Rd
Cedar Creek Rd
Noack Rd
Depot Rd
Old U.S. Highway
Two Bumps Rd
287
287N
Legend
Land Management
Public Lands
US Forest Service
USFS Owned
USFS Ranger Districts
USFS National Forest Boundaries
USFS Wilderness Areas
USFS Wilderness Study Areas
USFS Research Natural Areas
USFS Proposed Research Natural Areas
USFS Wild and Scenic Rivers
USFS National Recreation Areas
USFS Special Interest Areas
USFS Wildlife Management Areas
US Bureau of Land Management
BLM Owned
BLM Wilderness Areas
BLM Wilderness Study Areas
BLM National Monuments
BLM Areas of Critical Environmental Concern
BLM Wild and Scenic Rivers
BLM Outstanding Natural Areas
BLM Primitive Areas
BLM Wild Horse Ranges
National Parks
National Park Service Owned
National Parks
National Recreation Areas
National Monuments
National Historic Sites
US Fish and Wildlife Services
USFWS Owned
USFWS National Wildlife Refuges
USFWS Wilderness Areas
USFWS Wetland Management Districts
USFWS Research Natural Areas
USFWS Natural Areas
USFWS Fish Hatcheries
USFWS Research Stations
US Bureau of Reclamation
USBR Owned
USBR Water Projects
US Department of Agriculture
USDA Owned
USDA Experimental Areas
US Department of Defense
USDOD Owned
USDOD Military Reserve
US Army Corps of Engineers
USACE Owned
Charts and Data

APPENDIX C

NRCS Soil Report


111° 46' 6" W
111° 43' 4" W
45° 21' 58" N
45° 20' 35" N
440000
440400
440800
441200
441600
442000
442400
442800
443200
443600
5023800
5023400
5023000
5022600
5022200
5021800
5021400
133
326
326
326
130
147
62
91
62
37
29
115
59
287
ESO
Pearl St
10
107
147
147
117
91
Hugels St
327
Map Scale: 1:18,100 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0 250 500 1000 1500
Feet
0 500 1000 2000 3000
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 12N WGS84

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
- Local 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: Madison County Area, Montana
Survey Area Data: Version 26, Aug 29, 2023

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

Date(s) aerial images were photographed: Aug 18, 2022—Aug 29, 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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
10	Attewan loam, cool, 0 to 2 percent slopes	75.4	5.0%
29	Brocko-Crago complex, cool, 8 to 45 percent slopes	263.8	17.5%
37	Crago-Scravo complex, cool, 15 to 45 percent slopes	77.0	5.1%
59	Havre loam, cool, wet, 0 to 2 percent slopes	175.1	11.6%
62	Kalsted sandy loam, 2 to 8 percent slopes	186.6	12.4%
91	Nuley-Rock outcrop complex, 8 to 35 percent slopes	85.8	5.7%
107	Rivra-Ryell-Havre complex, cool, 0 to 2 percent slopes	4.1	0.3%
115	Scravo very cobbly sandy loam, cool, 0 to 4 percent slopes	435.9	28.9%
117	Scravo-Thess complex, cool, 0 to 4 percent slopes	15.6	1.0%
130	Shurley-Rock outcrop complex, 25 to 60 percent slopes	4.9	0.3%
133	Thess-Amesha loams, cool, 0 to 2 percent slopes	7.5	0.5%
147	Varney clay loam, 2 to 8 percent slopes	136.4	9.0%
326	Manhattan-Groff families, complex, 0 to 4 percent slopes	41.4	2.7%
327	Chaffee, occasionally flooded-Beavrock, rarely flooded, Dillon families, complex 0 to 2 percent slopes	0.1	0.0%
Totals for Area of Interest		**1,509.7**	**100.0%**

Madison County Area, Montana

10—Attewan loam, cool, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 4x9m
Elevation: 2,200 to 6,500 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 90 to 130 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Attewan and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Attewan

Setting

Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium over sandy and gravelly alluvium

Typical profile

A - 0 to 4 inches: loam
Bt - 4 to 8 inches: clay loam
Bk - 8 to 24 inches: sandy clay loam
2C - 24 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R044BA032MT - Loamy (Lo) LRU 44B-A
Hydric soil rating: No

Minor Components

Varney

Percent of map unit: 5 percent
Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R044BS339MT - Silty (Si) 9-14" p.z.
Hydric soil rating: No

Trimad

Percent of map unit: 5 percent
Landform: Drainageways on stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R044BS339MT - Silty (Si) 9-14" p.z.
Hydric soil rating: No

Data Source Information

Soil Survey Area: Madison County Area, Montana
Survey Area Data: Version 24, Sep 2, 2021

Madison County Area, Montana

107—Rivra-Ryell-Havre complex, cool, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 4x9w
Elevation: 1,900 to 6,000 feet
Mean annual precipitation: 10 to 16 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 90 to 135 days
Farmland classification: Farmland of local importance

Map Unit Composition

Rivra and similar soils: 40 percent
Ryell and similar soils: 25 percent
Havre and similar soils: 20 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rivra

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy and gravelly alluvium

Typical profile

A - 0 to 5 inches: gravelly sandy loam
C1 - 5 to 9 inches: gravelly loamy sand
C2 - 9 to 60 inches: very gravelly coarse sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 0 to 42 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.3 inches)

Interpretive groups

Land capability classification (irrigated): 6s
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A/D

Ecological site: R044BA134MT - Shallow to Gravel (SwGr) LRU 44B-A
Hydric soil rating: No

Description of Ryell

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy over sandy and gravelly alluvium

Typical profile

A - 0 to 7 inches: loam
C1 - 7 to 23 inches: loam
2C2 - 23 to 60 inches: very gravelly loamy sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): 4e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R044BA032MT - Loamy (Lo) LRU 44B-A
Hydric soil rating: No

Description of Havre

Setting

Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

A - 0 to 9 inches: loam
C1 - 9 to 14 inches: fine sandy loam
C2 - 14 to 36 inches: loam
C3 - 36 to 60 inches: sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches

Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: R044BA032MT - Loamy (Lo) LRU 44B-A
Hydric soil rating: No

Minor Components

Poorly drained soils

Percent of map unit: 5 percent
Landform: Swales
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R044BS333MT - Saline Subirrigated (SSb) 9-14" p.z.
Hydric soil rating: Yes

Rivra, sandy loam

Percent of map unit: 5 percent
Landform: Flood plains
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R044BS338MT - Shallow to Gravel (SwGr) 9-14" p.z.
Hydric soil rating: No

Moderately well drained soils

Percent of map unit: 5 percent
Ecological site: R044BS333MT - Saline Subirrigated (SSb) 9-14" p.z.
Hydric soil rating: No

Data Source Information

Soil Survey Area: Madison County Area, Montana
Survey Area Data: Version 24, Sep 2, 2021

Madison County Area, Montana

115—Scravo very cobbly sandy loam, cool, 0 to 4 percent slopes

Map Unit Setting

National map unit symbol: 4xb5
Elevation: 3,500 to 6,500 feet
Mean annual precipitation: 10 to 14 inches
Mean annual air temperature: 37 to 45 degrees F
Frost-free period: 90 to 135 days
Farmland classification: Not prime farmland

Map Unit Composition

Scravo and similar soils: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scravo

Setting

Landform: Stream terraces
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Calcareous sandy and gravelly alluvium

Typical profile

A - 0 to 5 inches: very cobbly sandy loam
Bk - 5 to 17 inches: very gravelly sandy loam
2C - 17 to 60 inches: very gravelly sand

Properties and qualities

Slope: 0 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 40 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: R044BA020MT - Gravelly (Gr) LRU 44B-A
Hydric soil rating: No

Minor Components

Crago

Percent of map unit: 5 percent
Landform: Alluvial fans, terraces
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R044BA031MT - Limy Droughty (LyDr) LRU A
Hydric soil rating: No

Thess

Percent of map unit: 5 percent
Landform: Stream terraces, alluvial fans
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R044BA030MT - Limy (Ly) LRU 44B-A
Hydric soil rating: No

Data Source Information

Soil Survey Area: Madison County Area, Montana
Survey Area Data: Version 24, Sep 2, 2021

APPENDIX D

Source Water Delineation and Assessment Report

TOWN OF ENNIS

PUBLIC WATER SYSTEM

PWS ID No. MT0000208

SOURCE WATER DELINEATION & ASSESSMENT REPORT

PREPARED BY:

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
SOURCE WATER PROTECTION PROGRAM

PREPARED FOR:

Duane Martian
Certified Operator

P.O. Box 147
Ennis, Montana 59729

March 2006

Montana Department of Environmental Quality

Source Water Protection

EXECUTIVE SUMMARY

This Source Water Delineation and Assessment Report (SWDAR) was prepared as required by the Federal Safe Drinking Water Act, according to a detailed Source Water Assessment Plan developed by a statewide Montana citizens' advisory committee, and approved by the US Environmental Protection Agency. The Department of Environmental Quality (DEQ) is completing assessment and delineation reports for all public water systems in Montana. Source water assessment is the first step towards source water protection. These reports are intended to provide information so that the public water system staff/operator, consumers, and community citizens can develop strategies to protect drinking water sources. The information provided includes the delineation of the area most critical to maintaining safe drinking water (the inventory region), an inventory of significant potential sources of contamination within this area, and an assessment of the relative threat that these sources pose to the water system.

The Town of Ennis subdivision's drinking water is supplied by two wells. The water source is groundwater. According to the Source Water Protection Program (DEQ, 1999) the source aquifer for the well is considered to have **moderate sensitivity** to potential contamination, since the aquifer is composed of Tertiary basin fill sediments, and is semi-confined.

As part of this assessment, three types of source water protection management areas were mapped. They are: the control zone, the inventory region, and the recharge region. The control zone (sometimes called the exclusion zone) is a 100-foot radius circle around each wellhead. The goal of management in the control zone is to avoid introducing contaminants directly into the wells or immediate surrounding areas. Drainage should be directed away from the wellheads, and caution should be exercised to ensure that all contaminant sources are removed from the control zones. The inventory region is the area that is expected to contribute groundwater to the wells over the next three years (DEQ, 1999). For this aquifer, this is mapped to a distance of one mile upgradient of the wells. The recharge region represents the full upgradient extent of the aquifer. Potential sources of contamination were inventoried within the control zone and inventory region and the results are as follows:

- No potential sources of contamination were identified within the control zones.
- The inventory region includes sewered portions of Ennis, as well as areas of low, moderate and high septic system density. No irrigated agricultural land was identified within the inventory region, although possible hayfields are apparent on aerial photos. Grazing land is present at the edges of the inventory region. No active underground storage tanks (USTs) were identified within the inventory region. Numerous UST records were identified within the inventory region, but all of these represent out-of-service residential tanks. It is possible that UST or LUST locations may be improperly mapped.

The operator should take care that surface drainage is directed away from the wellheads. Wells completed into the deep confined aquifer are generally less vulnerable to contamination, but without annular seals, the wells could be compromised at the wellheads. Well 1 is reportedly grouted to 19 feet below grade (ftbg), and Well 2 is reportedly grouted to 30 ftbg.

Contaminant sources are not inventoried within the recharge region. Land use patterns are identified and evaluated. The recharge region is mapped as the extent of basin-fill sediments in the Madison Valley. The majority of the recharge area is sparsely developed and populated. The primary land cover is shrub and grassland.

Low risk potential sources and potential sources located outside the inventory region, but within the recharge region, may still pose a threat over time. These are not considered in this assessment, however. The susceptibility analysis is intended to provide the operator with information on where the greatest risk

occurs. To this end, the assessment is focused on potential contaminant sources that the Source Water Protection Section has determined to be significant. These are detailed in Chapter 4.

Mitigating and managing potential sources of contamination identified within the inventory region are often beyond the scope of what an operator of a relatively small PWS may accomplish.

The costs associated with contaminated drinking water are high, and prevention is vastly preferable to treatment. Public awareness is a powerful tool for protecting drinking water. The information in this report is intended to help increase public awareness about the relationship between land use activities and drinking water quality.

TABLE OF CONTENTS

1.0 Introduction 1
2.0 Background 1
2.1 Physical Setting 1
2.1.1 Geography and Geology 1
2.1.2 Climate 2
2.1.3 Source Water 2
2.2 The Public Water Supply 2
2.2.1 Water Supply System 2
2.2.2 Supply Well Information 2
2.3 Water Quality 3
2.3.1 Public Water Supply Monitoring Results 3
2.3.2 Background Water Quality Monitoring Results 3
3.0 Management Area Delineation 4
3.1 Delineation 4
4.0 Inventory 4
4.1 Inventory Method 4
4.2 Inventory Results 5
4.2.1 Control Zone Inventory Results 5
4.2.2 Inventory Region Results 5
4.2.3 Recharge Region Results 6
5.0 Susceptibility Assessment 6
6.0 Limitations 8
7.0 Conclusions 9
8.0 References 10
9.0 Glossary 11

FIGURES

Figure 1 – Public Water Supply Location
Figure 2 – Geology of the Ennis Area
Figure 3 – Town of Ennis PWS Inventory Region
Figure 4 – Town of Ennis PWS Recharge Region

APPENDICES

Appendix A – Well Logs and PWS Sanitary Survey
Appendix B – Water Quality Analytical Results
Appendix C – Groundwater Time-of-Travel Estimates
Appendix D – Monitoring Waiver Recommendations
Appendix E – Concurrence Letter

1.0 INTRODUCTION

The primary purpose of this source water delineation and assessment report (SWDAR) is to provide information that helps the Town of Ennis public water supply (PWS) protect its drinking water sources. Source water assessment is the first step towards source water protection. The Montana Source Water Protection Program is intended to be a preventative, practical, and cost-effective approach to protect public drinking water supplies.

This Source Water Delineation and Assessment Report is intended to meet the technical requirements for delineation and assessment of the Town of Ennis Public Water System as required by the Montana Source Water Protection Program (DEQ, 1999) and the federal Safe Drinking Water Act (SDWA) Amendments of 1996 [U.S. Code Title 42, Chapter 6A, Subchapter XII, Part E, § 300j-13-(a) Source Water Assessment].

This report was completed by Eric Sivers, a hydrogeologist with the Montana Department of Environmental Quality (DEQ) Source Water Protection Section. A draft wellhead protection plan prepared by Montana Rural Water Systems, Inc. (MRWS) and Ennis PWS operator Duane Martian provided background. Additional information on the PWS was obtained from the most recent sanitary survey (February 2005). Other references are detailed at the end of this report.

2.0 BACKGROUND

The Town of Ennis PWS is classified as a community PWS, as it serves more than 25 year-round residents. Ennis is located in Madison County in southwestern Montana, along the Madison River (Figure 1). According to the Census Bureau, the population of Madison County in 2000 was 6,851, 840 of whom lived within Ennis. In accordance with the wellhead protection plan drafted by MRWS, this report uses an estimated population of 1,600.

2.1 PHYSICAL SETTING

2.1.1 Geography and Geology

Ennis is located in the Madison River valley, on the western bank of the Madison River. The town's elevation is approximately 4,950 feet above mean sea level.

The Madison River valley extends over 350 square miles of southwestern Montana. The valley is bounded by the Madison Range to the east, the Gravelly Range and Tobacco Root Mountains to the west and northwest, Ennis Lake to the north, and Raynolds Pass to the south (Kendy and Tresch, 1996). It is a structural basin, created as the valley floor dropped relative to the synchronously uplifted Madison Range. The downdropped basin has been filled with Tertiary and Quaternary sediments, which are thickest along the fault at the eastern margin of the valley. The mountains surrounding the basin are composed of bedrock varying in age from Archean (pre-Belt series) to Tertiary (Kellogg and Williams, 2005). These bedrock units are generally less permeable than the unconsolidated basin sediments, although fractures or carbonate dissolution features create significant local flow conduits. The aquifer is recharged by infiltration of precipitation and of surface water and at the edges of the basin. Groundwater flows from the margins of the basins towards the center of the basin, where it turns northward, generally parallel to the Madison River.

More detailed information on the hydrogeology of the study area is provided in Section 2.1.3.

2.1.2 Climate

Climate in the area is typical of intermontane valleys in southwest Montana, with mild summers and cold winters. Average annual precipitation is 12.46 inches, and is most abundant in May and June. The area receives an annual average of 33 inches of snow, mainly from October to April. The climate summary is based upon records from the climate station at Ennis. Climate data is provided by the Western Regional Climate Center, operated by the Desert Research Institute of Reno, Nevada. See Table 1 for additional climate information.

Table 1. Monthly Climate Summary: Ennis Climate Station (242793)

Period of Record: 07/02/1948 to 09/30/2005

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Ave. Max. Temp (F)	33.1	38.4	45.2	55.6	65.5	73.6	82.7	81.5	71.2	59.6	43.4	34.8	57.0
Ave. Min. Temp. (F)	14.4	17.8	22.3	29.2	36.7	43.2	47.7	46.0	38.5	31.5	23.4	16.9	30.6
Ave Tot. Precip. (in.)	0.38	0.40	0.71	1.12	2.04	2.35	1.24	1.21	1.16	0.90	0.55	0.42	12.46
Ave. Tot. Snowfall (in.)	5.9	4.4	5.9	3.3	1.1	0.1	0.0	0.0	0.2	2.0	4.7	5.2	33.0
Ave Snow Depth (in.)	1	0	0	0	0	0	0	0	0	0	0	1	0

2.1.3 Source Water

The source aquifer is composed of Tertiary basin-fill deposits. This aquifer includes layers of fine-grained sediments that were shed from the surrounding highlands into the valley. Volcanic and volcaniclastic deposits are also present. Up to 15,000 feet of sediment have accumulated in the deepest parts of the basin (Kendy & Tresch, 1996), although the depth to bedrock is probably half that over much of the basin. The aquifer is heterogeneous, and includes bodies of both high and low permeability. The cumulative effect of many low-permeability bodies produces a semi-confined aquifer. Coarse-grained deposits are less common than fine-grained deposits, and the basin fill aquifer has the reputation of being relatively impermeable. Ennis' wells are unusually productive for the Tertiary aquifer.

The primary source of recharge is stream loss, particularly at the valley margins where streams cross from the less permeable bedrock to more permeable basin fill deposits. Leakage from irrigation canals contributes additional recharge. Finally, some recharge is expected from by infiltration of snowmelt and rainfall. Comparison of the low arsenic concentrations in the PWS water (Section 2.3.1.) to the higher concentrations reported from surface water (Tuck *et al.*, 1997) suggests that the Madison River does not contribute significantly to the Ennis source water. The recharge region (extent of the aquifer) is illustrated on Figure 3.

2.2 THE PUBLIC WATER SUPPLY

2.2.1 Water Supply System

Two wells supply the PWS. The wells are indicated on Figure 1 and Figure 2. The PWS distributes water through 506 service connections, serving an estimated population of 1,600. Storage is currently provided by a 530,000+ gallon tank.

2.2.2 Supply Well Information

There has been some confusion over the PWS well logs. The MRWS report (O'Connell, 2002) describes two wells, completed in 1979 and 1978. The description of Well 1(GWIC ID

108663) is actually that of Well 2, according to the copy of the original driller's log attached to the sanitary survey.

Well 1 was drilled in 1960. Well 1 is cased with 8-inch steel to a depth of 165 feet below grade (ftbg). The well is grouted to 19 ftbg, and perforated in two intervals: 100-107 ftbg and 130-160 ftbg. Well 1 yields 200 gallons per minute (gpm).

Well 2 was drilled in 1978. The well is 140 feet deep, and is 12-inch diameter over the full depth. The well is grouted from grade to 30 ftbg. The well is perforated over four intervals: 75-85 ftbg, 97-105 ftbg, 112-120 ftbg, and 130-140 ftbg. The static water level is reported to be 28 ftbg, with a pumping water level of 105 ftbg. The well yields 400 gpm.

2.3 WATER QUALITY

Each PWS performs regular sampling of its water supply to detect contamination. The analytical parameters for a community PWS include: coliform bacteria, nitrates, metals, petroleum hydrocarbons, synthetic organic chemicals, and radionuclides. The monitoring schedule depends on factors such as the type of PWS, type of source water (surface water or groundwater), the number of supplies (e.g. wells, springs or intakes), and the population served. Monitoring programs are tailored to each system, following the general protocols defined by DEQ and the US EPA. Monitoring schedules are available online at: <http://nris.state.mt.us/wis/swap/swapquery.asp>. The Ennis PWS monitoring data from DEQ's database for the past five years was reviewed and is summarized in this section. Analytical results are reported in units of milligrams per liter (mg/L, equivalent to one part per million) or micrograms per liter (µg/L, equivalent to one part per billion). The results are compared to quality standards established by the US EPA. Maximum Contaminant Levels (MCLs) are enforceable standards limiting the amount of a contaminant in drinking water. National Secondary Drinking Water Standards (known as SMCLs) are non-enforceable guidelines regarding contaminants that may cause aesthetic (color, odor, taste) or cosmetic (staining, skin/tooth discoloration) issues.

2.3.1 Public Water Supply Monitoring Results

Each well has an entry point, and are therefore sampled individually. The water quality is comparable. Coliform bacteria have not been detected in the PWS water within the past five years. Nitrate concentrations are consistently low, with the highest reported level of 0.97 mg/L (from Well 1), below the MCL of 10 mg/L. No organic chemicals have been detected at either well. Dissolved solids detected from both wells are low: arsenic (0.002 mg/L), barium (0.110 mg/L), and fluoride (1.05 mg/L). Additionally, chromium was detected at Well 1 (0.001 mg/L) and antimony was detected at Well 2 (0.006 mg/L).

The Madison River is noted for (naturally) elevated arsenic levels due to the volcanic rocks in its Yellowstone caldera headwaters. Despite this, the PWS water is below the new EPA MCL of 0.010 mg/L.

The water quality summary report is attached as Appendix B.

2.3.2 Background Water Quality Monitoring Results

Background water quality data was not identified for the subject PWS. Background water quality typically includes general water quality parameters: major dissolved ions (calcium, magnesium, sodium, potassium, iron, manganese, silica, bicarbonate, carbonate, chloride, sulfate, nitrate, fluoride and orthophosphate), trace elements, and metals. Since the PWS

does not disinfect, the water quality summarized above is generally indicative of the source water.

3.0 MANAGEMENT AREA DELINEATION

This report delineates three source water management areas. The goal of source water management is protection of the source water by 1) controlling activities in the control zone(s), 2) managing significant potential contaminant sources in the inventory region, and 3) ensuring that major land use activities or other significant activities in the recharge region pose minimal threat to the source water. Methods and criteria for delineating source water protection areas for public water supplies are specified in the Montana Source Water Protection Program (DEQ, 1999).

3.1 DELINEATION

Control Zone – A 100-foot radius control zone is delineated around the wellheads.

Inventory Region – The inventory region is generally the area that is expected to contribute to the water supply over three years; this is sometimes referred to as a three-year capture zone. The inventory region for the Town of Ennis PWS was delineated an estimate of groundwater time-of-travel distance. The distance was estimated using the uniform flow equation (Appendix C), as recommended by EPA. Aquifer properties were estimated according to DEQ protocol for non-degradation analysis (also attached in Appendix C), using available data from the well logs. The estimated three-year time-of-travel distance varies from 1,940 to 6,270 feet, depending on the values used. In consideration of the number of assumptions and variables involved, the inventory region was mapped to a distance of one mile from the wells, according to presumed groundwater flow directions (as described above in Section 2.1.1).

Recharge Region – The recharge area is delineated as the extent of basin fill deposits upgradient of the PWS (Figure 3), as illustrated on a geologic map by Kellogg and Sears (2005).

4.0 INVENTORY

Prior to assessing PWS susceptibility to contamination, an inventory of potential contaminant sources must be created. To this end, potential contaminant sources in the control zone and inventory region were inventoried. The inventory focuses on facilities or features that generate, use, store, or transport potential contaminants, as well as certain land uses. The methods and data sources used in the inventory process are explained below. It is important to remember that the sources identified in this section are only potential sources of contamination to the drinking water. Contamination of drinking water sources is less likely when potential contaminants are properly managed.

4.1 INVENTORY METHOD

Information on facilities and land uses that are potential sources of regulated contaminants was obtained from a number of databases. The process for completing the inventory includes the following:

- Step 1: The Montana State Library Natural Resources Information System (NRIS) GIS database was queried to identify septic land application sites, wastewater treatment plants, animal feeding operations, septic system density, sewer systems, and agricultural land uses.
- Step 2: The DEQ PWS files were reviewed to identify agricultural activities or wastewater treatment in the vicinity of the PWS.

- Step 3: The US Environmental Protection Agency's (EPA) Envirofacts System <http://www.epa.gov/enviro/> was queried to identify EPA-regulated facilities located in the management areas. This system accesses facilities listed in the following databases: Resource Conservation and Recovery Information System (RCRIS), Biennial Reporting System (BRS), Toxic Release Inventory System (TRIS), and Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS) and the Permit Compliance System (PCS - for Concentrated Animal Feeding Operations with MPDES permits). The available reports were browsed for facility information including the Handler/Facility Classification to be used in assessing whether a facility should be classified as a significant potential contaminant source.
- Step 4: Montana DEQ databases were queried to identify any of the following in the management areas:

  Underground storage tanks (USTs) and leaking underground storage tanks (LUSTs) <http://www.deq.state.mt.us/UST/USTDownloads.asp>

  Hazardous waste contaminated sites, above ground storage tanks (ASTs), landfills, and abandoned and active mines, including gravel pits <http://nris.state.mt.us/gis/bundler/>

  Any information on past releases and present compliance status was noted.

Potential contaminant sources are considered significant if they fall into one or more of the following categories:

1. Large quantity hazardous waste generators.
2. Landfills.
3. Underground storage tanks.
4. Known groundwater contamination (including open or closed hazardous waste sites, state or federal Superfund sites, and leaking UST sites).
5. Underground injection well.
6. Major roads or rail transportation routes.
7. Cultivated cropland exceeding 20% of the inventory region.
8. Animal feeding operations.
9. Wastewater treatment facilities, sludge handling sites, or land application areas.
10. Septic systems.
11. Sewer mains.
12. Storm sewer outflows.
13. Abandoned or active mines

4.2 INVENTORY RESULTS

4.2.1 Control Zone Inventory Results

No potential contaminants were identified within the control zones. However, an inventory on this scale is difficult to complete accurately without a site visit.

4.2.2 Inventory Region Results

Point Sources: Identified point sources were identified within the inventory region are limited to USTs. All identified USTs are for residential use, and none are currently active, according to the DEQ database. No LUST facilities were identified within the inventory region. Unlisted or improperly mapped USTs or LUSTs may be present.

Nonpoint Sources: The inventory region includes municipal sewers and regions of high, moderate and low septic system density. No irrigated agricultural land is mapped within the inventory region. What appears to be a hayfield is evident on aerial photographs. The PWS' organic waiver application reports that there are hayfields in the vicinity, and that glyphosate

and 2,4-D are in use. Grazing land is present on the upgradient end of the inventory region. No animal feeding operations were apparent within the inventory region.

The PWS' susceptibility to these potential contaminant sources will be assessed in Section 5, and presented in Table 2.

4.2.3 Recharge Region Results

Contaminant sources are not inventoried within the recharge region. However, land use patterns are identified and evaluated. The primary land use within the recharge region is timber, with minor amounts of industrial uses. The majority of the recharge region is forested, and includes parkland and wilderness.

5.0 SUSCEPTIBILITY ASSESSMENT

Susceptibility is the degree of likelihood for a public water supply to be impacted by inventoried contaminant sources. Susceptibility is determined in accordance with the DEQ Source Water Protection Program (DEQ, 1999). This guidance document is available on the DEQ Source Water Protection website (see the Reference section), or by request.

Susceptibility is determined by considering the *hazard* that a significant potential contaminant source presents to the PWS source water, relative to any *barriers* to the contaminant. Hazard is determined by the proximity or density of significant potential contaminant sources, according to a formula laid out in the Source Water Protection Program (DEQ, 1999). Accordingly, point sources of contaminants within the inventory region would be rated high hazards. The septic system density presents a moderate hazard. Barriers to contamination are anything that decreases the likelihood of contaminants reaching a water source. No natural barriers are credited for this PWS.

Inventory results and management recommendations for the Town of Ennis PWS are provided in Table 2. In some cases the management recommendations are fairly site-specific and can be implemented by the public water supply. However, other management options can only be implemented by federal, state, county or local governmental entities. When the latter options are mentioned, it does not imply or suggest that this PWS should lead or spearhead the effort to implement the management option. It is assumed that representatives from this PWS would participate in the public process sponsored by various governmental entities to develop and implement any of these management options.

Table 2. Susceptibility Assessment of Significant Potential Contaminant Sources

Potential Contaminant Source	Potential Contaminants	Hazard	Hazard	Barriers	Susceptibility	Management Recommendations
Inventory Region						
Municipal sewers	Pathogens, nitrate (NO_3)	Discharge of pathogens; failure leading to discharge of untreated septage.	High	None	High	Maintain sewers in good working order.
Septic systems	Pathogens, nitrate (NO_3)	Discharge of pathogens; failure leading to discharge of untreated septage.	Moderate	None	Moderate	Participate as a stakeholder in debates over water quality and local water quality districts. Promote advanced septic systems, public education.
Other Potential Contaminant Sources, not rated significant						
USTs	VOCs	Leaching of VOCs to groundwater from historic releases.	Low	None	Low	Maintain water quality sampling according to schedule. Participate as a stakeholder in debates over water quality and local water quality districts.
Grazing land	Pathogens, nitrate (NO_3)	Infiltration of pathogens, nitrate loading	Low	None	Low	Maintain water quality sampling according to schedule. Participate as a stakeholder in debates over water quality and local water quality districts.

While it is not considered a barrier, the semi-confined nature of the aquifer probably affords some degree of protection from shallow contaminants. This is recognized in the 'moderate' sensitivity rating assigned to this type of aquifer.

These ratings are derived from the procedures established by the DEQ Source Water Protection Program (DEQ, 1999). The 'high' susceptibility rating for the sewers is probably conservative, in light of the low nitrate concentrations. However, wells located in town will always have elevated susceptibility to this potential contaminant source. A high susceptibility rating for the sewers is not a prediction of contamination. Instead, it identifies the most likely sources of contaminants, so that these may be managed and problems may be prevented.

While no active USTs were identified within the inventory region, there is always the possibility that a tank is unregistered or is not mapped to the proper location. The operator should be aware of the potential risks posed by a hydrocarbon release, and be mindful of any facilities in the area that may include a UST.

The current land uses identified within the recharge region do not generally pose a risk to the PWS' groundwater quality.

6.0 LIMITATIONS

This Source Water Delineation and Assessment Report is intended to meet the technical requirements for delineation and assessment of the Town of Ennis Public Water System (PWS) as required by the Montana Source Water Protection Program (DEQ, 1999) and the federal Safe Drinking Water Act (SDWA) Amendments of 1996 [U.S. Code Title 42, Chapter 6A, Subchapter XII, Part E, § 300j-13-(a) Source Water Assessment]. The following limitations should be noted:

- Not every potential or existing source contamination in the Town of Ennis area has been identified. Consideration was limited to potential sources of contamination that are within the inventory region and of a type determined by the DEQ to be significant.
- Potential sources of contamination were identified using online databases and available overhead and map imagery. Field surveys and inspections of the inventory region were not conducted. It is highly recommended that the operator or other persons knowledgeable about the community review the inventory, and revise it as necessary.
- The inventory region was delineated on the basis of a time-of-travel estimate. Many input parameters needed to be estimated. As far as possible, the estimates were based on commonly published values or interpretation of available information for the study area. After evaluating results based on varying parameters, a reasonable moderate value (1 mile) was used. This is intended to provide a starting point for the purposes of source water assessment, and detailed field investigations are beyond the scope of this report.
- Delineation of the recharge region is considered a first-order approximation, and may not be accurate. In order to accurately delineate a truly representative recharge region, a detailed field study would be required. Such a study is beyond the scope of this report.
- The potential contaminant sources described in the inventory are identified from readily available information, as described in Chapter 4. Consequently, unregulated activities or unreported contaminant releases may have been overlooked. Multiple data sources are used to increase the likelihood that major threats to the source water are identified. The inventory is not exhaustive. Absence of a potential contaminant in the inventory or susceptibility assessment of this report does not mean that the potential for contamination does not exist, or that there is no threat.
- This report is not, and should not be construed as, a guarantee, warranty or certification that the PWS will not be impacted by potential contaminant sources given a low susceptibility.

7.0 CONCLUSIONS

The Town of Ennis subdivision's drinking water is supplied by two wells. The water source is groundwater. According to the Source Water Protection Program (DEQ, 1999) the source aquifer for the well is considered to have **moderate sensitivity** to potential contamination, since the aquifer is composed of Tertiary basin fill sediments, and is semi-confined.

As part of this assessment, three types of source water protection management areas were mapped. They are: the control zone, the inventory region, and the recharge region. The control zone (sometimes called the exclusion zone) is a 100-foot radius circle around each wellhead. The goal of management in the control zone is to avoid introducing contaminants directly into the wells or immediate surrounding areas. Drainage should be directed away from the wellheads, and caution should be exercised to ensure that all contaminant sources are removed from the control zones. The inventory region is the area that is expected to contribute groundwater to the wells over the next three years (DEQ, 1999). For this aquifer, this is mapped to a distance of one mile upgradient of the wells. The recharge region represents the full upgradient extent of the aquifer. Potential sources of contamination were inventoried within the control zone and inventory region and the results are as follows:

- No potential sources of contamination were identified within the control zones.
- The inventory region includes sewered portions of Ennis, as well as areas of low, moderate and high septic system density. No irrigated agricultural land was identified within the inventory region, although what appears to be a hayfield is evident on aerial photographs. Grazing land is present at the edges of the inventory region. No active underground storage tanks (USTs) were identified within the inventory region. Numerous UST records were identified within the inventory region, but all of these represent out-of-service residential tanks. It is possible that UST or LUST locations may be improperly mapped.

The operator should take care that surface drainage is directed away from the wellheads. Wells completed into the deep confined aquifer are generally less vulnerable to contamination, but without annular seals, the wells could be compromised at the wellheads. Well 1 is reportedly grouted to 19 feet below grade (ftbg), and Well 2 is reportedly grouted to 30 ftbg.

Contaminant sources are not inventoried within the recharge region. Land use patterns are identified and evaluated. The recharge region is mapped as the extent of basin-fill sediments in the Madison Valley. The majority of the recharge area is sparsely developed and populated. The primary land cover is shrub and grassland.

Low risk potential sources and potential sources located outside the inventory region, but within the recharge region, may still pose a threat over time. These are not considered in this assessment, however. The susceptibility analysis is intended to provide the operator with information on where the greatest risk occurs. To this end, the assessment is focused on potential contaminant sources that the Source Water Protection Section has determined to be significant. These are detailed in Chapter 4.

Mitigating and managing potential sources of contamination identified within the inventory region are often beyond the scope of what an operator of a relatively small PWS may accomplish. The SWP section recommends that whenever possible, the operator should illustrate to residents the potential hazards associated with the onsite septic systems, and the need for regular maintenance.

8.0 REFERENCES

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9.0 GLOSSARY

Aquifer. A water-bearing layer of rock or sediment that will yield water in usable quantity to a well or spring.

Barrier. A physical feature or management plan that reduces the likelihood of contamination of a water source from a potential contaminant source

Best Management Practices (BMPs). Methods for various activities that have been determined to be the most effective, practical means of preventing or reducing non-point source pollution.

Coliform Bacteria. A general type of bacteria found in the intestinal tracts of animals and humans, and also in soils, vegetation and water. Their presence in water is used as an indicator of pollution and possible contamination by pathogens.

Confined Animal Feeding Operation (CAFO). Any agricultural operation that feeds animals within specific areas, not on rangeland. Certain CAFOs require permits for operation.

Confined Aquifer. A fully saturated aquifer overlain by a confining unit such as a clay layer. The static water level in a well in a confined aquifer is at an elevation that is equal to or higher than the base of the overlying confining unit.

Confining Unit. A geologic formation present above a confined aquifer that inhibits the flow of water and maintains the pressure of the groundwater in the aquifer. The physical properties of a confining unit may range from a five-foot thick clay layer to shale that is hundreds of feet thick.

Delineation. The process of determining and mapping source water protection areas.

Geographic Information Systems (GIS). A computerized database management and mapping system that allows for analysis and presentation of geographic data.

Hardness. Characteristic of water caused by presence of various calcium and magnesium salts. Hard water may interfere with some industrial processes and prevent soap from lathering.

Hazard. A relative measure of the potential of a contaminant from a facility or associated with a land use to reach the water source for a public water supply. The location, quantity and toxicity of significant potential contaminant sources determine hazard.

Hydraulic Conductivity. A constant number or coefficient of proportionality that describes the rate water can move through an aquifer material.

Inventory Region. A source water management area for groundwater systems that encompasses the area expected to contribute water to a public water supply within a fixed distance or a specified three year groundwater travel time.

Large Capacity Septic System. Defined by Underground Injection Control regulations as an on-site septic system serving 20 or more persons.

Maximum Contaminant Level (MCL). Maximum concentration of a substance in water that is permitted to be delivered to the users of a public water supply. Set by EPA under authority of the Safe Drinking Water Act to establish concentrations of contaminants in drinking water that are protective of human health.

Montana Bureau of Mines and Geology – Groundwater Information Center (MBMG/GWIC). The database of information on all wells drilled in Montana, including stratigraphic data and well construction data, when available.

Nitrate. An important plant nutrient and type of inorganic fertilizer that can be a potential contaminant in water at high concentrations. In water the major sources of nitrates are wastewater treatment effluent, septic tanks, feed lots and fertilizers.

Nonpoint Source Pollution. Pollution sources that are diffuse and do not have a single point of origin or are not introduced into a receiving stream from a specific outlet. Examples of nonpoint- source pollution include agriculture, forestry, and run-off from city streets. Nonpoint sources of pollution, such as the use of herbicides, can

concentrate low levels of these chemicals into surface and/or groundwaters at increased levels that may exceed MCLs.

Pathogens. A microorganism typically found in the intestinal tracts of mammals, capable of producing disease.

Point Source. A stationary location or a fixed facility from which pollutants are discharged. This includes any single identifiable source of pollution, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fracture, container, rolling stock (tanker truck), or vessel or other floating craft, from which pollutants are or may be discharged.

Pollutant. Generally, any substance introduced into the environment that adversely affects the usefulness of a resource (e.g. groundwater used for drinking water).

Public Water System (PWS). A system that provides water for human consumption through at least 15 service connections or regularly serves 25 individuals.

Pumping Water Level. Water level in a well when the pump is operating.

Sensitivity. The relative ease with which contaminants can migrate to source water through the natural materials

Source Water. Any surface water, spring, or groundwater source that provides water to a public water supply.

Source Water Delineation and Assessment Report (SWDAR). A report for a public water supply that delineates source water protection areas, provides an inventory of potential contaminant sources within the delineated areas, and evaluates the relative susceptibility of the source water to contamination from the potential contaminant sources under "worst-case" conditions.

Source Water Protection Areas. For surface water sources, the land and surface drainage network that contributes water to a stream or reservoir used by a public water supply. For groundwater sources, the area within a fixed radius or three-year travel time from a well, and the land area where the aquifer is recharged.

Static Water Level (SWL). Water level in a well when the pump is not operating.

Susceptibility (of a PWS). The relative potential for a PWS to draw water contaminated at concentrations that would pose concern. Susceptibility is evaluated at the point immediately preceding treatment or, if no treatment is provided, at the entry point to the distribution system.

Transmissivity. A number that describes the ability of an aquifer to transmit water. The transmissivity is determined by multiplying the hydraulic conductivity time the aquifer thickness.

Turbidity. The cloudy appearance of water caused by the presence of suspended matter.

Unconfined Aquifer. An aquifer containing water that is not under pressure. The water table is the top surface of an unconfined aquifer.

Watershed. The region drained by, or contributing water to, a stream, lake, or other water body of water.

FIGURES

APPENDIX A

PWS SANITARY SURVEY

APPENDIX B

WATER QUALITY ANALYTICAL REPORT

APPENDIX C

GROUNDWATER TIME-OF-TRAVEL CALCULATIONS

APPENDIX D

MONITORING WAIVER RECOMMENDATIONS

MONITORING WAIVERS

Waiver Recommendation

The PWS currently has waivers for Phase II inorganics (barium, cadmium, chromium, fluoride, mercury and selenium) and SOCs (excluding EPA Method 515). Diquat, endothall, glyphosate, dioxins, ethylene dibromide (EDB), dibromochloropropane (DBCP), polychlorinated biphenyls (PCBs), cyanide and asbestos (at the source) are excluded from monitoring requirements by statewide waivers.

The monitoring history suggests the PWS may be eligible for a Phase V inorganic (antimony, thallium, beryllium and nickel) waiver. Under these waivers, the monitoring schedule for these parameters is reduced to every nine years, rather than every three years. The wells' urban setting precludes eligibility for VOC waivers.

The PWS must be in compliance with DEQ regulations to be considered for monitoring waivers. Written waiver requests must be sent to DEQ at the address below:

Greg Butts
Montana DEQ, PWS Section
109 Cooperative Way
Suite 105
Kalispell, MT 59901

Upon receipt of a waiver request, DEQ will review the system's compliance history, historical monitoring results and source water setting. If waivers are considered appropriate, DEQ will provide the operator with application forms, guidance and technical assistance. If requested by DEQ, the PWS may also need to provide additional information regarding chemical use in the area within the Inventory Region. A site visit may be required to further investigate VOC and SOC use within the inventory region.

APPENDIX D

CONCURRENCE LETTER

APPENDIX E

NHP Species of Concern

Montana Natural Heritage - Species Snapshot

Report generated 6/9/2022, 3:38:53 PM

All Montana Species

found in

Township: 005S001W

	Species of Concern	Potential SOC	MT Special Status	Other Status	Invasive and Pest	Total
Mammals	1	1		15		17
Birds	25	3	1	166		195
Reptiles				2		2
Amphibians	1			2		3
Fish	2			6		8
Invertebrates	1			5	1	7
ALL ANIMALS	30	4	1	196	1	232
Vascular Plants	3			93	14	110
Bryophytes						
Lichens						
Algae				2		2
ALL PLANTS	3			95	14	112

Mammals 17 Species

	Number of Observations	Species Occurrences	Predicted Suitable Habitat Model
Mammals - Beaver *(Castor canadensis)*	9		View Model
Mammals - Coyote *(Canis latrans)*	3		View Model
Mammals - Elk *(Cervus canadensis)*	10		View Model
Mammals - Gray Wolf *(Canis lupus)*	1		View Model
Mammals - Grizzly Bear *(Ursus arctos)* SOC		36	View Model
Mammals - Long-tailed Weasel *(Mustela frenata)*	3		View Model
Mammals - Moose *(Alces alces)*	4		View Model
Mammals - Mountain Cottontail *(Sylvilagus nuttallii)*	3		View Model
Mammals - Mule Deer *(Odocoileus hemionus)*	12		View Model
Mammals - Muskrat *(Ondatra zibethicus)*	12		View Model
Mammals - North American Porcupine *(Erethizon dorsatum)* PSOC	3		View Model
Mammals - Northern River Otter *(Lontra canadensis)*	3		View Model
Mammals - Pronghorn *(Antilocapra americana)*	18		View Model
Mammals - Raccoon *(Procyon lotor)*	6		View Model
Mammals - Red Fox *(Vulpes vulpes)*	3		View Model
Mammals - Striped Skunk *(Mephitis mephitis)*	3		View Model
Mammals - White-tailed Deer *(Odocoileus virginianus)*	13		View Model

Birds 195 Species

	Number of Observations	Species Occurrences	Predicted Suitable Habitat Model
Birds - American Avocet *(Recurvirostra americana)*	65		View Model
Birds - American Coot *(Fulica americana)*	201		View Model
Birds - American Crow *(Corvus brachyrhynchos)*	70		View Model
Birds - American Dipper *(Cinclus mexicanus)*	1		View Model
Birds - American Goldfinch *(Spinus tristis)*	160		View Model
Birds - American Kestrel *(Falco sparverius)*	42		View Model
Birds - American Pipit *(Anthus rubescens)*	18		View Model
Birds - American Redstart *(Setophaga ruticilla)*	2		View Model

Birds - American Robin *(Turdus migratorius)*	357		View Model
Birds - American Tree Sparrow *(Spizelloides arborea)*	73		
Birds - American White Pelican *(Pelecanus erythrorhynchos)* SOC	341		View Model
Birds - American Wigeon *(Mareca americana)*	160		View Model
Birds - Bald Eagle *(Haliaeetus leucocephalus)* SSS	417	74	View Model
Birds - Bank Swallow *(Riparia riparia)*	39		View Model
Birds - Barn Swallow *(Hirundo rustica)*	81		View Model
Birds - Barrow's Goldeneye *(Bucephala islandica)* PSOC	95		View Model
Birds - Belted Kingfisher *(Megaceryle alcyon)*	164		View Model
Birds - Black Scoter *(Melanitta americana)*	1		
Birds - Black Tern *(Chlidonias niger)* SOC	2		View Model
Birds - Black-billed Magpie *(Pica hudsonia)*	568		View Model
Birds - Black-capped Chickadee *(Poecile atricapillus)*	229		View Model
Birds - Black-headed Grosbeak *(Pheucticus melanocephalus)*	53		View Model
Birds - Black-necked Stilt *(Himantopus mexicanus)* SOC	21		View Model
Birds - Blue Jay *(Cyanocitta cristata)*	4		View Model
Birds - Blue-winged Teal *(Spatula discors)*	26		View Model
Birds - Bonaparte's Gull *(Chroicocephalus philadelphia)*	10		
Birds - Brewer's Blackbird *(Euphagus cyanocephalus)*	110		View Model
Birds - Brewer's Sparrow *(Spizella breweri)* SOC	3	3	View Model
Birds - Brown-headed Cowbird *(Molothrus ater)*	193		View Model
Birds - Bufflehead *(Bucephala albeola)*	135		View Model
Birds - Bullock's Oriole *(Icterus bullockii)*	82		View Model
Birds - Cackling Goose *(Branta hutchinsii)*	4		
Birds - California Gull *(Larus californicus)*	86		View Model
Birds - Calliope Hummingbird *(Selasphorus calliope)*	6		View Model
Birds - Canada Goose *(Branta canadensis)*	366		View Model
Birds - Canada Jay *(Perisoreus canadensis)*	2		View Model
Birds - Canvasback *(Aythya valisineria)*	55		View Model
Birds - Canyon Wren *(Catherpes mexicanus)*	2		View Model
Birds - Caspian Tern *(Hydroprogne caspia)* SOC	42		View Model
Birds - Cassin's Finch *(Haemorhous cassinii)* SOC	2		View Model
Birds - Cedar Waxwing *(Bombycilla cedrorum)*	120		View Model
Birds - Chipping Sparrow *(Spizella passerina)*	20		View Model
Birds - Cinnamon Teal *(Spatula cyanoptera)*	64		View Model
Birds - Clark's Grebe *(Aechmophorus clarkii)* SOC	15		View Model
Birds - Clark's Nutcracker *(Nucifraga columbiana)* SOC	2	49	View Model
Birds - Cliff Swallow *(Petrochelidon pyrrhonota)*	88		View Model
Birds - Common Goldeneye *(Bucephala clangula)*	197		View Model
Birds - Common Grackle *(Quiscalus quiscula)*	160		View Model
Birds - Common Loon *(Gavia immer)* SOC	95		View Model
Birds - Common Merganser *(Mergus merganser)*	170		
Birds - Common Nighthawk *(Chordeiles minor)*	57		View Model
Birds - Common Raven *(Corvus corax)*	270		View Model
Birds - Common Redpoll *(Acanthis flammea)*	13		View Model
Birds - Common Tern *(Sterna hirundo)* SOC	2		View Model
Birds - Common Yellowthroat *(Geothlypis trichas)*	88		View Model
Birds - Cooper's Hawk *(Accipiter cooperii)*	5		View Model
Birds - Cordilleran Flycatcher *(Empidonax occidentalis)*	1		View Model
Birds - Dark-eyed Junco *(Junco hyemalis)*	14		View Model

Birds - Dark-eyed Junco (Montana) *(Junco hyemalis montanus)*	8		
Birds - Dark-eyed Junco (Pink-sided) *(Junco hyemalis mearnsi)*	4		
Birds - Dark-eyed Junco (Slate-colored) *(Junco hyemalis hyemalis / cismontanus)*	2		
Birds - Double-crested Cormorant *(Nannopterum auritum)*	75		View Model
Birds - Downy Woodpecker *(Dryobates pubescens)*	66		View Model
Birds - Dusky Flycatcher *(Empidonax oberholseri)*	4		View Model
Birds - Eared Grebe *(Podiceps nigricollis)*	103		View Model
Birds - Eastern Kingbird *(Tyrannus tyrannus)*	182		View Model
Birds - Eastern Phoebe *(Sayornis phoebe)*	4		
Birds - Eurasian Collared-Dove *(Streptopelia decaocto)*	137		View Model
Birds - Eurasian Wigeon *(Mareca penelope)*	2		
Birds - European Starling *(Sturnus vulgaris)*	290		View Model
Birds - Evening Grosbeak *(Coccothraustes vespertinus)* SOC	5		View Model
Birds - Ferruginous Hawk *(Buteo regalis)* SOC	32	28	View Model
Birds - Forster's Tern *(Sterna forsteri)* SOC	15		View Model
Birds - Franklin's Gull *(Leucophaeus pipixcan)* SOC	76		View Model
Birds - Gadwall *(Mareca strepera)*	155		View Model
Birds - Golden Eagle *(Aquila chrysaetos)* SOC	43	5	View Model
Birds - Gray Catbird *(Dumetella carolinensis)*	146		View Model
Birds - Gray Partridge *(Perdix perdix)*	35		View Model
Birds - Gray-crowned Rosy-Finch *(Leucosticte tephrocotis)* SOC	12		View Model
Birds - Great Blue Heron *(Ardea herodias)* SOC	148	103	View Model
Birds - Great Horned Owl *(Bubo virginianus)*	20		View Model
Birds - Greater Scaup *(Aythya marila)*	4		
Birds - Greater White-fronted Goose *(Anser albifrons)*	5		
Birds - Greater Yellowlegs *(Tringa melanoleuca)*	12		
Birds - Green-tailed Towhee *(Pipilo chlorurus)* SOC	4		View Model
Birds - Green-winged Teal *(Anas crecca)*	95		View Model
Birds - Hairy Woodpecker *(Dryobates villosus)*	14		View Model
Birds - Hammond's Flycatcher *(Empidonax hammondii)*	2		View Model
Birds - Harris's Sparrow *(Zonotrichia querula)*	6		
Birds - Hermit Thrush *(Catharus guttatus)*	3		View Model
Birds - Herring Gull *(Larus argentatus)*	38		View Model
Birds - Hooded Merganser *(Lophodytes cucullatus)* PSOC	28		View Model
Birds - Horned Grebe *(Podiceps auritus)* SOC	18		View Model
Birds - Horned Lark *(Eremophila alpestris)*	57		View Model
Birds - House Finch *(Haemorhous mexicanus)*	95		View Model
Birds - House Sparrow *(Passer domesticus)*	140		View Model
Birds - House Wren *(Troglodytes aedon)*	186		View Model
Birds - Killdeer *(Charadrius vociferus)*	191		View Model
Birds - Lapland Longspur *(Calcarius lapponicus)*	12		
Birds - Lark Sparrow *(Chondestes grammacus)*	3		View Model
Birds - Lazuli Bunting *(Passerina amoena)*	12		View Model
Birds - Least Flycatcher *(Empidonax minimus)*	36		View Model
Birds - Lesser Scaup *(Aythya affinis)*	134		View Model
Birds - Lincoln's Sparrow *(Melospiza lincolnii)*	28		View Model
Birds - Long-billed Curlew *(Numenius americanus)* SOC	26	6	View Model
Birds - MacGillivray's Warbler *(Geothlypis tolmiei)*	3		View Model
Birds - Mallard *(Anas platyrhynchos)*	410		View Model
Birds - Marbled Godwit *(Limosa fedoa)*	10		View Model
Birds - Marsh Wren *(Cistothorus palustris)*	94		View Model

Birds - Merlin *(Falco columbarius)*	18		View Model
Birds - Mountain Bluebird *(Sialia currucoides)*	49		View Model
Birds - Mountain Chickadee *(Poecile gambeli)*	18		View Model
Birds - Mourning Dove *(Zenaida macroura)*	106		View Model
Birds - Northern Bobwhite *(Colinus virginianus)*	4		
Birds - Northern Flicker *(Colaptes auratus)*	168		View Model
Birds - Northern Flicker (Red-shafted) *(Colaptes auratus cafer)*	48		
Birds - Northern Harrier *(Circus hudsonius)*	147		View Model
Birds - Northern Pintail *(Anas acuta)*	93		View Model
Birds - Northern Rough-winged Swallow *(Stelgidopteryx serripennis)*	104		View Model
Birds - Northern Shoveler *(Spatula clypeata)*	92		View Model
Birds - Northern Shrike *(Lanius borealis)*	16		
Birds - Northern Waterthrush *(Parkesia noveboracensis)*	17		View Model
Birds - Orange-crowned Warbler *(Leiothlypis celata)*	8		View Model
Birds - Osprey *(Pandion haliaetus)*	238		View Model
Birds - Pacific Loon *(Gavia pacifica)*	1		
Birds - Parasitic Jaeger *(Stercorarius parasiticus)*	1		
Birds - Peregrine Falcon *(Falco peregrinus)* **SOC**	4		View Model
Birds - Pied-billed Grebe *(Podilymbus podiceps)*	13		View Model
Birds - Pine Siskin *(Spinus pinus)*	42		View Model
Birds - Pinyon Jay *(Gymnorhinus cyanocephalus)* **SOC**	9		View Model
Birds - Prairie Falcon *(Falco mexicanus)*	21		View Model
Birds - Red-breasted Merganser *(Mergus serrator)*	47		
Birds - Red-breasted Nuthatch *(Sitta canadensis)*	7		View Model
Birds - Red-eyed Vireo *(Vireo olivaceus)*	2		View Model
Birds - Red-naped Sapsucker *(Sphyrapicus nuchalis)*	75		View Model
Birds - Red-tailed Hawk *(Buteo jamaicensis)*	180		View Model
Birds - Red-throated Loon *(Gavia stellata)*	6		
Birds - Red-winged Blackbird *(Agelaius phoeniceus)*	392		View Model
Birds - Redhead *(Aythya americana)*	71		View Model
Birds - Ring-billed Gull *(Larus delawarensis)*	199		View Model
Birds - Ring-necked Duck *(Aythya collaris)*	61		View Model
Birds - Ring-necked Pheasant *(Phasianus colchicus)*	77		View Model
Birds - Rock Pigeon *(Columba livia)*	61		
Birds - Rock Wren *(Salpinctes obsoletus)*	4		View Model
Birds - Ross's Goose *(Anser rossii)*	6		
Birds - Rough-legged Hawk *(Buteo lagopus)*	82		
Birds - Ruby-crowned Kinglet *(Corthylio calendula)*	29		View Model
Birds - Ruddy Duck *(Oxyura jamaicensis)*	41		View Model
Birds - Rusty Blackbird *(Euphagus carolinus)*	10		
Birds - Sabine's Gull *(Xema sabini)*	4		
Birds - Sandhill Crane *(Antigone canadensis)*	207		View Model
Birds - Savannah Sparrow *(Passerculus sandwichensis)*	112		View Model
Birds - Say's Phoebe *(Sayornis saya)*	1		View Model
Birds - Sharp-shinned Hawk *(Accipiter striatus)*	22		View Model
Birds - Snow Bunting *(Plectrophenax nivalis)*	2		
Birds - Snow Goose *(Anser caerulescens)*	35		
Birds - Solitary Sandpiper *(Tringa solitaria)*	6		View Model
Birds - Song Sparrow *(Melospiza melodia)*	338		View Model
Birds - Sora *(Porzana carolina)*	26		View Model

Birds - Spotted Sandpiper *(Actitis macularius)*	76		View Model
Birds - Spotted Towhee *(Pipilo maculatus)*	4		View Model
Birds - Surf Scoter *(Melanitta perspicillata)*	2		
Birds - Swainson's Hawk *(Buteo swainsoni)*	28		View Model
Birds - Swainson's Thrush *(Catharus ustulatus)*	1		View Model
Birds - Townsend's Solitaire *(Myadestes townsendi)*	4		View Model
Birds - Tree Swallow *(Tachycineta bicolor)*	255		View Model
Birds - Trumpeter Swan *(Cygnus buccinator)* SOC	210	7	View Model
Birds - Tundra Swan *(Cygnus columbianus)*	52		
Birds - Turkey Vulture *(Cathartes aura)*	36		View Model
Birds - Veery *(Catharus fuscescens)* SOC	1	1	View Model
Birds - Vesper Sparrow *(Pooecetes gramineus)*	46		View Model
Birds - Violet-green Swallow *(Tachycineta thalassina)*	51		View Model
Birds - Virginia Rail *(Rallus limicola)*	27		View Model
Birds - Warbling Vireo *(Vireo gilvus)*	40		View Model
Birds - Western Grebe *(Aechmophorus occidentalis)*	98		View Model
Birds - Western Kingbird *(Tyrannus verticalis)*	13		View Model
Birds - Western Meadowlark *(Sturnella neglecta)*	182		View Model
Birds - Western Screech-Owl *(Megascops kennicottii)* PSOC	6		View Model
Birds - Western Tanager *(Piranga ludoviciana)*	38		View Model
Birds - Western Wood-Pewee *(Contopus sordidulus)*	114		View Model
Birds - White-breasted Nuthatch *(Sitta carolinensis)*	1		View Model
Birds - White-crowned Sparrow *(Zonotrichia leucophrys)*	52		View Model
Birds - White-faced Ibis *(Plegadis chihi)* SOC	4		View Model
Birds - White-winged Scoter *(Melanitta deglandi)*	2		
Birds - Willet *(Tringa semipalmata)*	14		View Model
Birds - Willow Flycatcher *(Empidonax traillii)*	63		View Model
Birds - Wilson's Phalarope *(Phalaropus tricolor)*	23		View Model
Birds - Wilson's Snipe *(Gallinago delicata)*	64		View Model
Birds - Wilson's Warbler *(Cardellina pusilla)*	22		View Model
Birds - Wood Duck *(Aix sponsa)*	1		View Model
Birds - Yellow Warbler *(Setophaga petechia)*	249		View Model
Birds - Yellow-headed Blackbird *(Xanthocephalus xanthocephalus)*	65		View Model
Birds - Yellow-rumped Warbler *(Setophaga coronata)*	75		View Model
Birds - Yellow-rumped Warbler (Audubon's) *(Setophaga coronata auduboni)*	50		
Birds - Yellow-rumped Warbler (Myrtle) *(Setophaga coronata coronata)*	4		

Reptiles 2 Species

	Number of Observations	Species Occurrences	Predicted Suitable Habitat Model
Reptiles - Common Gartersnake *(Thamnophis sirtalis)*	1		View Model
Reptiles - Terrestrial Gartersnake *(Thamnophis elegans)*	3		View Model

Amphibians 3 Species

	Number of Observations	Species Occurrences	Predicted Suitable Habitat Model
Amphibians - Boreal Chorus Frog *(Pseudacris maculata)*	1		View Model
Amphibians - Columbia Spotted Frog *(Rana luteiventris)*	15		View Model
Amphibians - Western Toad *(Anaxyrus boreas)* SOC	1		View Model

Fish 8 Species

	Number of Observations	Species Occurrences	Predicted Suitable Habitat Model
Fish - Arctic Grayling *(Thymallus arcticus)* **SOC**	2	23	View Model
Fish - Brook Trout *(Salvelinus fontinalis)*	3		View Model
Fish - Brown Trout *(Salmo trutta)*	4		View Model
Fish - Columbia River Redband Trout *(Oncorhynchus mykiss gairdneri)* **SOC**	3		View Model
Fish - Longnose Dace *(Rhinichthys cataractae)*	3		View Model
Fish - Rainbow Trout *(Oncorhynchus mykiss)*	3		View Model
Fish - Rocky Mountain Sculpin *(Cottus bondi)*	1		View Model
Fish - Utah Chub *(Gila atraria)*	1		View Model

Invertebrates 7 Species

	Number of Observations	Species Occurrences	Predicted Suitable Habitat Model
Invertebrates - Anax junius *(Common Green Darner)*	2		
Invertebrates - Caecidotea communis *(An Aquatic Isopod)*	2		
Invertebrates - Gammarus lacustris *(An Amphipod)*	2		
Invertebrates - Margaritifera falcata *(Western Pearlshell)* **SOC**	4		
Invertebrates - Pacifastacus leniusculus *(Signal Crayfish)*	3		
Invertebrates - Potamopyrgus antipodarum *(New Zealand Mudsnail)* **AIS**	1		
Invertebrates - Radix auricularia *(Big-eared Radix)*	1		

Vascular Plants 110 Species

	Number of Observations	Species Occurrences	Predicted Suitable Habitat Model
Vascular Plants - Acroptilon repens *(Russian Knapweed)* **N2B**	2		View Model
Vascular Plants - Agrostis gigantea *(Redtop)*	3		
Vascular Plants - Alopecurus aequalis *(Short-awn Foxtail)*	3		
Vascular Plants - Alopecurus arundinaceus *(Creeping Foxtail)*	3		
Vascular Plants - Alopecurus pratensis *(Meadow Foxtail)*	3		
Vascular Plants - Argentina anserina *(Silverweed cinquefoil)*	4		
Vascular Plants - Beckmannia syzigachne *(American Sloughgrass)*	3		
Vascular Plants - Berteroa incana *(Hoary False-alyssum)* **N2B**	1		View Model
Vascular Plants - Bromus inermis *(Smooth Brome)*	3		
Vascular Plants - Bromus tectorum *(Cheatgrass)* **R3**	3		View Model
Vascular Plants - Calamagrostis canadensis *(Blue-joint reedgrass)*	3		
Vascular Plants - Callitriche hermaphroditica *(Autumnal Water-starwort)*	3		
Vascular Plants - Camassia quamash *(Common Camas)*	3		View Model
Vascular Plants - Carduus nutans *(Musk Thistle)*	3		View Model
Vascular Plants - Carex aquatilis *(Water Sedge)*	3		
Vascular Plants - Carex microptera *(Small-wing Sedge)*	3		
Vascular Plants - Carex nebrascensis *(Nebraska Sedge)*	3		
Vascular Plants - Carex pellita *(Woolly Sedge)*	4		
Vascular Plants - Carex utriculata *(Common Beaked Sedge)*	3		
Vascular Plants - Centaurea diffusa *(Diffuse Knapweed)* **N2B**	2		View Model
Vascular Plants - Centaurea stoebe *(Spotted Knapweed)* **N2B**	43		View Model
Vascular Plants - Ceratophyllum demersum *(Common Hornwort)*	40		
Vascular Plants - Chenopodium album *(White Goosefoot)*	3		

Vascular Plants - Cirsium arvense *(Canada Thistle)* N2B	25		View Model
Vascular Plants - Convolvulus arvensis *(Field Bindweed)* N2B	7		View Model
Vascular Plants - Cynoglossum officinale *(Common Hound's-tongue)* N2B	21		View Model
Vascular Plants - Dactylis glomerata *(Orchard Grass)*	3		
Vascular Plants - Deschampsia cespitosa *(Tufted Hairgrass)*	3		
Vascular Plants - Distichlis spicata *(Saltgrass)*	3		
Vascular Plants - Eleocharis acicularis *(Least Spikerush)*	3		
Vascular Plants - Eleocharis palustris *(Creeping Spikerush)*	3		
Vascular Plants - Elodea canadensis *(Broad Waterweed)*	157		
Vascular Plants - Elodea nuttallii *(Nuttall Waterweed)*	4		
Vascular Plants - Elymus canadensis *(Canada Wildrye)*	3		
Vascular Plants - Elymus cinereus *(Great Basin Wildrye)*	3		
Vascular Plants - Elymus lanceolatus *(Thickspike Wheatgrass)*	6		
Vascular Plants - Elymus repens *(Quackgrass)*	3		
Vascular Plants - Elymus trachycaulus *(Slender Wheatgrass)*	3		
Vascular Plants - Epilobium ciliatum *(Hairy Willowherb)*	3		
Vascular Plants - Equisetum arvense *(Field Horsetail)*	3		
Vascular Plants - Equisetum hyemale *(Rough Horsetail)*	3		
Vascular Plants - Euphorbia virgata *(Leafy Spurge)* N2B	4		View Model
Vascular Plants - Glyceria grandis *(American Mannagrass)*	3		
Vascular Plants - Glycyrrhiza lepidota *(Wild Licorice)*	3		
Vascular Plants - Grindelia squarrosa *(Curlycup Gumweed)*	3		
Vascular Plants - Hieracium aurantiacum *(Orange Hawkweed)* N2A	3		View Model
Vascular Plants - Hordeum jubatum *(Foxtail Barley)*	3		
Vascular Plants - Hyoscyamus niger *(Black Henbane)*	3		View Model
Vascular Plants - Iris missouriensis *(Western Blue Iris)*	3		
Vascular Plants - Juncus balticus *(Baltic Rush)*	3		
Vascular Plants - Juncus bufonius *(Toad Rush)*	3		
Vascular Plants - Juncus ensifolius *(Three-stamened Rush)*	3		
Vascular Plants - Juncus longistylis *(Long-styled Rush)*	3		
Vascular Plants - Juncus mertensianus *(Mertens' Rush)*	3		
Vascular Plants - Juncus torreyi *(Torrey's Rush)*	3		
Vascular Plants - Kochia scoparia *(Common Kochia)*	3		View Model
Vascular Plants - Lactuca serriola *(Prickly Lettuce)*	3		View Model
Vascular Plants - Lemna valdiviana *(Pale Duckweed)* SOC	1	1	View Model
Vascular Plants - Lepidium draba *(Whitetop)* N2B	16		View Model
Vascular Plants - Linaria vulgaris *(Yellow Toadflax)* N2B	2		View Model
Vascular Plants - Medicago lupulina *(Black Medic)*	3		
Vascular Plants - Melilotus albus *(White Sweetclover)*	3		View Model
Vascular Plants - Melilotus officinalis *(Yellow Sweetclover)*	3		View Model
Vascular Plants - Mentha arvensis *(Wild mint)*	3		
Vascular Plants - Muhlenbergia asperifolia *(Alkali Muhly)*	3		
Vascular Plants - Myriophyllum sibiricum *(Common Water-milfoil)*	59		
Vascular Plants - Phalaris arundinacea *(Reed Canarygrass)*	3		View Model
Vascular Plants - Phleum pratense *(Meadow Timothy)*	3		
Vascular Plants - Pleiacanthus spinosus *(Spiny Skeletonweed)* SOC		36	View Model
Vascular Plants - Poa compressa *(Canada Bluegrass)*	3		
Vascular Plants - Poa palustris *(Fowl Bluegrass)*	3		
Vascular Plants - Poa pratensis *(Kentucky Bluegrass)*	3		

Vascular Plants - Polygonum amphibium *(Water Smartweed)*	3		
Vascular Plants - Polygonum cuspidatum *(Japanese Knotweed)* **N1B**	2		View Model
Vascular Plants - Populus angustifolia *(Narrowleaf Cottonwood)*	3		
Vascular Plants - Potamogeton crispus *(Curly-leaf Pondweed)* **N2B/AIS**	53		View Model
Vascular Plants - Potamogeton foliosus *(Leafy Pondweed)*	98		
Vascular Plants - Potamogeton pectinatus *(Sago Pondweed)*	35		
Vascular Plants - Potamogeton richardsonii *(Richardson's Pondweed)*	8		
Vascular Plants - Potamogeton vaginatus *(Sheathed Pondweed)*	1		
Vascular Plants - Puccinellia nuttalliana *(Nuttall's Alkaligrass)*	3		
Vascular Plants - Ranunculus aquatilis *(White Water Buttercup)*	50		
Vascular Plants - Ranunculus cymbalaria *(Alkali Buttercup)*	3		
Vascular Plants - Rorippa nasturtium-aquaticum *(Watercress)*	3		
Vascular Plants - Rumex crispus *(Curly Dock)*	3		View Model
Vascular Plants - Ruppia maritima *(Ditch-grass)*	3		
Vascular Plants - Sagittaria cuneata *(Northern Arrowhead)*	36		
Vascular Plants - Salix bebbiana *(Bebb's Willow)*	3		
Vascular Plants - Salix exigua *(Sandbar Willow)*	3		
Vascular Plants - Salix lasiandra *(Pacific Willow)*	3		
Vascular Plants - Salsola tragus *(Russian Thistle)*	3		View Model
Vascular Plants - Schedonorus arundinaceus *(Tall Fescue)*	3		
Vascular Plants - Schedonorus pratensis *(Meadow Fescue)*	3		
Vascular Plants - Schoenoplectus acutus *(Hardstem Bulrush)*	1		
Vascular Plants - Schoenoplectus pungens *(Three-square Bulrush)*	3		
Vascular Plants - Schoenoplectus tabernaemontani *(Softstem Bulrush)*	3		
Vascular Plants - Scirpus microcarpus *(Small-fruit Bulrush)*	4		
Vascular Plants - Senecio hydrophilus *(Alkali-marsh Ragwort)* **SOC**		20	View Model
Vascular Plants - Sisymbrium altissimum *(Tall Tumble-mustard)*	3		View Model
Vascular Plants - Sisyrinchium montanum *(Strict Blue-eyed-grass)*	3		
Vascular Plants - Spartina gracilis *(Alkali Cordgrass)*	3		
Vascular Plants - Thermopsis montana *(Mountain Goldenbanner)*	3		
Vascular Plants - Thlaspi arvense *(Field Pennycress)*	3		View Model
Vascular Plants - Tragopogon dubius *(Meadow Goat's-beard)*	3		View Model
Vascular Plants - Triglochin palustris *(Slender Bog Arrow-grass)*	3		
Vascular Plants - Typha latifolia *(Broadleaf Cattail)*	3		
Vascular Plants - Verbascum thapsus *(Common Mullein)*	3		View Model
Vascular Plants - Verbena hastata *(Swamp verbena)*	3		
Vascular Plants - Veronica americana *(American Speedwell)*	3		
Vascular Plants - Zannichellia palustris *(Horned Pondweed)*	2		

Algae 2 Species

	Number of Observations	Species Occurrences	Predicted Suitable Habitat Model
Algae - Chara sp. *(Chara)*	102		
Algae - Nitella sp. *(Nitella)*	6		

Other 68 Species

	Number of Observations	Species Occurrences	Predicted Suitable Habitat Model
Other - Achnanthidium minutissimum *(A Diatom)*	2		
Other - Achnanthidium pyrenaicum *(A Diatom)*	1		
Other - Adlafia minuscula *(A Diatom)*	2		
Other - Amphipleura pellucida *(A Diatom)*	1		
Other - Amphora pediculus *(A Diatom)*	2		
Other - Amphora veneta *(A Diatom)*	1		
Other - Chamaepinnularia bremensis *(A Diatom)*	1		
Other - Cocconeis pediculus *(A Diatom)*	2		
Other - Cocconeis placentula *(A Diatom)*	2		
Other - Cocconeis placentula var. lineata *(A Diatom)*	2		
Other - Cyclostephanos invisitatus *(A Diatom)*	1		
Other - Cyclotella meneghiniana *(A Diatom)*	1		
Other - Cymbella affiniformis *(A Diatom)*	1		
Other - Cymbella affinis *(A Diatom)*	1		
Other - Denticula kuetzingii *(A Diatom)*	1		
Other - Diatoma moniliforme *(A Diatom)*	2		
Other - Diatoma vulgare *(A Diatom)*	1		
Other - Encyonema minutum *(A Diatom)*	1		
Other - Encyonema silesiacum *(A Diatom)*	1		
Other - Encyonopsis subminuta *(A Diatom)*	1		
Other - Eolimna minima *(A Diatom)*	1		
Other - Fragilaria capucina *(A Diatom)*	1		
Other - Fragilaria crotonensis *(A Diatom)*	1		
Other - Fragilaria vaucheriae *(A Diatom)*	1		
Other - Frustulia vulgaris *(A Diatom)*	1		
Other - Gomphoneis minuta *(A Diatom)*	1		
Other - Gomphonema kobayasii *(A Diatom)*	1		
Other - Gomphonema micropus *(A Diatom)*	1		
Other - Gomphonema minutum *(A Diatom)*	1		
Other - Gomphonema olivaceum *(A Diatom)*	2		
Other - Gomphonema parvulum *(A Diatom)*	1		
Other - Gomphonema subclavatum *(A Diatom)*	1		
Other - Hippodonta capitata *(A Diatom)*	1		
Other - Mayamaea agrestis *(A Diatom)*	1		
Other - Mayamaea atomus *(A Diatom)*	2		
Other - Melosira varians *(A Diatom)*	1		
Other - Navicula capitatoradiata *(A Diatom)*	2		
Other - Navicula caterva *(A Diatom)*	2		
Other - Navicula cryptotenella *(A Diatom)*	2		
Other - Navicula cryptotenelloides *(A Diatom)*	1		
Other - Navicula erifuga *(A Diatom)*	1		
Other - Navicula gregaria *(A Diatom)*	2		
Other - Navicula lanceolata *(A Diatom)*	2		
Other - Navicula seibigiana *(A Diatom)*	1		
Other - Navicula subminuscula *(A Diatom)*	1		
Other - Navicula tripunctata *(A Diatom)*	2		
Other - Navicula veneta *(A Diatom)*	1		
Other - Nitzschia acicularis *(A Diatom)*	2		
Other - Nitzschia amphibia *(A Diatom)*	1		
Other - Nitzschia archibaldii *(A Diatom)*	2		

Other - Nitzschia dissipata *(A Diatom)*	2		
Other - Nitzschia fonticola *(A Diatom)*	2		
Other - Nitzschia heufleriana *(A Diatom)*	1		
Other - Nitzschia inconspicua *(A Diatom)*	2		
Other - Nitzschia lacuum *(A Diatom)*	1		
Other - Nitzschia linearis *(A Diatom)*	1		
Other - Nitzschia palea *(A Diatom)*	2		
Other - Nitzschia paleacea *(A Diatom)*	1		
Other - Nitzschia pusilla *(A Diatom)*	1		
Other - Nitzschia sociabilis *(A Diatom)*	1		
Other - Placoneis exigua *(A Diatom)*	1		
Other - Planothidium frequentissimum *(A Diatom)*	1		
Other - Planothidium lanceolatum *(A Diatom)*	2		
Other - Reimeria sinuata *(A Diatom)*	1		
Other - Rhoicosphenia abbreviata *(A Diatom)*	2		
Other - Sellaphora pupula *(A Diatom)*	1		
Other - Simonsenia delognei *(A Diatom)*	1		
Other - Synedra ulna *(A Diatom)*	2		

Montana Natural Heritage - Species Snapshot

Report generated 6/9/2022, 3:45:03 PM

All Montana Species

found in

Township: 006S001W

	Species of Concern	Potential SOC	MT Special Status	Other Status	Invasive and Pest	Total
Mammals	3			7		10
Birds	26	4	1	144		175
Reptiles				1		1
Amphibians				1		1
Fish	1			1		2
Invertebrates	1			19	1	21
ALL ANIMALS	31	4	1	173	1	210
Vascular Plants	8			45	9	62
Bryophytes						
Lichens						
Algae						
ALL PLANTS	8			45	9	62

Mammals 10 Species

	Number of Observations	Species Occurrences	Predicted Suitable Habitat Model
Mammals - Gray Wolf *(Canis lupus)*	2		View Model
Mammals - Grizzly Bear *(Ursus arctos)* SOC		36	View Model
Mammals - Long-eared Myotis *(Myotis evotis)* SOC		1	View Model
Mammals - Long-tailed Weasel *(Mustela frenata)*	1		View Model
Mammals - Mule Deer *(Odocoileus hemionus)*	7		View Model
Mammals - Pronghorn *(Antilocapra americana)*	8		View Model
Mammals - Raccoon *(Procyon lotor)*	4		View Model
Mammals - Red Fox *(Vulpes vulpes)*	4		View Model
Mammals - Townsend's Big-eared Bat *(Corynorhinus townsendii)* SOC		10	View Model
Mammals - White-tailed Deer *(Odocoileus virginianus)*	12		View Model

Birds 175 Species

	Number of Observations	Species Occurrences	Predicted Suitable Habitat Model
Birds - American Avocet *(Recurvirostra americana)*	13		View Model
Birds - American Coot *(Fulica americana)*	25		View Model
Birds - American Crow *(Corvus brachyrhynchos)*	54		View Model
Birds - American Dipper *(Cinclus mexicanus)*	2		View Model
Birds - American Goldfinch *(Spinus tristis)*	131		View Model
Birds - American Kestrel *(Falco sparverius)*	71		View Model
Birds - American Pipit *(Anthus rubescens)*	15		View Model
Birds - American Robin *(Turdus migratorius)*	322		View Model
Birds - American Tree Sparrow *(Spizelloides arborea)*	6		
Birds - American White Pelican *(Pelecanus erythrorhynchos)* SOC	61		View Model
Birds - American Wigeon *(Mareca americana)*	14		View Model
Birds - Baird's Sparrow *(Centronyx bairdii)* SOC	2		View Model
Birds - Bald Eagle *(Haliaeetus leucocephalus)* SSS	204	167	View Model
Birds - Bank Swallow *(Riparia riparia)*	42		View Model

Birds - Barn Swallow *(Hirundo rustica)*	59		View Model
Birds - Barrow's Goldeneye *(Bucephala islandica)* PSOC	10		View Model
Birds - Belted Kingfisher *(Megaceryle alcyon)*	77		View Model
Birds - Black-billed Magpie *(Pica hudsonia)*	395		View Model
Birds - Black-capped Chickadee *(Poecile atricapillus)*	222		View Model
Birds - Black-headed Grosbeak *(Pheucticus melanocephalus)*	58		View Model
Birds - Black-necked Stilt *(Himantopus mexicanus)* SOC	3		View Model
Birds - Blue Jay *(Cyanocitta cristata)*	10		View Model
Birds - Blue-winged Teal *(Spatula discors)*	10		View Model
Birds - Bohemian Waxwing *(Bombycilla garrulus)*	2		
Birds - Brewer's Blackbird *(Euphagus cyanocephalus)*	175		View Model
Birds - Brewer's Sparrow *(Spizella breweri)* SOC	5	11	View Model
Birds - Brown Creeper *(Certhia americana)* SOC	1		View Model
Birds - Brown-headed Cowbird *(Molothrus ater)*	142		View Model
Birds - Bufflehead *(Bucephala albeola)*	7		View Model
Birds - Bullock's Oriole *(Icterus bullockii)*	97		View Model
Birds - Burrowing Owl *(Athene cunicularia)* SOC		4	View Model
Birds - California Gull *(Larus californicus)*	10		View Model
Birds - Calliope Hummingbird *(Selasphorus calliope)*	6		View Model
Birds - Canada Goose *(Branta canadensis)*	149		View Model
Birds - Caspian Tern *(Hydroprogne caspia)* SOC	7		View Model
Birds - Cassin's Finch *(Haemorhous cassinii)* SOC	4		View Model
Birds - Cedar Waxwing *(Bombycilla cedrorum)*	112		View Model
Birds - Chipping Sparrow *(Spizella passerina)*	2		View Model
Birds - Cinnamon Teal *(Spatula cyanoptera)*	31		View Model
Birds - Clark's Nutcracker *(Nucifraga columbiana)* SOC	8	3	View Model
Birds - Cliff Swallow *(Petrochelidon pyrrhonota)*	114		View Model
Birds - Common Goldeneye *(Bucephala clangula)*	19		View Model
Birds - Common Grackle *(Quiscalus quiscula)*	140		View Model
Birds - Common Merganser *(Mergus merganser)*	73		
Birds - Common Nighthawk *(Chordeiles minor)*	49		View Model
Birds - Common Raven *(Corvus corax)*	175		View Model
Birds - Common Redpoll *(Acanthis flammea)*	9		View Model
Birds - Common Yellowthroat *(Geothlypis trichas)*	82		View Model
Birds - Cooper's Hawk *(Accipiter cooperii)*	6		View Model
Birds - Dark-eyed Junco *(Junco hyemalis)*	34		View Model
Birds - Dark-eyed Junco (Montana) *(Junco hyemalis montanus)*	7		
Birds - Dark-eyed Junco (Pink-sided) *(Junco hyemalis mearnsi)*	6		
Birds - Dark-eyed Junco (Slate-colored) *(Junco hyemalis hyemalis / cismontanus)*	4		
Birds - Double-crested Cormorant *(Nannopterum auritum)*	12		View Model
Birds - Downy Woodpecker *(Dryobates pubescens)*	66		View Model
Birds - Eastern Kingbird *(Tyrannus tyrannus)*	134		View Model
Birds - Eurasian Collared-Dove *(Streptopelia decaocto)*	163		View Model
Birds - European Starling *(Sturnus vulgaris)*	238		View Model
Birds - Evening Grosbeak *(Coccothraustes vespertinus)* SOC	2		View Model
Birds - Ferruginous Hawk *(Buteo regalis)* SOC	228	53	View Model
Birds - Franklin's Gull *(Leucophaeus pipixcan)* SOC	14		View Model
Birds - Gadwall *(Mareca strepera)*	25		View Model
Birds - Golden Eagle *(Aquila chrysaetos)* SOC	27	15	View Model
Birds - Grasshopper Sparrow *(Ammodramus savannarum)*	6		View Model
Birds - Gray Catbird *(Dumetella carolinensis)*	101		View Model

Birds - Gray Partridge *(Perdix perdix)*	18		View Model
Birds - Gray-crowned Rosy-Finch *(Leucosticte tephrocotis)* SOC	2		View Model
Birds - Great Blue Heron *(Ardea herodias)* SOC	105	142	View Model
Birds - Great Horned Owl *(Bubo virginianus)*	28		View Model
Birds - Greater Sage-Grouse *(Centrocercus urophasianus)* SOC		5	View Model
Birds - Greater Yellowlegs *(Tringa melanoleuca)*	8		
Birds - Green-tailed Towhee *(Pipilo chlorurus)* SOC	11		View Model
Birds - Green-winged Teal *(Anas crecca)*	37		View Model
Birds - Hairy Woodpecker *(Dryobates villosus)*	7		View Model
Birds - Hammond's Flycatcher *(Empidonax hammondii)*	2		View Model
Birds - Hermit Thrush *(Catharus guttatus)*	6		View Model
Birds - Herring Gull *(Larus argentatus)*	2		View Model
Birds - Hooded Merganser *(Lophodytes cucullatus)* PSOC	4		View Model
Birds - Horned Lark *(Eremophila alpestris)*	95		View Model
Birds - House Finch *(Haemorhous mexicanus)*	131		View Model
Birds - House Sparrow *(Passer domesticus)*	109		View Model
Birds - House Wren *(Troglodytes aedon)*	204		View Model
Birds - Killdeer *(Charadrius vociferus)*	54		View Model
Birds - Lark Sparrow *(Chondestes grammacus)*	1		View Model
Birds - Lazuli Bunting *(Passerina amoena)*	8		View Model
Birds - Least Flycatcher *(Empidonax minimus)*	77		View Model
Birds - Lesser Scaup *(Aythya affinis)*	21		View Model
Birds - Lincoln's Sparrow *(Melospiza lincolnii)*	8		View Model
Birds - Long-billed Curlew *(Numenius americanus)* SOC	57	5	View Model
Birds - MacGillivray's Warbler *(Geothlypis tolmiei)*	3		View Model
Birds - Mallard *(Anas platyrhynchos)*	161		View Model
Birds - Marbled Godwit *(Limosa fedoa)*	1		View Model
Birds - Marsh Wren *(Cistothorus palustris)*	26		View Model
Birds - Merlin *(Falco columbarius)*	11		View Model
Birds - Mountain Bluebird *(Sialia currucoides)*	81		View Model
Birds - Mountain Chickadee *(Poecile gambeli)*	48		View Model
Birds - Mourning Dove *(Zenaida macroura)*	108		View Model
Birds - Northern Bobwhite *(Colinus virginianus)*	2		
Birds - Northern Flicker *(Colaptes auratus)*	151		View Model
Birds - Northern Flicker (Red-shafted) *(Colaptes auratus cafer)*	22		
Birds - Northern Harrier *(Circus hudsonius)*	97		View Model
Birds - Northern Parula *(Setophaga americana)*	1		
Birds - Northern Pintail *(Anas acuta)*	7		View Model
Birds - Northern Rough-winged Swallow *(Stelgidopteryx serripennis)*	101		View Model
Birds - Northern Shoveler *(Spatula clypeata)*	20		View Model
Birds - Northern Shrike *(Lanius borealis)*	5		
Birds - Northern Waterthrush *(Parkesia noveboracensis)*	7		View Model
Birds - Osprey *(Pandion haliaetus)*	168		View Model
Birds - Peregrine Falcon *(Falco peregrinus)* SOC	2		View Model
Birds - Pied-billed Grebe *(Podilymbus podiceps)*	11		View Model
Birds - Pine Grosbeak *(Pinicola enucleator)*	6		View Model
Birds - Pine Siskin *(Spinus pinus)*	35		View Model
Birds - Pinyon Jay *(Gymnorhinus cyanocephalus)* SOC	17		View Model
Birds - Prairie Falcon *(Falco mexicanus)*	24		View Model
Birds - Red Crossbill *(Loxia curvirostra)*	1		View Model

Birds - Red-breasted Merganser *(Mergus serrator)*	15		
Birds - Red-breasted Nuthatch *(Sitta canadensis)*	17		View Model
Birds - Red-eyed Vireo *(Vireo olivaceus)*	2		View Model
Birds - Red-naped Sapsucker *(Sphyrapicus nuchalis)*	78		View Model
Birds - Red-tailed Hawk *(Buteo jamaicensis)*	167		View Model
Birds - Red-winged Blackbird *(Agelaius phoeniceus)*	282		View Model
Birds - Redhead *(Aythya americana)*	5		View Model
Birds - Ring-billed Gull *(Larus delawarensis)*	27		View Model
Birds - Ring-necked Duck *(Aythya collaris)*	8		View Model
Birds - Ring-necked Pheasant *(Phasianus colchicus)*	10		View Model
Birds - Rock Pigeon *(Columba livia)*	44		
Birds - Rock Wren *(Salpinctes obsoletus)*	13		View Model
Birds - Rough-legged Hawk *(Buteo lagopus)*	36		
Birds - Ruby-crowned Kinglet *(Corthylio calendula)*	52		View Model
Birds - Ruddy Duck *(Oxyura jamaicensis)*	2		View Model
Birds - Rufous Hummingbird *(Selasphorus rufus)* **PSOC**	8		View Model
Birds - Rusty Blackbird *(Euphagus carolinus)*	2		
Birds - Sage Thrasher *(Oreoscoptes montanus)* **SOC**	2	2	View Model
Birds - Sandhill Crane *(Antigone canadensis)*	83		View Model
Birds - Savannah Sparrow *(Passerculus sandwichensis)*	93		View Model
Birds - Sharp-shinned Hawk *(Accipiter striatus)*	6		View Model
Birds - Sharp-tailed Grouse *(Tympanuchus phasianellus)* **SOC**	1		View Model
Birds - Short-eared Owl *(Asio flammeus)* **PSOC**	3		View Model
Birds - Snow Bunting *(Plectrophenax nivalis)*	2		
Birds - Snow Goose *(Anser caerulescens)*	6		
Birds - Song Sparrow *(Melospiza melodia)*	239		View Model
Birds - Sora *(Porzana carolina)*	6		View Model
Birds - Spotted Sandpiper *(Actitis macularius)*	55		View Model
Birds - Spotted Towhee *(Pipilo maculatus)*	5		View Model
Birds - Sprague's Pipit *(Anthus spragueii)* **SOC**	7		View Model
Birds - Steller's Jay *(Cyanocitta stelleri)*	2		View Model
Birds - Swainson's Hawk *(Buteo swainsoni)*	24		View Model
Birds - Swainson's Thrush *(Catharus ustulatus)*	3		View Model
Birds - Thick-billed Longspur *(Rhynchophanes mccownii)* **SOC**	4	4	View Model
Birds - Townsend's Solitaire *(Myadestes townsendi)*	21		View Model
Birds - Tree Swallow *(Tachycineta bicolor)*	215		View Model
Birds - Trumpeter Swan *(Cygnus buccinator)* **SOC**	44		View Model
Birds - Turkey Vulture *(Cathartes aura)*	32		View Model
Birds - Veery *(Catharus fuscescens)* **SOC**	1		View Model
Birds - Vesper Sparrow *(Pooecetes gramineus)*	211		View Model
Birds - Violet-green Swallow *(Tachycineta thalassina)*	32		View Model
Birds - Virginia Rail *(Rallus limicola)*	4		View Model
Birds - Warbling Vireo *(Vireo gilvus)*	69		View Model
Birds - Western Kingbird *(Tyrannus verticalis)*	12		View Model
Birds - Western Meadowlark *(Sturnella neglecta)*	270		View Model
Birds - Western Tanager *(Piranga ludoviciana)*	17		View Model
Birds - Western Wood-Pewee *(Contopus sordidulus)*	149		View Model
Birds - White-breasted Nuthatch *(Sitta carolinensis)*	2		View Model
Birds - White-crowned Sparrow *(Zonotrichia leucophrys)*	31		View Model
Birds - White-throated Sparrow *(Zonotrichia albicollis)*	2		
Birds - Willet *(Tringa semipalmata)*	8		View Model

Birds - Williamson's Sapsucker *(Sphyrapicus thyroideus)*	4		View Model
Birds - Willow Flycatcher *(Empidonax traillii)*	27		View Model
Birds - Wilson's Phalarope *(Phalaropus tricolor)*	9		View Model
Birds - Wilson's Snipe *(Gallinago delicata)*	26		View Model
Birds - Wilson's Warbler *(Cardellina pusilla)*	18		View Model
Birds - Yellow Warbler *(Setophaga petechia)*	234		View Model
Birds - Yellow-headed Blackbird *(Xanthocephalus xanthocephalus)*	4		View Model
Birds - Yellow-rumped Warbler *(Setophaga coronata)*	54		View Model
Birds - Yellow-rumped Warbler (Audubon's) *(Setophaga coronata auduboni)*	32		

Reptiles 1 Species

	Number of Observations	Species Occurrences	Predicted Suitable Habitat Model
Reptiles - Terrestrial Gartersnake *(Thamnophis elegans)*	3		View Model

Amphibians 1 Species

	Number of Observations	Species Occurrences	Predicted Suitable Habitat Model
Amphibians - Columbia Spotted Frog *(Rana luteiventris)*	2		View Model

Fish 2 Species

	Number of Observations	Species Occurrences	Predicted Suitable Habitat Model
Fish - Arctic Grayling *(Thymallus arcticus)* SOC		11	View Model
Fish - Brown Trout *(Salmo trutta)*	1		View Model

Invertebrates 21 Species

	Number of Observations	Species Occurrences	Predicted Suitable Habitat Model
Invertebrates - Amiocentrus aspilus *(A Caddisfly)*	10		
Invertebrates - Baetis tricaudatus *(A Mayfly)*	18		
Invertebrates - Brachycentrus occidentalis *(A Caddisfly)*	20		
Invertebrates - Claassenia sabulosa *(Shortwing Stone)*	10		
Invertebrates - Drunella grandis *(A Mayfly)*	12		
Invertebrates - Ephemerella excrucians *(A Mayfly)*	18		
Invertebrates - Gammarus lacustris *(An Amphipod)*	1		
Invertebrates - Helicopsyche borealis *(A Caddisfly)*	2		
Invertebrates - Hesperoperla pacifica *(Golden Stone)*	2		
Invertebrates - Iswaeon anoka *(A Mayfly)*	4		
Invertebrates - Lepidostoma pluviale *(A Caddisfly)*	14		
Invertebrates - Margaritifera falcata *(Western Pearlshell)* SOC	4	3	
Invertebrates - Oecetis avara *(A Caddisfly)*	2		
Invertebrates - Paraleptophlebia heteronea *(A Mayfly)*	2		
Invertebrates - Physella acuta *(Pewter Physa)*	1		
Invertebrates - Potamopyrgus antipodarum *(New Zealand Mudsnail)* AIS	4		
Invertebrates - Psychomyia flavida *(A Caddisfly)*	6		
Invertebrates - Pteronarcys californica *(Giant Salmonfly)*	16		
Invertebrates - Rhithrogena undulata *(Wavy Flat-headed Mayfly)*	2		
Invertebrates - Skwala americana *(American Springfly)*	4		
Invertebrates - Tricorythodes explicatus *(A Mayfly)*	4		

Vascular Plants 62 Species

	Number of Observations	Species Occurrences	Predicted Suitable Habitat Model
Vascular Plants - Acroptilon repens *(Russian Knapweed)* **N2B**	4		View Model
Vascular Plants - Agropyron cristatum *(Crested Wheatgrass)*	1		
Vascular Plants - Agrostis stolonifera *(Creeping Bentgrass)*	1		
Vascular Plants - Allium schoenoprasum *(Chives)*	1		
Vascular Plants - Alopecurus arundinaceus *(Creeping Foxtail)*	1		
Vascular Plants - Alyssum alyssoides *(Pale Alyssum)*	1		View Model
Vascular Plants - Argentina anserina *(Silverweed cinquefoil)*	5		
Vascular Plants - Astragalus purshii var. concinnus *(Woollypod Milkvetch)*	1		
Vascular Plants - Astragalus terminalis *(Railhead Milkvetch)* **SOC**	1	1	View Model
Vascular Plants - Atriplex truncata *(Wedge-leaf Saltbush)* **SOC**	3	3	View Model
Vascular Plants - Berteroa incana *(Hoary False-alyssum)* **N2B**	2		View Model
Vascular Plants - Bromus inermis *(Smooth Brome)*	1		
Vascular Plants - Bromus japonicus *(Japanese Brome)*	1		View Model
Vascular Plants - Bromus tectorum *(Cheatgrass)* **R3**	1		View Model
Vascular Plants - Calamagrostis stricta *(Slimstem reedgrass)*	5		
Vascular Plants - Carex aurea *(Golden-fruit Sedge)*	3		
Vascular Plants - Carex nebrascensis *(Nebraska Sedge)*	3		
Vascular Plants - Carex praegracilis *(Clustered Field Sedge)*	3		
Vascular Plants - Carex scirpoidea *(Single-spike Sedge)*	3		
Vascular Plants - Centaurea diffusa *(Diffuse Knapweed)* **N2B**	5		View Model
Vascular Plants - Centaurea stoebe *(Spotted Knapweed)* **N2B**	109		View Model
Vascular Plants - Ceratophyllum demersum *(Common Hornwort)*	1		
Vascular Plants - Chenopodium album *(White Goosefoot)*	1		
Vascular Plants - Cirsium arvense *(Canada Thistle)* **N2B**	51		View Model
Vascular Plants - Cynoglossum officinale *(Common Hound's-tongue)* **N2B**	29		View Model
Vascular Plants - Deschampsia cespitosa *(Tufted Hairgrass)*	2		
Vascular Plants - Distichlis spicata *(Saltgrass)*	8		
Vascular Plants - Dodecatheon pulchellum *(Few-flowered Shootingstar)*	6		
Vascular Plants - Eleocharis quinqueflora *(Few-flower Spikerush)*	1		
Vascular Plants - Elodea canadensis *(Broad Waterweed)*	1		
Vascular Plants - Erigeron parryi *(Parry's Fleabane)* **SOC**	1	1	View Model
Vascular Plants - Festuca idahoensis *(Idaho Fescue)*	1		
Vascular Plants - Juncus balticus *(Baltic Rush)*	4		
Vascular Plants - Lepidium draba *(Whitetop)* **N2B**	3		View Model
Vascular Plants - Lepidium perfoliatum *(Clasping Pepper-grass)*	1		View Model
Vascular Plants - Medicago lupulina *(Black Medic)*	1		
Vascular Plants - Melilotus officinalis *(Yellow Sweetclover)*	1		View Model
Vascular Plants - Muhlenbergia richardsonis *(Mat Muhly)*	6		
Vascular Plants - Myriophyllum quitense *(Andean Water-milfoil)* **SOC**	1	1	View Model
Vascular Plants - Phalaris arundinacea *(Reed Canarygrass)*	1		View Model
Vascular Plants - Phlox hoodii *(Hood's Phlox)*	1		
Vascular Plants - Plantago major *(Common Plantain)*	1		
Vascular Plants - Pleiacanthus spinosus *(Spiny Skeletonweed)* **SOC**	2	38	View Model
Vascular Plants - Poa pratensis *(Kentucky Bluegrass)*	1		

Vascular Plants - Polygonum cuspidatum *(Japanese Knotweed)* N1B	2		View Model
Vascular Plants - Polygonum ramosissimum *(Bushy Knotweed)*	4		
Vascular Plants - Potamogeton pectinatus *(Sago Pondweed)*	1		
Vascular Plants - Potamogeton vaginatus *(Sheathed Pondweed)*	2		
Vascular Plants - Potentilla fruticosa *(Shrubby Cinquefoil)*	2		
Vascular Plants - Primula alcalina *(Alkali Primrose)* SOC	5	5	View Model
Vascular Plants - Primula incana *(Mealy Primrose)* SOC	17	6	View Model
Vascular Plants - Puccinellia nuttalliana *(Nuttall's Alkaligrass)*	1		
Vascular Plants - Pyrrocoma integrifolia *(Entire-leaf Goldenweed)*	1		
Vascular Plants - Ranunculus aquatilis *(White Water Buttercup)*	4		
Vascular Plants - Schedonorus arundinaceus *(Tall Fescue)*	1		
Vascular Plants - Senecio hydrophilus *(Alkali-marsh Ragwort)* SOC	1	21	View Model
Vascular Plants - Sonchus arvensis ssp. uliginosus *(Field Sowthistle)*	1		View Model
Vascular Plants - Suaeda calceoliformis *(Horned Sea-blite)*	6		
Vascular Plants - Tragopogon dubius *(Meadow Goat's-beard)*	1		View Model
Vascular Plants - Trifolium repens *(White Clover)*	1		View Model
Vascular Plants - Verbascum thapsus *(Common Mullein)*	1		View Model
Vascular Plants - Zannichellia palustris *(Horned Pondweed)*	1		

Other 123 Species

	Number of Observations	Species Occurrences	Predicted Suitable Habitat Model
Other - Achnanthes taeniata *(A Diatom)*	1		
Other - Achnanthidium affine *(A Diatom)*	1		
Other - Achnanthidium deflexum *(A Diatom)*	1		
Other - Achnanthidium exiguum *(A Diatom)*	2		
Other - Achnanthidium gracillimum *(A Diatom)*	1		
Other - Achnanthidium minutissimum *(A Diatom)*	5		
Other - Achnanthidium pyrenaicum *(A Diatom)*	2		
Other - Achnanthidium thienemannii *(A Diatom)*	1		
Other - Adlafia bryophila *(A Diatom)*	1		
Other - Adlafia minuscula *(A Diatom)*	3		
Other - Amphora copulata *(A Diatom)*	2		
Other - Amphora inariensis *(A Diatom)*	3		
Other - Amphora ovalis *(A Diatom)*	1		
Other - Amphora pediculus *(A Diatom)*	5		
Other - Asterionella formosa *(A Diatom)*	1		
Other - Aulacoseira crenulata *(A Diatom)*	1		
Other - Aulacoseira granulata *(A Diatom)*	1		
Other - Caloneis bacillum *(A Diatom)*	2		
Other - Chamaepinnularia bremensis *(A Diatom)*	1		
Other - Cocconeis pediculus *(A Diatom)*	4		
Other - Cocconeis placentula *(A Diatom)*	5		
Other - Cocconeis placentula var. lineata *(A Diatom)*	3		
Other - Cyclostephanos invisitatus *(A Diatom)*	2		
Other - Cyclotella meneghiniana *(A Diatom)*	2		
Other - Cymatopleura solea *(A Diatom)*	1		
Other - Cymbella affinis *(A Diatom)*	2		
Other - Cymbellonitzschia diluviana *(A Diatom)*	1		

Other - Cymbopleura naviculiformis *(A Diatom)*	1		
Other - Denticula kuetzingii *(A Diatom)*	1		
Other - Diatoma hiemale *(A Diatom)*	2		
Other - Diatoma moniliforme *(A Diatom)*	3		
Other - Diatoma vulgare *(A Diatom)*	2		
Other - Diploneis oblongella *(A Diatom)*	1		
Other - Encyonema minutum *(A Diatom)*	3		
Other - Encyonema prostratum *(A Diatom)*	1		
Other - Encyonema reichardtii *(A Diatom)*	2		
Other - Encyonema silesiacum *(A Diatom)*	4		
Other - Encyonopsis microcephala *(A Diatom)*	1		
Other - Eolimna minima *(A Diatom)*	5		
Other - Epithemia sorex *(A Diatom)*	1		
Other - Eunotia subarcuatoides *(A Diatom)*	1		
Other - Fragilaria capucina *(A Diatom)*	2		
Other - Fragilaria crotonensis *(A Diatom)*	2		
Other - Fragilaria vaucheriae *(A Diatom)*	4		
Other - Geissleria acceptata *(A Diatom)*	1		
Other - Geissleria decussis *(A Diatom)*	1		
Other - Gomphoneis eriense *(A Diatom)*	1		
Other - Gomphonema angustatum *(A Diatom)*	1		
Other - Gomphonema kobayasii *(A Diatom)*	2		
Other - Gomphonema micropus *(A Diatom)*	2		
Other - Gomphonema minutum *(A Diatom)*	2		
Other - Gomphonema olivaceum *(A Diatom)*	3		
Other - Gomphonema parvulum *(A Diatom)*	3		
Other - Gomphonema pumilum *(A Diatom)*	1		
Other - Gomphonema truncatum *(A Diatom)*	2		
Other - Gyrosigma acuminatum *(A Diatom)*	1		
Other - Hannaea arcus *(A Diatom)*	1		
Other - Hantzschia amphioxys *(A Diatom)*	1		
Other - Hippodonta capitata *(A Diatom)*	3		
Other - Karayevia clevei *(A Diatom)*	1		
Other - Luticola mutica *(A Diatom)*	1		
Other - Mayamaea atomus *(A Diatom)*	4		
Other - Melosira varians *(A Diatom)*	2		
Other - Meridion circulare *(A Diatom)*	1		
Other - Meridion circulare var. constrictum *(A Diatom)*	1		
Other - Navicula antonii *(A Diatom)*	2		
Other - Navicula capitatoradiata *(A Diatom)*	3		
Other - Navicula cari *(A Diatom)*	2		
Other - Navicula caterva *(A Diatom)*	4		
Other - Navicula cryptocephala *(A Diatom)*	2		
Other - Navicula cryptotenella *(A Diatom)*	3		
Other - Navicula cryptotenelloides *(A Diatom)*	2		
Other - Navicula erifuga *(A Diatom)*	1		
Other - Navicula gregaria *(A Diatom)*	4		
Other - Navicula lanceolata *(A Diatom)*	3		
Other - Navicula menisculus *(A Diatom)*	1		
Other - Navicula tripunctata *(A Diatom)*	5		
Other - Navicula veneta *(A Diatom)*	2		

Other - Nitzschia acicularis *(A Diatom)*	2		
Other - Nitzschia amphibia *(A Diatom)*	2		
Other - Nitzschia angustata *(A Diatom)*	1		
Other - Nitzschia archibaldii *(A Diatom)*	5		
Other - Nitzschia aurariae *(A Diatom)*	1		
Other - Nitzschia dissipata *(A Diatom)*	5		
Other - Nitzschia fonticola *(A Diatom)*	5		
Other - Nitzschia fossilis *(A Diatom)*	1		
Other - Nitzschia frustulum *(A Diatom)*	4		
Other - Nitzschia gracilis *(A Diatom)*	1		
Other - Nitzschia heufleriana *(A Diatom)*	2		
Other - Nitzschia incognita *(A Diatom)*	1		
Other - Nitzschia inconspicua *(A Diatom)*	3		
Other - Nitzschia lanceolata *(A Diatom)*	1		
Other - Nitzschia liebetruthii *(A Diatom)*	1		
Other - Nitzschia linearis *(A Diatom)*	5		
Other - Nitzschia microcephala *(A Diatom)*	1		
Other - Nitzschia palea *(A Diatom)*	4		
Other - Nitzschia paleacea *(A Diatom)*	2		
Other - Nitzschia perminuta *(A Diatom)*	2		
Other - Nitzschia pura *(A Diatom)*	2		
Other - Nitzschia pusilla *(A Diatom)*	2		
Other - Nitzschia recta *(A Diatom)*	1		
Other - Nitzschia sociabilis *(A Diatom)*	1		
Other - Nitzschia sublinearis *(A Diatom)*	2		
Other - Placoneis exigua *(A Diatom)*	2		
Other - Planothidium dubium *(A Diatom)*	3		
Other - Planothidium frequentissimum *(A Diatom)*	3		
Other - Planothidium lanceolatum *(A Diatom)*	5		
Other - Pseudostaurosira brevistriata *(A Diatom)*	2		
Other - Pseudostaurosira parasitica *(A Diatom)*	1		
Other - Reimeria sinuata *(A Diatom)*	2		
Other - Rhoicosphenia abbreviata *(A Diatom)*	5		
Other - Sellaphora pupula *(A Diatom)*	1		
Other - Stauroneis smithii *(A Diatom)*	2		
Other - Staurosira construens *(A Diatom)*	3		
Other - Staurosira venter *(A Diatom)*	3		
Other - Staurosirella leptostauron *(A Diatom)*	3		
Other - Staurosirella pinnata *(A Diatom)*	4		
Other - Stephanodiscus hantzschii *(A Diatom)*	1		
Other - Stephanodiscus minutulus *(A Diatom)*	1		
Other - Surirella angusta *(A Diatom)*	3		
Other - Synedra acus *(A Diatom)*	1		
Other - Synedra rumpens *(A Diatom)*	1		
Other - Synedra ulna *(A Diatom)*	4		

Montana Natural Heritage - SOC Report

Species List Last Updated **02/19/2021**

Animal Species of Concern

10 Species of Concern
1 Special Status Species
Filtered by the following criteria:
Township = 005S001W (based on mapped Species Occurrences)

MONTANA Natural Heritage Program

A program of the Montana State Library's Natural Resource Information System operated by the University of Montana.

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Introduction

Species of Concern

Species of Concern
10 Species
Filtered by the following criteria:
Township = 005S001W (based on mapped **Species Occurrences**)

MAMMALS (MAMMALIA)

1 SPECIES
TOWNSHIP = 005S001W (based on mapped **Species Occurrences**)

SCIENTIFIC NAME / COMMON NAME / TAXA SORT	FAMILY (SCIENTIFIC) / FAMILY (COMMON)	GLOBAL RANK	STATE RANK	USFWS	USFS	BLM	FWP SWAP	% OF GLOBAL BREEDING RANGE IN MT	% OF MT THAT IS BREEDING RANGE	HABITAT
Ursus arctos Grizzly Bear	**Ursidae** Bears	G4	S2S3	PS: LT; XN		THREATENED	SGCN2-3	1%	22%	Conifer forest
		Species Occurrences verified in these Counties: Beaverhead, Broadwater, Carbon, Cascade, Chouteau, Deer Lodge, Fergus, Flathead, Gallatin, Glacier, Granite, Hill, Jefferson, Judith Basin, Lake, Lewis and Clark, Liberty, Lincoln, Madison, Meagher, Mineral, Missoula, Park, Pondera, Powell, Ravalli, Sanders, Silver Bow, Stillwater, Sweet Grass, Teton, Toole, Wheatland, Yellowstone								

BIRDS (AVES)

8 SPECIES
TOWNSHIP = 005S001W (based on mapped **Species Occurrences**)

SCIENTIFIC NAME / COMMON NAME / TAXA SORT	FAMILY (SCIENTIFIC) / FAMILY (COMMON)	GLOBAL RANK	STATE RANK	USFWS	USFS	BLM	FWP SWAP	% OF GLOBAL BREEDING RANGE IN MT	% OF MT THAT IS BREEDING RANGE	HABITAT
Aquila chrysaetos Golden Eagle	**Accipitridae** Hawks / Kites / Eagles	G5	S3	BGEPA; MBTA		SENSITIVE	SGCN3	3%	100%	Grasslands
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Dawson, Deer Lodge, Fallon, Fergus, Flathead, Gallatin, Garfield, Glacier, Golden Valley, Granite, Hill, Jefferson, Judith Basin, Lake, Lewis and Clark, Liberty, Lincoln, Madison, Mccone, Meagher, Missoula, Musselshell, Park, Petroleum, Phillips, Pondera, Powder River, Powell, Prairie, Ravalli, Richland, Roosevelt, Rosebud, Sanders, Sheridan, Silver Bow, Stillwater, Sweet Grass, Teton, Toole, Treasure, Valley, Wheatland, Wibaux, Yellowstone								
Ardea herodias Great Blue Heron	**Ardeidae** Bitterns / Egrets / Herons / Night-Herons	G5	S3	MBTA			SGCN3	3%	100%	Riparian forest
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Dawson, Deer Lodge, Fallon, Fergus, Flathead, Gallatin, Garfield, Glacier, Golden Valley, Granite, Hill, Jefferson, Judith Basin, Lake, Lewis and Clark, Liberty, Lincoln, Madison, Mccone, Meagher, Mineral, Missoula, Musselshell, Park, Petroleum, Phillips, Pondera, Powder River, Powell, Prairie, Ravalli, Richland, Roosevelt, Rosebud, Sanders, Sheridan, Silver Bow, Stillwater, Sweet Grass, Teton, Treasure, Valley, Wheatland, Wibaux, Yellowstone **State Rank Reason:** Small breeding population size, evidence of recent declines, and declining regeneration of riparian cottonwood forests due to altered hydrology and grazing.								
Buteo regalis Ferruginous Hawk	**Accipitridae** Hawks / Kites / Eagles	G4	S3B	MBTA; BCC17		SENSITIVE	SGCN3	11%	95%	Sagebrush grassland
		Species Occurrences verified in these Counties: Beaverhead, Blaine, Broadwater, Carter, Cascade, Chouteau, Custer, Daniels, Dawson, Deer Lodge, Fallon, Fergus, Gallatin, Garfield, Glacier, Golden Valley, Hill, Jefferson, Judith Basin, Lewis and Clark, Liberty, Madison, Mccone, Meagher, Musselshell, Park, Petroleum, Phillips, Pondera, Powder River, Powell, Prairie, Roosevelt, Rosebud, Sheridan, Stillwater, Teton, Toole, Valley, Wheatland, Wibaux, Yellowstone								
Catharus fuscescens Veery	**Turdidae** Thrushes	G5	S3B	MBTA		SENSITIVE	SGCN3	6%	100%	Riparian forest
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Cascade, Chouteau, Custer, Deer Lodge, Fergus, Flathead, Gallatin, Glacier, Granite, Hill, Jefferson, Judith Basin, Lake, Lewis and Clark, Liberty, Lincoln, Madison, Mccone, Meagher, Mineral, Missoula, Musselshell, Park, Petroleum, Phillips, Pondera, Powder River, Powell, Ravalli, Richland, Roosevelt, Rosebud, Sanders, Silver Bow, Stillwater, Sweet Grass, Teton, Wheatland, Yellowstone								

Cygnus buccinator Trumpeter Swan	**Anatidae** Swans / Geese / Ducks	G4	S3	MBTA	Sensitive - Known on Forests (BD)	SENSITIVE	SGCN3	2%	9%	Lakes, ponds, reservoirs
		Species Occurrences verified in these Counties: Beaverhead, Flathead, Lake, Lewis and Clark, Madison, Missoula, Park, Powell, Ravalli								
Nucifraga columbiana Clark's Nutcracker	**Corvidae** Jays / Crows / Magpies	G5	S3	MBTA	Species of Conservation Concern on Forests (FLAT)		SGCN3	9%	84%	Conifer forest
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Deer Lodge, Fergus, Flathead, Gallatin, Garfield, Glacier, Golden Valley, Granite, Hill, Jefferson, Judith Basin, Lake, Lewis and Clark, Liberty, Lincoln, Madison, Meagher, Mineral, Missoula, Musselshell, Park, Petroleum, Phillips, Pondera, Powder River, Powell, Ravalli, Sanders, Silver Bow, Stillwater, Sweet Grass, Teton, Toole, Wheatland, Yellowstone								
Numenius americanus Long-billed Curlew	**Scolopacidae** Sandpipers	G5	S3B	MBTA; BCC11		SENSITIVE	SGCN3	19%	100%	Grasslands
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Daniels, Dawson, Deer Lodge, Fallon, Fergus, Flathead, Gallatin, Garfield, Glacier, Golden Valley, Granite, Hill, Jefferson, Judith Basin, Lake, Lewis and Clark, Liberty, Madison, Mccone, Meagher, Missoula, Musselshell, Park, Petroleum, Phillips, Pondera, Powder River, Powell, Prairie, Ravalli, Richland, Roosevelt, Rosebud, Sanders, Sheridan, Silver Bow, Stillwater, Sweet Grass, Teton, Toole, Treasure, Valley, Wheatland, Wibaux, Yellowstone								
Spizella breweri Brewer's Sparrow	**Passerellidae** New World Sparrows	G5	S3B	MBTA		SENSITIVE	SGCN3	12%	100%	Sagebrush
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Chouteau, Custer, Dawson, Deer Lodge, Fallon, Fergus, Flathead, Gallatin, Garfield, Glacier, Golden Valley, Granite, Hill, Jefferson, Lake, Lewis and Clark, Liberty, Lincoln, Madison, Mccone, Meagher, Missoula, Musselshell, Park, Petroleum, Phillips, Pondera, Powder River, Powell, Prairie, Ravalli, Richland, Roosevelt, Rosebud, Sanders, Sheridan, Silver Bow, Stillwater, Sweet Grass, Teton, Toole, Treasure, Valley, Wheatland, Wibaux, Yellowstone **State Rank Reason:** Species faces threats from loss of sagebrush habitats it is dependent on as a result of habitat conversion for agriculture and increased frequency of fire as a result of weed encroachment and drought.								

FISH (ACTINOPTERYGII)

1 SPECIES

TOWNSHIP = 005S001W (based on mapped **Species Occurrences**)

SCIENTIFIC NAME COMMON NAME TAXA SORT	FAMILY (SCIENTIFIC) FAMILY (COMMON)	GLOBAL RANK	STATE RANK	USFWS	USFS	BLM	FWP SWAP	% OF GLOBAL BREEDING RANGE IN MT	% OF MT THAT IS BREEDING RANGE	HABITAT
Thymallus arcticus Arctic Grayling	**Salmonidae** Trout	G5	S1		Sensitive - Known on Forests (BD)	SENSITIVE	SGCN1		5%	Mountain rivers, lakes
		Species Occurrences verified in these Counties: Beaverhead, Deer Lodge, Madison, Silver Bow **State Rank Reason:** The Arctic Grayling is currently ranked "S1" in Montana because it is at extremely high risk of extirpation in the state due to very limited and/or rapidly declining population numbers, range and/or habitat.								

Potential Species of Concern

Special Status Species

Additions To Statewide List

Species Removed From Statewide List

Species of Greatest Inventory Need

Citation for data on this website:
Montana Animal Species of Concern Report. Montana Natural Heritage Program and Montana Fish, Wildlife and Parks. Retrieved on 5/27/2022, from mtnhp.org/SpeciesOfConcern/?AorP=a

Montana Natural Heritage - SOC Report

Animal Species of Concern

Species List Last Updated **02/19/2021**

15 Species of Concern
1 Special Status Species
Filtered by the following criteria:
Township = 006S001W (based on mapped Species Occurrences)

MONTANA Natural Heritage Program

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Introduction

Species of Concern

Species of Concern
15 Species
Filtered by the following criteria:
Township = 006S001W (based on mapped **Species Occurrences**)

MAMMALS (MAMMALIA)

3 SPECIES
TOWNSHIP = 006S001W (based on mapped **Species Occurrences**)

SCIENTIFIC NAME COMMON NAME TAXA SORT	FAMILY (SCIENTIFIC) FAMILY (COMMON)	GLOBAL RANK	STATE RANK	USFWS	USFS	BLM	FWP SWAP	% OF GLOBAL BREEDING RANGE IN MT	% OF MT THAT IS BREEDING RANGE	HABITAT
Corynorhinus townsendii Townsend's Big-eared Bat	**Vespertilionidae** Bats	G4	S3		Sensitive - Known on Forests (BD, BRT, KOOT, LOLO)	SENSITIVE	SGCN3	5%	87%	Caves in forested habitats
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Fergus, Flathead, Gallatin, Garfield, Granite, Jefferson, Judith Basin, Lake, Lewis and Clark, Lincoln, Madison, Mccone, Meagher, Mineral, Missoula, Musselshell, Park, Phillips, Powder River, Powell, Prairie, Ravalli, Richland, Roosevelt, Rosebud, Sanders, Silver Bow, Stillwater, Treasure, Valley, Yellowstone **State Rank Reason:** Species is widespread, but uncommon and appears to occur at low densities. Disturbance of cave and mine roosts and the hard closure of occupied mines threaten long-term persistence.								
Myotis evotis Long-eared Myotis	**Vespertilionidae** Bats	G5	S3					12%	100%	Forest
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Dawson, Deer Lodge, Fergus, Flathead, Gallatin, Garfield, Glacier, Golden Valley, Granite, Hill, Jefferson, Judith Basin, Lake, Lewis and Clark, Lincoln, Madison, Mccone, Meagher, Mineral, Missoula, Musselshell, Park, Petroleum, Phillips, Pondera, Powder River, Powell, Prairie, Ravalli, Richland, Roosevelt, Rosebud, Sanders, Silver Bow, Stillwater, Sweet Grass, Teton, Toole, Treasure, Valley, Wheatland, Wibaux, Yellowstone								
Ursus arctos Grizzly Bear	**Ursidae** Bears	G4	S2S3	PS: LT; XN		THREATENED	SGCN2-3	1%	22%	Conifer forest
		Species Occurrences verified in these Counties: Beaverhead, Broadwater, Carbon, Cascade, Chouteau, Deer Lodge, Fergus, Flathead, Gallatin, Glacier, Granite, Hill, Jefferson, Judith Basin, Lake, Lewis and Clark, Liberty, Lincoln, Madison, Meagher, Mineral, Missoula, Park, Pondera, Powell, Ravalli, Sanders, Silver Bow, Stillwater, Sweet Grass, Teton, Toole, Wheatland, Yellowstone								

BIRDS (AVES)

10 SPECIES
TOWNSHIP = 006S001W (based on mapped **Species Occurrences**)

SCIENTIFIC NAME COMMON NAME TAXA SORT	FAMILY (SCIENTIFIC) FAMILY (COMMON)	GLOBAL RANK	STATE RANK	USFWS	USFS	BLM	FWP SWAP	% OF GLOBAL BREEDING RANGE IN MT	% OF MT THAT IS BREEDING RANGE	HABITAT
Aquila chrysaetos Golden Eagle	**Accipitridae** Hawks / Kites / Eagles	G5	S3	BGEPA; MBTA		SENSITIVE	SGCN3	3%	100%	Grasslands
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Dawson, Deer Lodge, Fallon, Fergus, Flathead, Gallatin, Garfield, Glacier, Golden Valley, Granite, Hill, Jefferson, Judith Basin, Lake, Lewis and Clark, Liberty, Lincoln, Madison, Mccone, Meagher, Missoula, Musselshell, Park, Petroleum, Phillips, Pondera, Powder River, Powell, Prairie, Ravalli, Richland, Roosevelt, Rosebud, Sanders, Sheridan, Silver Bow, Stillwater, Sweet Grass, Teton, Toole, Treasure, Valley, Wheatland, Wibaux, Yellowstone								
Ardea herodias Great Blue Heron	**Ardeidae** Bitterns / Egrets / Herons / Night-Herons	G5	S3	MBTA			SGCN3	3%	100%	Riparian forest

		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Dawson, Deer Lodge, Fallon, Fergus, Flathead, Gallatin, Garfield, Glacier, Golden Valley, Granite, Hill, Jefferson, Judith Basin, Lake, Lewis and Clark, Liberty, Lincoln, Madison, Mccone, Meagher, Mineral, Missoula, Musselshell, Park, Petroleum, Phillips, Pondera, Powder River, Powell, Prairie, Ravalli, Richland, Roosevelt, Rosebud, Sanders, Sheridan, Silver Bow, Stillwater, Sweet Grass, Teton, Treasure, Valley, Wheatland, Wibaux, Yellowstone **State Rank Reason:** Small breeding population size, evidence of recent declines, and declining regeneration of riparian cottonwood forests due to altered hydrology and grazing.								
Athene cunicularia Burrowing Owl	**Strigidae** Owls	G4	S3B	MBTA; BCC17		SENSITIVE	SGCN3	2%	82%	Grasslands
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Dawson, Fallon, Fergus, Gallatin, Garfield, Glacier, Golden Valley, Hill, Jefferson, Lewis and Clark, Liberty, Madison, Mccone, Musselshell, Petroleum, Phillips, Pondera, Powder River, Prairie, Ravalli, Roosevelt, Rosebud, Sheridan, Stillwater, Teton, Toole, Treasure, Valley, Wheatland, Yellowstone **State Rank Reason:** Species has a negative short-term population trend.								
Buteo regalis Ferruginous Hawk	**Accipitridae** Hawks / Kites / Eagles	G4	S3B	MBTA; BCC17		SENSITIVE	SGCN3	11%	95%	Sagebrush grassland
		Species Occurrences verified in these Counties: Beaverhead, Blaine, Broadwater, Carter, Cascade, Chouteau, Custer, Daniels, Dawson, Deer Lodge, Fallon, Fergus, Gallatin, Garfield, Glacier, Golden Valley, Hill, Jefferson, Judith Basin, Lewis and Clark, Liberty, Madison, Mccone, Meagher, Musselshell, Park, Petroleum, Phillips, Pondera, Powder River, Powell, Prairie, Roosevelt, Rosebud, Sheridan, Stillwater, Teton, Toole, Valley, Wheatland, Wibaux, Yellowstone								
Centrocercus urophasianus Greater Sage-Grouse	**Phasianidae** Upland Game Birds	G3G4	S2		Sensitive - Known on Forests (BD) Species of Conservation Concern on Forests (CG)	SENSITIVE	SGCN2	17%	75%	Sagebrush
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Chouteau, Custer, Dawson, Deer Lodge, Fallon, Fergus, Gallatin, Garfield, Golden Valley, Hill, Madison, Mccone, Meagher, Musselshell, Park, Petroleum, Phillips, Powder River, Prairie, Rosebud, Silver Bow, Stillwater, Sweet Grass, Treasure, Valley, Wheatland, Wibaux, Yellowstone								
Nucifraga columbiana Clark's Nutcracker	**Corvidae** Jays / Crows / Magpies	G5	S3	MBTA	Species of Conservation Concern on Forests (FLAT)		SGCN3	9%	84%	Conifer forest
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Deer Lodge, Fergus, Flathead, Gallatin, Garfield, Glacier, Golden Valley, Granite, Hill, Jefferson, Judith Basin, Lake, Lewis and Clark, Liberty, Lincoln, Madison, Meagher, Mineral, Missoula, Musselshell, Park, Petroleum, Phillips, Pondera, Powder River, Powell, Ravalli, Sanders, Silver Bow, Stillwater, Sweet Grass, Teton, Toole, Wheatland, Yellowstone								
Numenius americanus Long-billed Curlew	**Scolopacidae** Sandpipers	G5	S3B	MBTA; BCC11		SENSITIVE	SGCN3	19%	100%	Grasslands
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Cascade, Chouteau, Custer, Daniels, Dawson, Deer Lodge, Fallon, Fergus, Flathead, Gallatin, Garfield, Glacier, Golden Valley, Granite, Hill, Jefferson, Judith Basin, Lake, Lewis and Clark, Liberty, Madison, Mccone, Meagher, Missoula, Musselshell, Park, Petroleum, Phillips, Pondera, Powder River, Powell, Prairie, Ravalli, Richland, Roosevelt, Rosebud, Sanders, Sheridan, Silver Bow, Stillwater, Sweet Grass, Teton, Toole, Treasure, Valley, Wheatland, Wibaux, Yellowstone								
Oreoscoptes montanus Sage Thrasher	**Mimidae** Thrashers / Mockingbirds / Catbirds	G4	S3B	MBTA		SENSITIVE	SGCN3	9%	84%	Sagebrush
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Chouteau, Custer, Deer Lodge, Fallon, Fergus, Gallatin, Garfield, Glacier, Golden Valley, Jefferson, Lewis and Clark, Madison, Missoula, Musselshell, Park, Petroleum, Phillips, Powder River, Powell, Prairie, Ravalli, Richland, Rosebud, Sanders, Silver Bow, Stillwater, Sweet Grass, Toole, Valley, Wheatland, Yellowstone								
Rhynchophanes mccownii Thick-billed Longspur	**Calcariidae** Longspurs and Snow Buntings	G4	S3B	MBTA; BCC10; BCC11; BCC17		SENSITIVE	SGCN3	41%	79%	Grasslands
		Species Occurrences verified in these Counties: Beaverhead, Blaine, Broadwater, Cascade, Chouteau, Daniels, Fallon, Fergus, Garfield, Glacier, Golden Valley, Hill, Jefferson, Judith Basin, Lewis and Clark, Liberty, Madison, Mccone, Musselshell, Park, Petroleum, Phillips, Pondera, Roosevelt, Rosebud, Sheridan, Silver Bow, Stillwater, Sweet Grass, Teton, Toole, Valley, Wheatland, Yellowstone **State Rank Reason:** Species faces threats from cover type conversion and altered grazing and fire regimes, and although populations in the core of their breeding range in northeast Montana appear to be relatively stable, declines are occurring in much of the species' global breeding range.								
Spizella breweri Brewer's Sparrow	**Passerellidae** New World Sparrows	G5	S3B	MBTA		SENSITIVE	SGCN3	12%	100%	Sagebrush
		Species Occurrences verified in these Counties: Beaverhead, Big Horn, Blaine, Broadwater, Carbon, Carter, Chouteau, Custer, Dawson, Deer Lodge, Fallon, Fergus, Flathead, Gallatin, Garfield, Glacier, Golden Valley, Granite, Hill, Jefferson, Lake, Lewis and Clark, Liberty, Lincoln, Madison, Mccone, Meagher, Missoula, Musselshell, Park, Petroleum, Phillips, Pondera, Powder River, Powell, Prairie, Ravalli, Richland, Roosevelt, Rosebud, Sanders, Sheridan, Silver Bow, Stillwater, Sweet Grass, Teton, Toole, Treasure, Valley, Wheatland, Wibaux, Yellowstone **State Rank Reason:** Species faces threats from loss of sagebrush habitats it is dependent on as a result of habitat conversion for agriculture and increased frequency of fire as a result of weed encroachment and drought.								

FISH (ACTINOPTERYGII)

1 SPECIES

TOWNSHIP = 006S001W (based on mapped **Species Occurrences**)

SCIENTIFIC NAME COMMON NAME TAXA SORT	FAMILY (SCIENTIFIC) FAMILY (COMMON)	GLOBAL RANK	STATE RANK	USFWS	USFS	BLM	FWP SWAP	% OF GLOBAL BREEDING RANGE IN MT	% OF MT THAT IS BREEDING RANGE	HABITAT
Thymallus arcticus Arctic Grayling	**Salmonidae** Trout	G5	S1		Sensitive - Known on Forests (BD)	SENSITIVE	SGCN1		5%	Mountain rivers, lakes
		Species Occurrences verified in these Counties: Beaverhead, Deer Lodge, Madison, Silver Bow **State Rank Reason:** The Arctic Grayling is currently ranked "S1" in Montana because it is at extremely high risk of extirpation in the state due to very limited and/or rapidly declining population numbers, range and/or habitat.								

INVERTEBRATES - MOLLUSKS

1 SPECIES

TOWNSHIP = 006S001W (based on mapped **Species Occurrences**)

SCIENTIFIC NAME COMMON NAME TAXA SORT	FAMILY (SCIENTIFIC) FAMILY (COMMON)	GLOBAL RANK	STATE RANK	USFWS	USFS	BLM	FWP SWAP	% OF GLOBAL BREEDING RANGE IN MT	% OF MT THAT IS BREEDING RANGE	HABITAT
Margaritifera falcata Western Pearlshell	**Margaritiferidae** Margaritiferid Mussels	G5	S2		Sensitive - Known on Forests (BD, BRT, KOOT, LOLO) Species of Conservation Concern on Forests (CG, HLC)	SENSITIVE	SGCN2	10%	26%	Mountain streams, rivers
		Species Occurrences verified in these Counties: Beaverhead, Broadwater, Cascade, Deer Lodge, Gallatin, Granite, Jefferson, Lake, Lewis and Clark, Lincoln, Madison, Meagher, Missoula, Powell, Ravalli, Sanders, Silver Bow **State Rank Reason:** The Western Pearlshell is currently ranked a "S2" Species of Concern in MT and is at risk because of very limited and/or potentially declining population numbers, range and/or habitat, making it vulnerable to extirpation in the state. This species is widespread in geographic area, but is declining in terms of area occupied and the number of sites with viable individuals; populations showing repeated reproduction (at least several age classes) are now the exception rather than the rule. Montana currently has only 14 "excellent" viable populations out of ~120 known locations (Stagliano 2010). Short term trends show populations declining by ~20% over the last decade (Stagliano 2015).								

Potential Species of Concern

Special Status Species

Additions To Statewide List

Species Removed From Statewide List

Species of Greatest Inventory Need

Citation for data on this website:
Montana Animal Species of Concern Report. Montana Natural Heritage Program and Montana Fish, Wildlife and Parks. Retrieved on 5/27/2022, from mtnhp.org/SpeciesOfConcern/?AorP=a

Montana Natural Heritage - SOC Report

Plant Species of Concern

Species List Last Updated **02/19/2021**

3 Species of Concern
Filtered by the following criteria:
Township = 005S001W (based on mapped Species Occurrences)

MONTANA Natural Heritage Program

A program of the Montana State Library's Natural Resource Information System operated by the University of Montana.

Expand All | Collapse All

Introduction

Species of Concern

Species of Concern
3 Species
Filtered by the following criteria:
Township = 005S001W (based on mapped **Species Occurrences**)

FLOWERING PLANTS - DICOTS (MAGNOLIOPSIDA) — 2 SPECIES
TOWNSHIP = 005S001W (based on mapped **Species Occurrences**)

SCIENTIFIC NAME / COMMON NAME / TAXA SORT	OTHER NAMES	FAMILY (SCIENTIFIC) / FAMILY (COMMON)	GLOBAL RANK	STATE RANK	USFWS	USFS	BLM	MNPS THREAT CATEGORY	HABITAT
Pleiacanthus spinosus Spiny Skeletonweed	Stephanomeria spinosa, Lygodesmia spinosa	**Asteraceae** Aster/Sunflowers	G4	S2S3			SENSITIVE	2	Grasslands (low-elevation)
		Species Occurrences verified in these Counties: Beaverhead, Carbon, Madison, Park **State Rank Reason:** *Pleiacanthus spinosus* occurs in Montana at the northeastern edge of its range, where it is known only from grasslands in the Madison Valley. Currently, there are only a few extant occurrences and three historical collections from this area. No specific threats have been reported. Trend data are not available. However, parts of the Madison Valley are being subdivided and habitat is likely to be negatively impacted.							
Senecio hydrophilus Alkali-marsh Ragwort		**Asteraceae** Aster/Sunflowers	G5	S3				3	
		Species Occurrences verified in these Counties: Beaverhead, Broadwater, Flathead, Gallatin, Madison **State Rank Reason:** Senecio hydrophilus is present in alkaline habitats within a portion of southwest Montana. Plants are not that common, and occur in low-elevation wetlands that can be victum to dewatering.							

FLOWERING PLANTS - MONOCOTS (LILIOPSIDA) — 1 SPECIES
TOWNSHIP = 005S001W (based on mapped **Species Occurrences**)

SCIENTIFIC NAME / COMMON NAME / TAXA SORT	OTHER NAMES	FAMILY (SCIENTIFIC) / FAMILY (COMMON)	GLOBAL RANK	STATE RANK	USFWS	USFS	BLM	MNPS THREAT CATEGORY	HABITAT
Lemna valdiviana Pale Duckweed		**Lemnaceae** Duckweeds	G5	S1					
		Species Occurrences verified in these Counties: Granite, Madison, Stillwater **State Rank Reason:** *Lemna valdiviana* is known from one verified location and two unverified locations in Montana and near the border in Yellowstone National Park, Wyoming. In the western U.S. plants are known from widely scattered locations, and apparently are more widespread in the mid-western and eastern U.S. states (Landolt *in* Flora of North America 2000). Montana's lone verified population occurs in a warm spring, which is a rare habitat, that is subjected to human disturbance. The population has not been surveyed for in more than 20 years. Current data on its presence, population size, and viability are greatly needed.							

Potential Species of Concern

Special Status Species

Additions To Statewide List

Species Removed From Statewide List

Citation for data on this website:
Montana Plant Species of Concern Report. Montana Natural Heritage Program. Retrieved on 5/27/2022, from mtnhp.org/SpeciesOfConcern/?AorP=p

Montana Natural Heritage - SOC Report

Plant Species of Concern

Species List Last Updated **02/19/2021**

8 Species of Concern
Filtered by the following criteria:
Township = 006S001W (based on mapped Species Occurrences)

MONTANA Natural Heritage Program

A program of the Montana State Library's Natural Resource Information System operated by the University of Montana.

Expand All | Collapse All

Introduction

Species of Concern

Species of Concern
8 Species
Filtered by the following criteria:
Township = 006S001W (based on mapped **Species Occurrences**)

FLOWERING PLANTS - DICOTS (MAGNOLIOPSIDA)

8 SPECIES
TOWNSHIP = 006S001W (based on mapped **Species Occurrences**)

SCIENTIFIC NAME COMMON NAME TAXA SORT	OTHER NAMES	FAMILY (SCIENTIFIC) FAMILY (COMMON)	GLOBAL RANK	STATE RANK	USFWS	USFS	BLM	MNPS THREAT CATEGORY	HABITAT
Astragalus terminalis Railhead Milkvetch		**Fabaceae** Pea Family	G3	S2S3			SENSITIVE	3	Sagebrush steppe
			Species Occurrences verified in these Counties: Beaverhead, Gallatin, Madison **State Rank Reason:** *Astragalus terminalus* is a regional endemic known from southwest Montana, east-central Idaho and northwest Wyoming. In Montana it is documented from Beaverhead County and the Upper Madison River Valley. The species appears to be vulnerable to intensive grazing and competition from noxious weeds, at least in low-elevation areas.						
Atriplex truncata Wedge-leaf Saltbush		**Amaranthaceae** Amaranth (Pigweed) Family	G5	S3				4	Wetland/Riparian
			Species Occurrences verified in these Counties: Beaverhead, Deer Lodge, Jefferson, Lake, Lewis and Clark, Madison, Park, Powell **State Rank Reason:** Known from two extent occurrences; one in the Centennial Valley and the other near Warm Springs. Also, known historically from four collections in the western half of the state. Additional population and trend data are needed to better evaluate the species' vulnerability.						
Erigeron parryi Parry's Fleabane		**Asteraceae** Aster/Sunflowers	G2G3	S2S3				3	Slopes and ridges (Open, Montane)
			Species Occurrences verified in these Counties: Beaverhead, Big Horn, Broadwater, Carbon, Jefferson, Madison **State Rank Reason:** Though the species is restricted to southwest Montana, it is locally common at many of the sites it occupies. Additionally, threats to the species appear to be low as a result of the rocky, sparsely vegetated habitat it prefers.						
Myriophyllum quitense Andean Water-milfoil		**Haloragaceae** Water Milfoils	G4?	S3				3	
			Species Occurrences verified in these Counties: Broadwater, Gallatin, Madison **State Rank Reason:** *Myriophyllum quitense* is an aquatic plant that has recently (2008-2016) been found in three waterbodies of Montana. Plants are found in slow-moving rivers that vary in water quality from the Madison River in Yellowstone National Park to Toston Reservoir on the Missouri River. These locations represent a very narrow geographical portion of Montana. Proper identification of *Myriophyllum* species require careful collections to obtain flowering or fruiting structures, use of an appropriate and current taxonomic key, and time spent studying the specimen. More surveys are greatly needed to assess the true abundance and distribution of *Myriophyllum quitense* in Montana.						
Pleiacanthus spinosus Spiny Skeletonweed	**Stephanomeria spinosa, Lygodesmia spinosa**	**Asteraceae** Aster/Sunflowers	G4	S2S3			SENSITIVE	2	Grasslands (low-elevation)
			Species Occurrences verified in these Counties: Beaverhead, Carbon, Madison, Park **State Rank Reason:** *Pleiacanthus spinosus* occurs in Montana at the northeastern edge of its range, where it is known only from grasslands in the Madison Valley. Currently, there are only a few extant occurrences and three historical collections from this area. No specific threats have been reported. Trend data are not available. However, parts of the Madison Valley are being subdivided and habitat is likely to be negatively impacted.						
Primula alcalina Alkali Primrose		**Primulaceae** Primrose Family	G2	S2		Sensitive - Known on Forests (BD)	SENSITIVE	1	Wetland/Riparian
			Species Occurrences verified in these Counties: Beaverhead, Madison **State Rank Reason:** *Primula alcalina* is a regional endemic, occuring only in east-central Idaho and adjacent Montana, where it is known from just one recently documented population in Beaverhead County on BLM and National Forest lands. Another population documented by a historical collection from 1920 by F. Rose has not been relocated. The extant location is actively grazed and the species may be vulnerable to impacts associated with cattle grazing and activities that alter the hydrology (irrigation, diversions).						

Primula incana Mealy Primrose		**Primulaceae** Primrose Family	G5	S3		Sensitive - Known on Forests (BD)		2	Wetland/Riparian
			Species Occurrences verified in these Counties: Beaverhead, Broadwater, Carbon, Deer Lodge, Gallatin, Jefferson, Madison, Meagher, Powell, Sheridan, Silver Bow, Teton **State Rank Reason:** *Primula incana* is known from a few dozen extant occurrences in Montana, including several moderate to large populations. However, most known populations are small, and the status of several populations is uncertain. Ownership of the occupied areas is varied and includes federal, state and private lands, including several locations managed or protected for their conservation values. However, unprotected private lands host many occurrences. Cattle grazing may have some negative effects on the species including the direct effects of herbivory and trampling. The species is also vulnerable to activities that alter the hydrology of the wetlands it occupies. Continued threats and potentially declining trends, particularly in regards to habitat quality make the species' vulnerable to local extirpation.						
Senecio hydrophilus Alkali-marsh Ragwort		**Asteraceae** Aster/Sunflowers	G5	S3				3	
			Species Occurrences verified in these Counties: Beaverhead, Broadwater, Flathead, Gallatin, Madison **State Rank Reason:** Senecio hydrophilus is present in alkaline habitats within a portion of southwest Montana. Plants are not that common, and occur in low-elevation wetlands that can be victum to dewatering.						

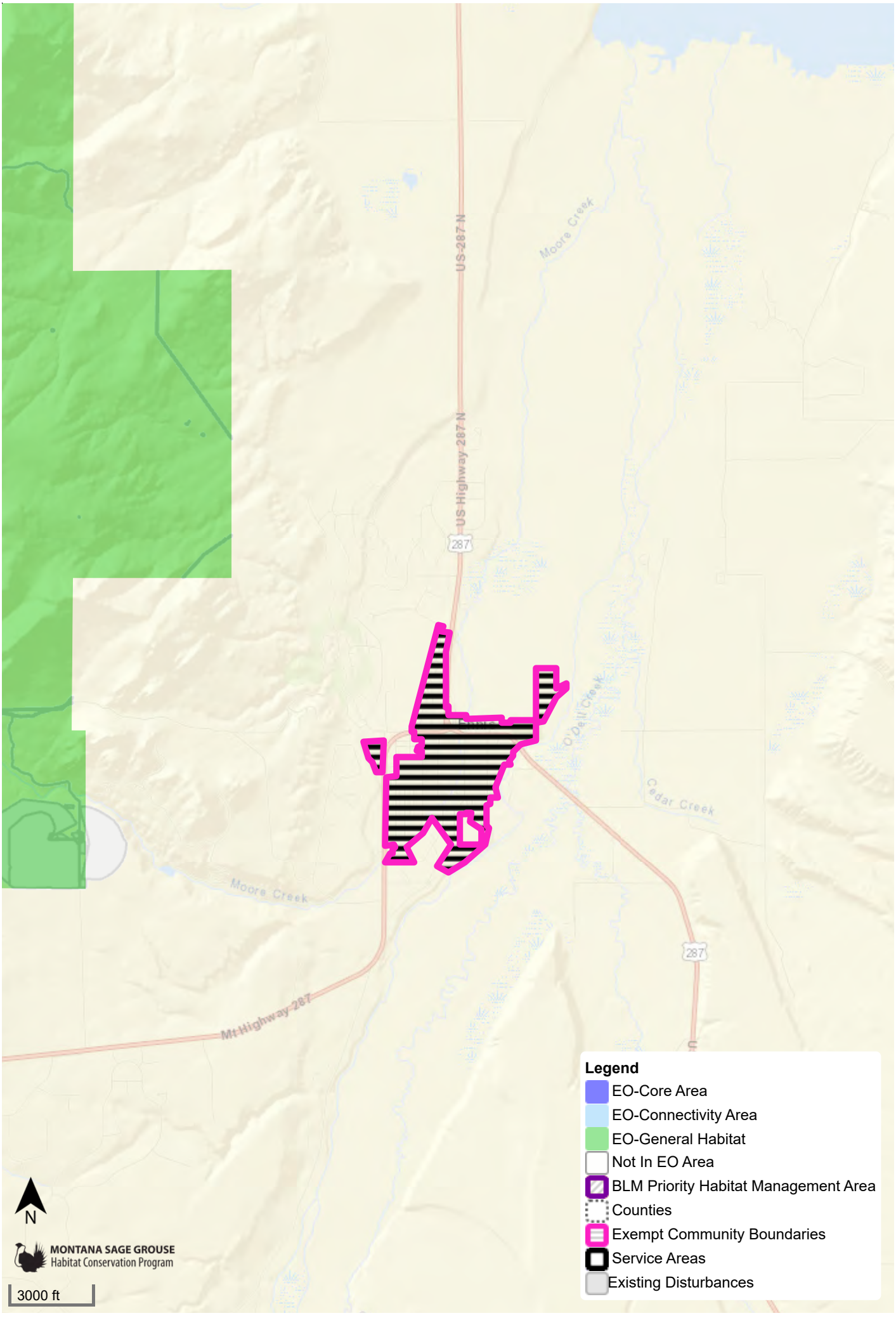
Potential Species of Concern

Special Status Species

Additions To Statewide List

Species Removed From Statewide List

Citation for data on this website:
Montana Plant Species of Concern Report. Montana Natural Heritage Program. Retrieved on 5/27/2022, from mtnhp.org/SpeciesOfConcern/?AorP=p


US-287-N
US Highway 287 N
Moore Creek
O'Dell Creek
Cedar Creek
Moore Creek
Mt Highway 287
287
287
Legend
EO-Core Area
EO-Connectivity Area
EO-General Habitat
Not In EO Area
BLM Priority Habitat Management Area
Counties
Exempt Community Boundaries
Service Areas
Existing Disturbances
N
MONTANA SAGE GROUSE
Habitat Conservation Program
3000 ft

APPENDIX F

DEQ Sanitary Survey

DEQ
Montana Department
of Environmental Quality

April 28, 2022

Town of Ennis
Attn: Mayor Nici Haas
328 W. Main
Ennis, MT. 59729

Re: Sanitary Survey Inspection of Town of Ennis' (PWSID: MT0000208).

Dear Nici Haas,

I would like to thank Eric Olson for his time and assistance with the sanitary survey inspection of the Town of Ennis' public water supply (PWS) system. The Town of Ennis' PWS system is classified as a community (C) public water supply. Community means a public water supply system which serves at least 15 service connection used by year-round residents or that regularly serves at least 25 year-round residents. As a community water supply system, your facility is required to have a sanitary survey inspection every third year. These regular inspections offer us an opportunity to look for sanitary deficiencies that have the potential to cause contamination in the water system, as well as pointing out operational and maintenance concerns.

The bulleted item(s) below are my comments and recommendations related to the sanitary survey conducted on April 5, 2022.

SYSTEM DESCRIPTION:
The Town of Ennis' PWS consists of two active groundwater source wells, a storage facility, and a distribution system that serves approximately 1,200 year-round residents through 572 service connections and approximately 200 transient water users through 80 commercial service connections.

SOURCE(s):
Well 2 1979 Comley SW GWIC 108663 (WL003): WL003 is inside the locked wellhouse at 520 Comely Way. WL003 was completed in July 1979 to a total depth of 142 feet with a 12-inch steel casing. The well was grouted to 30 feet with cement and had a reported static water level of 28 feet. Additional details about the well are in the well log obtained from the Ground Water Information (GWIC) website and enclosed with this letter.

Well 2 was covered with a custom split-style steel plate well cap. The well cap appeared to be adequately bolted together and sealed to the raised concrete well pad. The plate appeared to be adequately sealed around the drop pipe and both electrical conduit connections.

- An air vent is installed on the well; however, a sounding tube was inserted in an opening in the screen on the vent; which could potentially allow contaminants into the source. It is recommended the sounding tube be removed and a new screen (24-mesh) be placed over the vent outlet. On April 19, 2022, DEQ received photo documentation depicting the sounding tube removed from the vent and a screen placed over the vent (see photos attached).

Well 3 GWIC 277857 (WL004): WL004 is just south of the locked pumphouse at 606 1st Street. The well was completed in April 2014 to a total depth of 150 feet with a 10-inch steel casing to 130 feet. A 7.5-inch stainless screen was placed from 130 to 150 feet. The well was grouted to 40 feet and had a reported static water level of 57 feet. Additional details about the well are in the well log obtained from the Ground Water Information (GWIC) website and enclosed with this letter.

Well 3 had a Baker Monitor brand sanitary sealed well cap with a downward facing screened air vent. The well cap bolts were tight, and the electrical conduit was sealed and tight within the well cap. The well cap had a lockable bolt used for extra security. Grading around the well was adequate to promote surface water drainage away from the well. No issues were observed with Well 3.

TREATMENT:

There is no treatment provided by the system at this time.

DISTRIBUTION:

Distribution System (DS001): DS001 reportedly consists of PVC, AC, and cast-iron piping from 4-inch to 12-inch. There are approximately 98 fire hydrants that are reported to be flushed twice per year. There are two dead-ends: one with a service connection and the other a fire hydrant. All service connections are metered. It was also reported the inactive storage tank (ST002) has been valved off at the edge of Town to eliminate a long dead-end but has not been physically disconnected.

There are two in-ground irrigation systems that are maintained by the Town. Both irrigation systems had appropriate backflow protection (reduced pressure zone (RPZ) assemblies) that were disconnected for the winter but are re-installed each spring.

- Similarly, to the recommendation in the 2019 Sanitary Survey report, the system should physically disconnect ST002 from the PWS system and submit photos to DEQ that depict the physical disconnection.
- Similarly, to the recommendation in the 2019 Sanitary Survey report, the two RPZ backflow preventer assemblies should be tested each year after being re-installed, in accordance with the manufacturer guidance, by a certified backflow preventer tester. Please refer to the list of certified backflow preventer tester professionals that I provided in an email to Eric Olson should you need to locate a professional in your area.

STORAGE:

Storage Facility 1 532,600 GAL (ST001): ST001 is west of the Town of Ennis on Aqua Lane. The tank is within a fenced area with a padlocked gate. This facility consists of a 532,600 gallon, 40-foot-tall, on-grade bolted steel tank. This is reported to be a single pipe tank with a common inlet/outlet that rides on distribution. The overflow pipe was screened, and it has a splash pad.
The access ladder gate was several feet off the ground and secured with a padlock.

The valve pit on the east side of the tank contains SCADA controls, a pressure transducer, and a pressure gauge. A screened air vent is provided for the pit and the aluminum shoebox style access hatch was padlocked and appeared to be adequately sealed.

The Operator stated an inspection, leak repair, and cleaning of the storage tank by Midco Divers is scheduled for this spring. The Operator also reported the tank hatch is sealed and secured with a padlocked. A few leaks were known and noted at the base of the tank on the north side and on the west side.

PUMPS, PUMP FACILITIES and CONTROLS:

There are no pumping facilities or pressure control assemblies. The SCADA system is used to monitor storage tank levels and it triggers the submersible well pumps accordingly. Both wells are reported to have 30hp submersible pumps. A pressure transducer and flowmeter appeared to be tied to SCADA at Well 2.

- The flowmeter in the pump house for Well 3 was disconnected. It is recommended the flowmeter be reconnected to the SCADA system.

MONITORING, REPORTING and DATA VERIFICATION:

In the two-year period (4/05/2020 – 4/05/2022) prior to the sanitary survey, the system received one violation for failure to monitor for lead and copper (DEQ-PWS Database, 2022). It was reported the lead and copper samples were taken in 2021 but the samples expired prior to being delivered to the lab; therefore, the system will have to take the required ten lead and copper samples in 2022. The system operator, Eric Olson, is aware of the sampling and reporting requirements to close the violation. Lead and copper notification and certification forms were provided to the Operator. Currently, all other drinking water monitoring and reporting requirements appear up to date.

- Eric Olson stated he wanted to update the coliform bacteria sample sites for the RTCR SSP. Please remind Eric to send in the updated RTCR SSP to DEQ RTCR Rule Manager. I provided the Plan template in an email to Eric. The template includes the email for submitting the Plan to DEQ.
- Due to the PWS system serving a population of more than 1000 water users, the system is required to take two coliform bacteria samples each month, which Eric reported is being done; however, DEQ's current monitoring schedule indicates only one sample is required. Please note the monitoring schedule will be updated and a new monitoring schedule (MS) will be sent to your system to reflect the requirement of two monthly coliform bacteria samples.

MAINTENANCE, MANAGEMENT, SAFETY and OPERATION:

The previous operator retired, and Eric Olson is now the Public Works Director and primary operator for the Town of Ennis. Eric is knowledgeable about the system and is doing a great job maintaining, managing, and operating the PWS system. Eric is looking into obtaining a back-up generator for Well 2, updating the Emergency Response Plan and training staff on the Plan, and he is planning to address Capacity Development and Asset Management. Staff are also planning to take cyber security training.

There were no safety concerns noted on the day of the inspection; however, the storage tank and valve vault are considered confined spaces. Confined space entry procedures and training should be considered and adhered to. Additionally, fall risk mitigation procedures, training, and equipment would be highly recommended for the safety of those having to climb into the tank or into the valve vault.

- The combined air/vacuum vent with a downward facing outlet in Well 2 wellhouse did not have a screen. It is recommended the vent outlet be screened with 24-mesh. On the day of the inspection, we screened the vent outlet (see photos attached).
- The blow-off dual outlet in Well 3 pumphouse was missing a screen on one of the outlet openings. We located the screen during the inspection and re-installed it so that both outlet openings are screened (see photos attached).
- The raw water sample tap in the Well 3 pumphouse had external threads. It is recommended the tap be replaced with a smooth nose tap.

As discussed with Eric during the inspection, future review of the Emergency Response Plan should consider America's Water Infrastructure Act of 2018 where Risk and Resilience Assessments replace Vulnerability Assessments as the basis to draft/update an Emergency Response Plan. One area of further consideration for the updated Emergency Response Plan would be cybersecurity, especially regarding the SCADA control system.

Please note that Montana DEQ PWS is committed to offering technical, managerial, and financial capacity assistance to all public water supplies across the state. Michael Kropp (406-755-8971) is the new Capacity Development Coordinator for the state, and he will be working with MAP, MRW, RATES and other DEQ staff to meet the demand for facility-based training opportunities. DEQ Certification is working with Mr. Kropp to provide operators an opportunity to earn CECs for completing facility-based capacity development training with one of the approved trainers. Please contact Mr. Kropp or one of the other approved trainers for additional information. His contact information can also be found on the back of my business card that was provided to Eric Olson.

OPERATOR COMPLIANCE WITH STATE REQUIREMENTS:

Eric Olson, Cert. #9128 Class 3A/3B/3C OT along with a temporary certification for his 3A, 3B, and 3C until he meets the full experience requirement to become fully certified, is the primary water operator for this system. Shawn O'Donnell is the system's back-up operator as he just passed the exam (Cert.# 9269 3A-OT, 3B-OT, 3C-OT). Kyle Lundru is also a back-up operator in training.

WASTEWATER:
The Town of Ennis manages wastewater using a 3-cell, partially mixed, aerated lagoon system.

DATABASE CHANGES MADE:

- Updated number of residential service connections and population, and A/C name and contact information – Inventory Update

SIGNIFICANT DEFICIENCIES: The potential significant deficiencies noted during this inspection were corrected.
Significant deficiencies may include, but are not limited to, defects in design, operation, or maintenance or a failure or malfunction of the sources, treatment, storage, or distribution system that the State determines to be causing or has the potential for causing the introduction of contamination into the water delivered to consumers.

If you find any inaccuracies in this letter or in the attachments, please contact me with the appropriate corrections.

Again, please thank Eric for his time and for his dedication to protecting public health through proper management of your public water system. It is greatly appreciated. If you have any questions about this report or public water supply regulations, please call me at 406-444-3967.

Sincerely,

Jodi Stoner-Granberg

Jodi Stoner-Granberg
Environmental Science Specialist
DEQ-PWS
Phone: 406-444-3967

CC: Helena PWS file
Madison County file
Eric Olson (Operator) -- email

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View scanned well log (3/27/2017 1:31:17 PM)

Site Name: TOWN OF ENNIS
GWIC Id: 277857 Well 3 WL004

Section 1: Well Owner(s)
1) TOWN OF ENNIS (MAIL)
328 W MAIN STREET
ENNIS MT 59729 [04/04/2014]

Section 2: Location

Township	Range	Section	Quarter Sections
06S	01W	4	SW¼ SW¼ NE¼

County MADISON

Geocode

Latitude	Longitude	Geomethod	Datum
45.343394	-111.730308	MAP	NAD27

Ground Surface Altitude **Ground Surface Method** **Datum** **Date**

Addition **Block** **Lot**

Section 3: Proposed Use of Water
PUBLIC WATER SUPPLY (1)

Section 4: Type of Work
Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date
Date well completed: Friday, April 4, 2014

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	40	14
40	150	10

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	130	10	0.375		WELDED	A53B STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
130	150	7.5		.070	SCREEN-CONTINUOUS-STAINLESS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	40	SMOOTH GROUT	Y

Section 7: Well Test Data
Total Depth: 150
Static Water Level: 57
Water Temperature:

Air Test *
200 gpm with drill stem set at 140 feet for 12 hours.
Time of recovery 0.17 hours.
Recovery water level 57 feet.
Pumping water level _ feet.

Pump Test *
Depth pump set for test 128 feet.
350 gpm pump rate with 79 feet of drawdown after 24 hours of pumping.
Time of recovery 3 hours.
Recovery water level 57 feet.
Pumping water level _ feet.
** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

Geologic Source
Unassigned

From	To	Description
0	25	BOULDERS
25	65	SILT AND CLAY-BROWN AND YELLOW
65	105	SMALL GRAVELS
105	110	SILT-BROWN
110	120	GRAVELS
120	139	SILT-BROWN/YELLOW
139	150	GRAVELS

Driller Certification
All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name: MIKE DOWNEY
Company: OKEEFE DRILLING CO
License No: WWD-90
Date Completed: 4/4/2014

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View scanned well log (5/15/2008 1:45:37 PM)

Site Name: CITY OF ENNIS
GWIC Id: 108663 Well 2 WL003
DNRC Water Right: 21774

Section 1: Well Owner(s)
1) CITY OF ENNIS (MAIL)
N/A
ENNIS MT 59729 [09/16/1979]

Section 2: Location

Township	Range	Section	Quarter Sections
06S	01W	4	SW¼ SW¼ SE¼ NW¼

County MADISON

Geocode

Latitude	Longitude	Geomethod	Datum
45.342369	-111.735222	TRS-SEC	NAD83

Ground Surface Altitude **Ground Surface Method** **Datum** **Date***

Addition **Block** **Lot**

Section 3: Proposed Use of Water
PUBLIC WATER SUPPLY (1)

Section 4: Type of Work
Drilling Method: CABLE TOOL
Status: NEW WELL

Section 5: Well Completion Date
Date well completed: Monday, July 16, 1979

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	142	12

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
0	142	12				54 LB STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
75	85	12			5/8 X 3 SLOTS
97	105	12			5/8 X 3 SLOTS
112	120	12			5/8 X 3 SLOTS
130	140	12			5/8 X 3 SLOTS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	30	CEMENT	

Section 7: Well Test Data

Total Depth: 142
Static Water Level: 28
Water Temperature:

Pump Test *

Depth pump set for test _ feet.
400 gpm pump rate with _ feet of drawdown after 10.5 hours of pumping.
Time of recovery _ hours.
Recovery water level _ feet.
Pumping water level 105 feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log
Geologic Source
120SDMS - SEDIMENTS (TERTIARY)

From	To	Description
0	20	BOULDERS
20	35	SMALL BOULDERS SOME WATER
35	75	SANDY CLAY
75	85	COARSE SAND SOME WATER
85	95	SANDY CLAY
95	105	SAND SMALL GRAVEL SOME WATER
105	112	SANDY CLAY
112	122	COARSE SAND GRAVEL & WATER
122	130	COARSE SAND AND CLAY
130	142	COARSE SAND PEA GRAVEL & WATER

Driller Certification
All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:
Company: AQUA
License No: WWC-281
Date Completed: 7/16/1979

Town Of Ennis PWSID# MT0000208

April 5, 2022

State Representative: Jodi Stoner-Granberg

System Representative: Eric Olson (Operator)

Overview and PWS Facility Locations



Groundwater source, Community Water System in Madison Co. – T06S R01W S4

Well 2 1979 Comley SW GWIC 108663 (WL003)



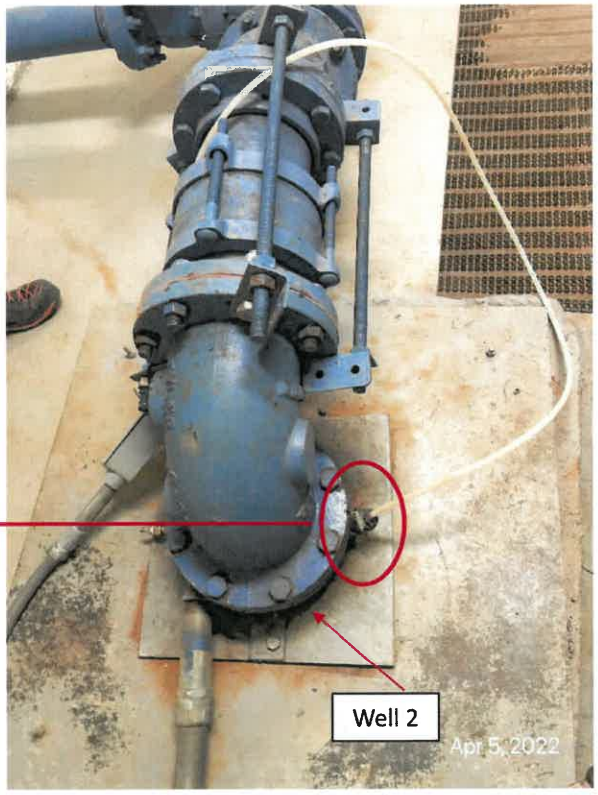
Well 2 Wellhouse







Corrective action: On April 19, 2022, DEQ received photo documentation depicting the tube removed from the well air vent. The vent was screened with 24-mesh screen



Well cap has two electrical conduit connections

Overview of the well, blow-off valve, combined air/vacuum relief valve, pressure gauge, and raw water smooth nose sample tap circled in red.

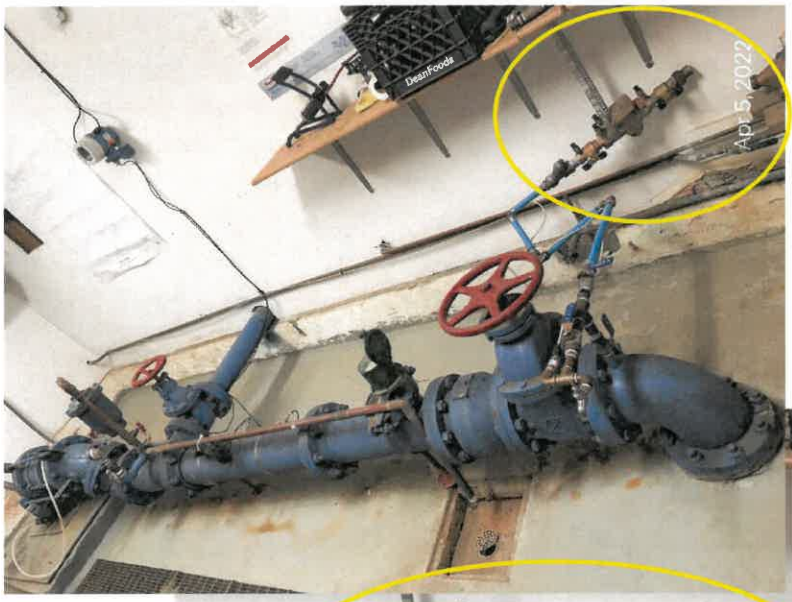
Well 2 1979 Comley SW GWIC 108663 (WL003) *cont.*





Combined air/vacuum relief valve was downward facing; however, the outlet was not screened. During the inspection we screened the outlet with 24-mesh screen.

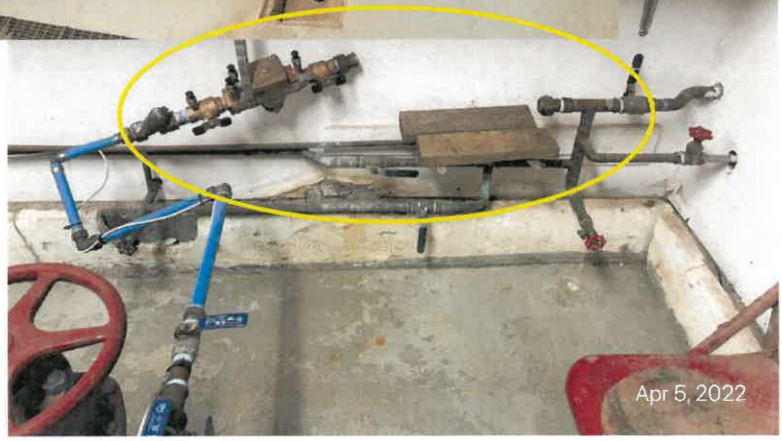
The backflow preventer between the drinking water system and the in-ground irrigation system that is in the wellhouse (circled in yellow) was disconnected for winter. It is recommended the RPZ assembly be tested following installation of the assembly in the spring by a certified backflow preventer testing professional, to ensure the assembly is functioning properly.







Blow-off outlet is in a room adjacent to the room with the well. The dual outlet was missing one screen (top photo). During the inspection, we located the screen and placed it back in the opening on the blow-off outlet (bottom photo)



Well 3 GWIC 277857 (WL004)



Well 3 pumphouse. Well 3 is behind the pumphouse and is circled (photo taken from 2019 Sanitary Survey report).



Overview of Well 3 and pitless adapter label on well casing.

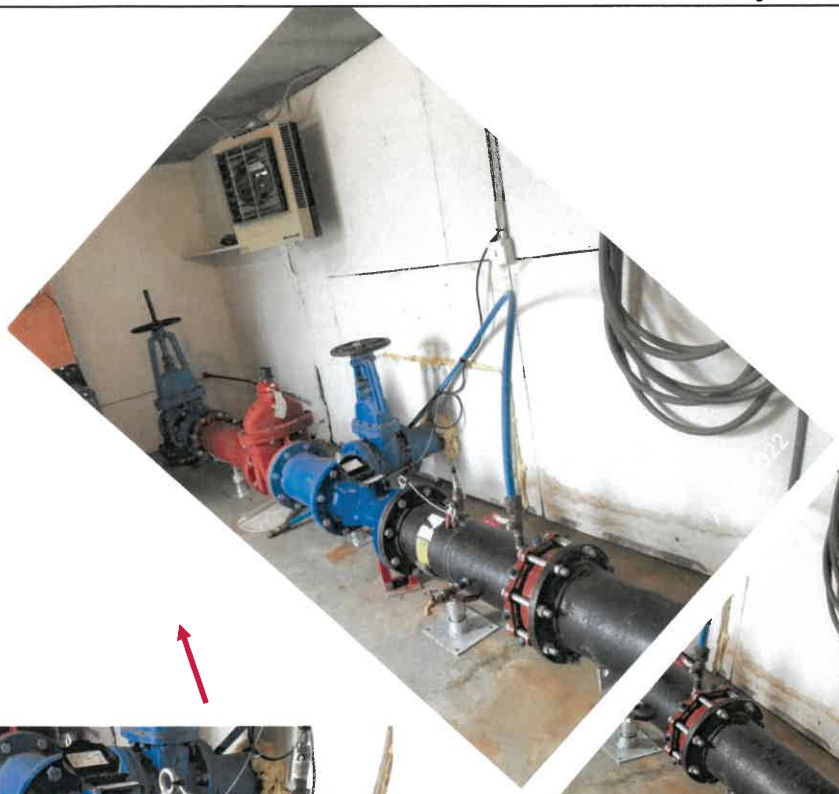






Well 4 with sealed electrical conduit.

Well 3 Pumphouse







Overview



Raw water sample tap had external threads. It is recommended this tap be replaced with a smooth nose sample tap.

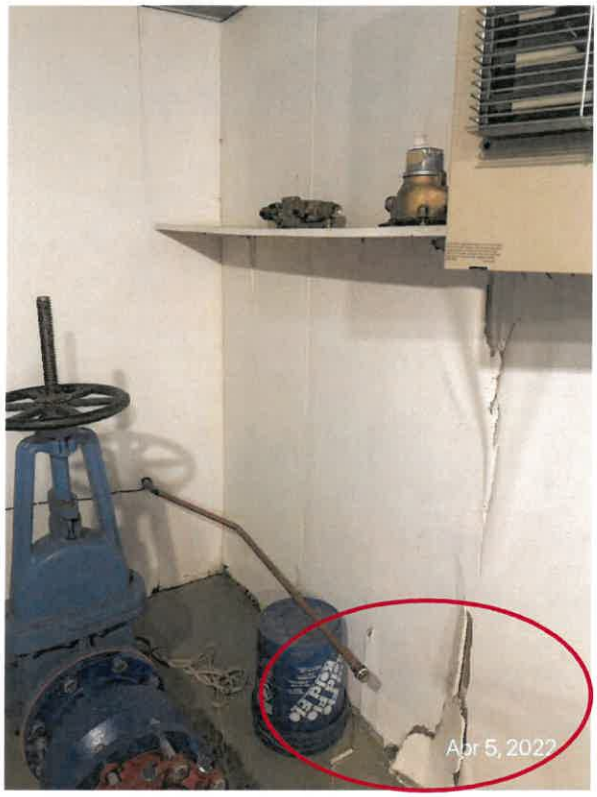


Disconnected flow meter. It is recommended the flowmeter be connected to the SCADA system.



Blow-off outlet was screened with 24-mesh screen.

Well 3 Pumphouse *cont.*

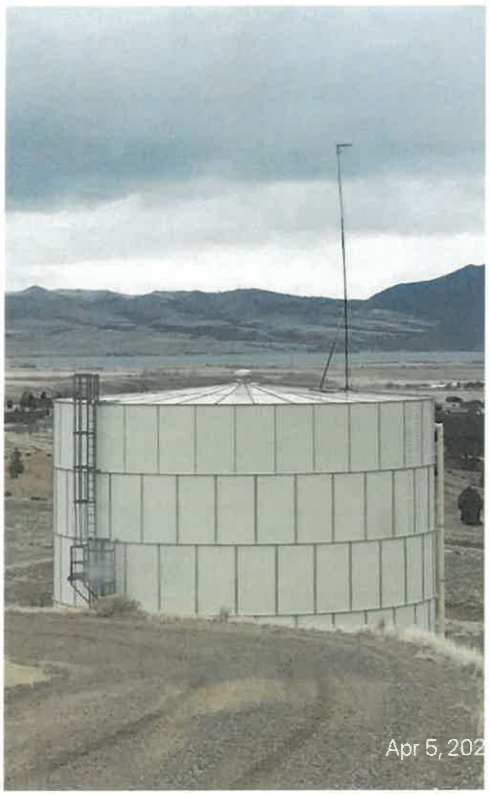


The backflow preventer (RPZ assembly) between the drinking water system and the in-ground irrigation system, that is in the Well 3 pumphouse, was disconnected for winter. It is recommended the RPZ assembly be tested following installation of the assembly in the spring by a certified backflow preventer testing professional to ensure the assembly is functioning properly.

Note: The RPZ assemblies should be tested each time they are installed and/or annually if the assembly is not disconnected each year.



Storage Facility 1 532,600 GAL (ST001)







Overview of the tank and the locked, caged ladder. The storage tank is located on the west side of the Town of Ennis on Aqua Lane.

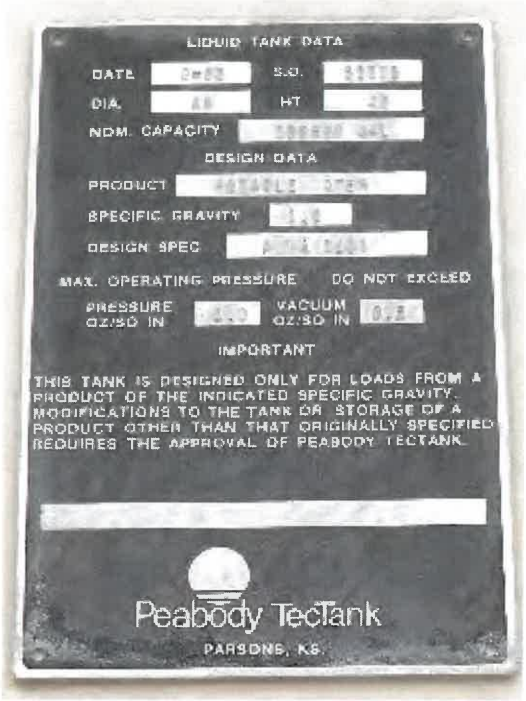


Example of one of the areas of the tank that is leaking at the base. There were at least three areas at the base of the tank that appear to be leaking.



Screened overflow and splash pad

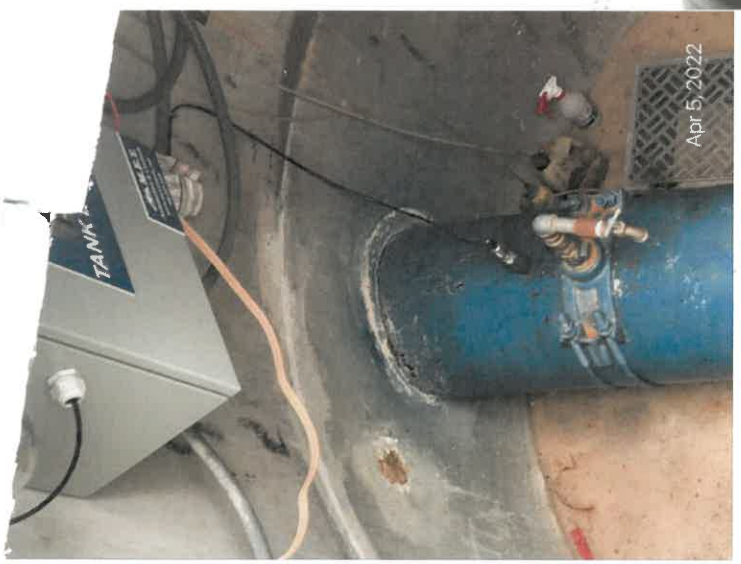
Storage Facility 1 532,600 GAL (ST001) *cont.*



Tank specifications panel (left photo) and monitoring panel that is in the Director of Public Work's office (right photo).

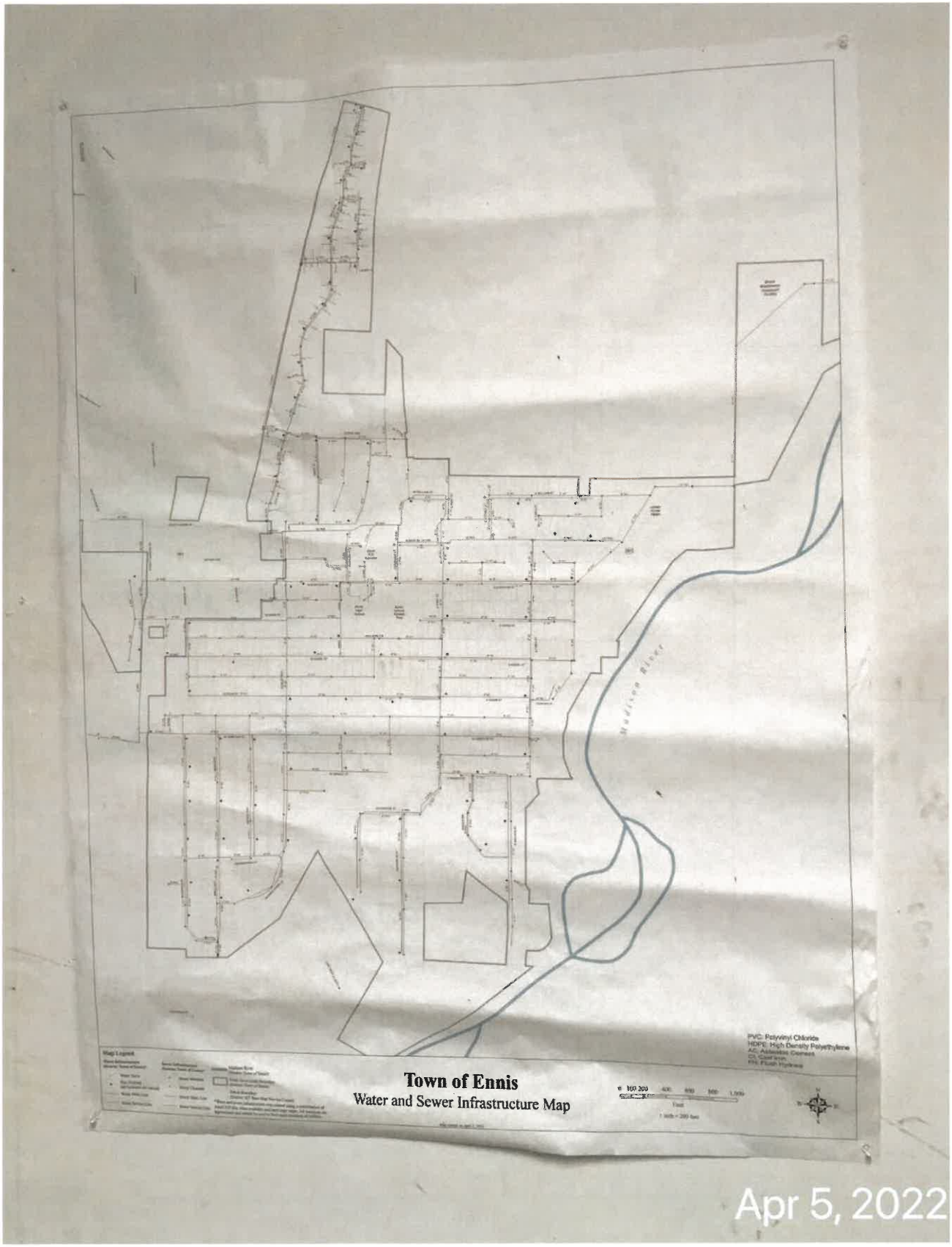








Valve pit on east side of tank. Pit air vent was downward facing and screened. It is depicted above.


Madison River
PVC: Polyvinyl Chloride
HDPE: High Density Polyethylene
Town of Ennis
Water and Sewer Infrastructure Map

Apr 5, 2022

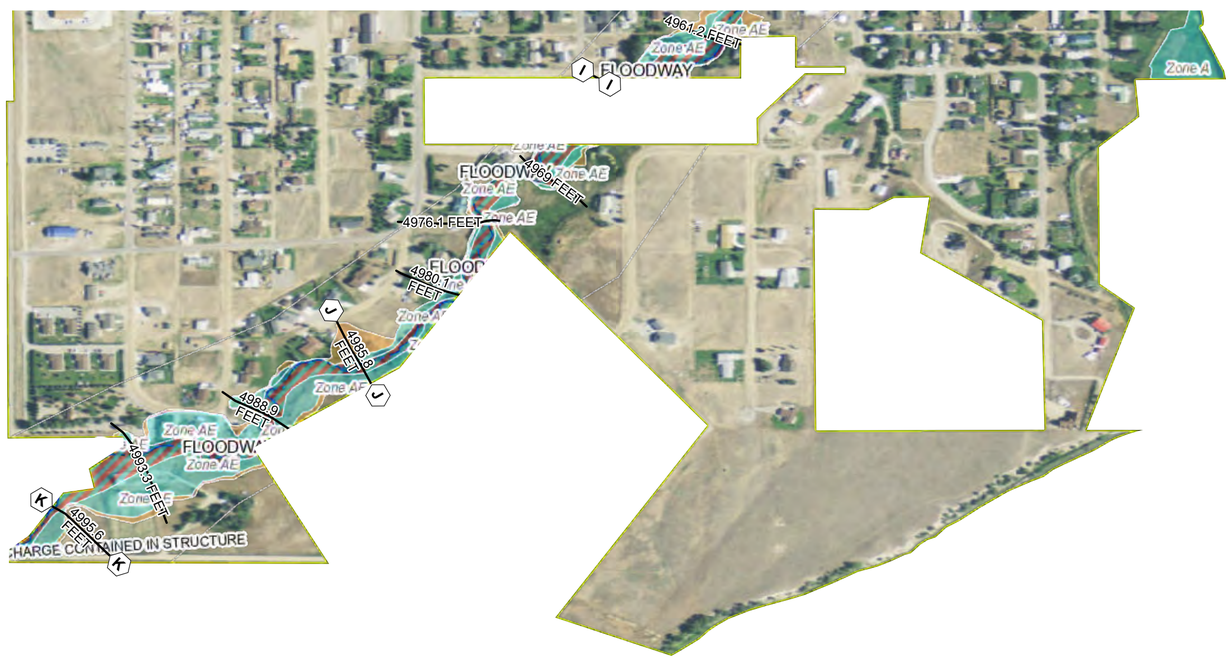
Water System Facilities Table and Flow

WSF ID	WSF Name	Description
WL003	Well 2 1979 Comley SW GWIC 108663	Well 2 has a 30hp submersible well pump that is controlled by SCADA and storage tank levels. Well pump installation date, brand, and rated capacity were not recorded or observed in the wellhouse.
WL004	Well 3 GWIC 277857	Well 3 has a 30hp Franklin Electric brand submersible well pump with a rated capacity of 275 gpm. The pump was reportedly installed in 2014. SCADA and storage tank levels control the well pump.
ST001	Storage Facility 1 532,600 GAL	ST001 is a Peabody TecTank brand, 532,600-gallon bolted steel on-grade tank that was built in 1995. The tank provides about 1 day of storage. There are a few leaks at the base of the tank. Midco diving has been contracted to inspect and clean the tank, as well as repair the leaks this spring. The last time the tank was cleaned and inspected as reported in the 2019 Sanitary Survey report was 2011 by Inland Potable. The tank's overflow had a screened outlet and there was a splash pad. The valve pit on the east side of the tank contains the SCADA controls, a pressure transducer and a pressure gauge. The pit has a shoe-box style sealed hatch with a padlock. There is an air vent provided for the pit that is downward facing and screened.
DS001	Distribution System	DS001 consists of 4-inch through 12-inch cast iron, PVC and AC pipes. There are approximately 98 fire hydrants that are flushed twice per year as there are two dead-ends on the distribution system: one is a service connection, and one is a fire hydrant. Appropriate backflow preventers RPZs for cross connection with the in-ground irrigations systems are on-site. The RPZs are disconnected each Fall and reinstalled each spring. The PWS has an O & M Manual, ERP Plan, and a program to routinely exercise valves.
Flow	WL003 & WL004>ST001>DS001	

APPENDIX G

Floodplain Mapping

111°44'56.49"W 45°21'25.54"N



111°43'3.13"W 45°19'19.86"N

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR DRAFT FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS

- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

For information and questions about this Flood Insurance Rate Map (FIRM), available products associated with this FIRM, including historic versions, the current map date for each FIRM panel, how to order products, or the National Flood Insurance Program (NFIP) in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Flood Map Service Center website at https://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Flood Map Service Center at the number listed above.

For community and countywide map dates, refer to the Flood Insurance Study Report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Basemap information shown on this FIRM was provided in digital format by the United States Geological Survey (USGS). The basemap shown is the USGS National Map: Orthoimagery. Last refreshed October, 2020.

This map was exported from FEMA's National Flood Hazard Layer (NFHL) on **5/27/2022 11:29 AM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time. For additional information, please see the Flood Hazard Mapping Updates Overview Fact Sheet at https://www.fema.gov/media-library/assets/documents/118418

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards. This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date.

SCALE

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: NAVD88

For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map, please see the Flood Insurance Study (FIS) Report for your community at https://msc.fema.gov

N

1 inch = 500 feet 1:6,000

0 250 500 1,000 1,500 2,000 Feet

0 50 100 200 300 400 Meters

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

PANEL **3** OF **3**

Panel Contains:

COMMUNITY	NUMBER	PANEL
ENNIS, TOWN OF	300044	0003
MADISON COUNTY	300043	0003

MAP NUMBER
3000440003E
EFFECTIVE DATE
June 16, 2011

111°44'44.22"W 45°22'8.36"N



111°42'50.87"W 45°20'2.68"N

FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR DRAFT FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD

- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee See Notes *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS

- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES

- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- 8 Coastal Transect
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary

NOTES TO USERS

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SCALE

Map Projection:
GCS, Geodetic Reference System 1980;
Vertical Datum: NAVD88
For information about the specific vertical datum for elevation features, datum conversions, or vertical monuments used to create this map, please see the Flood Insurance Study (FIS) Report for your community at https://msc.fema.gov

N

1 inch = 500 feet 1:6,000

0 250 500 1,000 1,500 2,000 Feet

0 50 100 200 300 400 Meters

NATIONAL FLOOD INSURANCE PROGRAM

FLOOD INSURANCE RATE MAP

PANEL **1** OF **3**

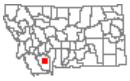
Panel Contains:

COMMUNITY	NUMBER	PANEL
ENNIS, TOWN OF	300044	0001

MAP NUMBER
3000440001E
EFFECTIVE DATE
June 16, 2011

APPENDIX H

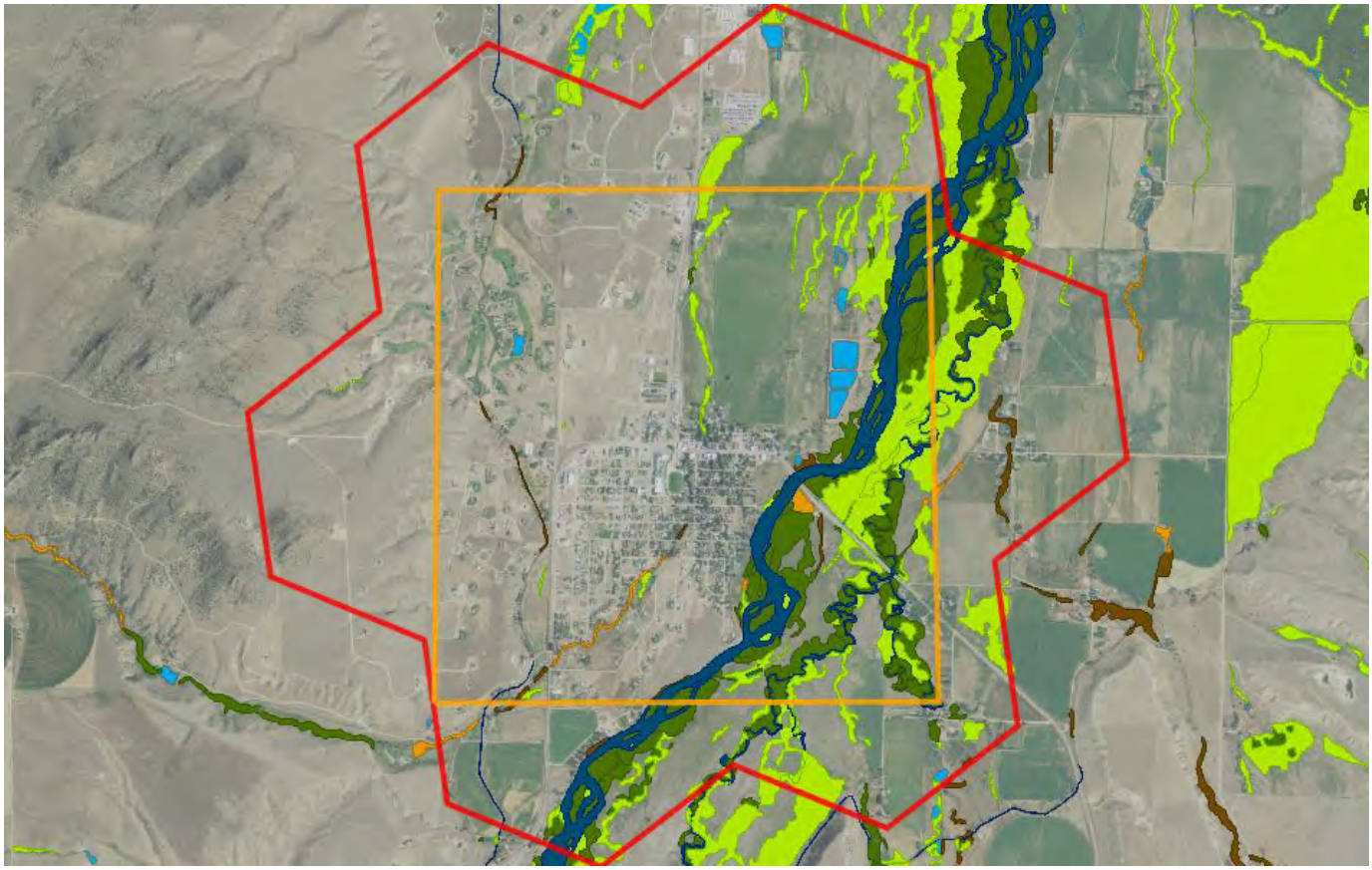
Wetlands



Latitude	Longitude
45.32567	-111.69830
45.37361	-111.76374

Wetland and Riparian

Summarized by: *(Custom Area of Interest)*



Wetland and Riparian Mapping

Explain

P - Palustrine

UB - Unconsolidated Bottom

P - Palustrine, UB - Unconsolidated Bottom
Wetlands where mud, silt or similar fine particles cover at least 25% of the bottom, and where vegetation cover is less than 30%.

F - Semipermanently Flooded	<1 Acres	
x - Excavated	**<1 Acres**	**PUBFx**

AB - Aquatic Bed

P - Palustrine, AB - Aquatic Bed
Wetlands with vegetation growing on or below the water surface for most of the growing season.

F - Semipermanently Flooded	13 Acres	
(no modifier)	**2 Acres**	**PABF**
h - Diked/Impounded	**4 Acres**	**PABFh**
x - Excavated	**7 Acres**	**PABFx**
K - Artificially Flooded	13 Acres	
x - Excavated	**13 Acres**	**PABKx**

EM - Emergent

P - Palustrine, EM - Emergent
Wetlands with erect, rooted herbaceous vegetation present during most of the growing season.

A - Temporarily Flooded	229 Acres	
(no modifier)	**229 Acres**	**PEMA**
h - Diked/Impounded	**<1 Acres**	**PEMAh**
C - Seasonally Flooded	90 Acres	
(no modifier)	**89 Acres**	**PEMC**
h - Diked/Impounded	**1 Acres**	**PEMCh**
F - Semipermanently Flooded	2 Acres	
(no modifier)	**<1 Acres**	**PEMF**
h - Diked/Impounded	**2 Acres**	**PEMFh**

SS - Scrub-Shrub

P - Palustrine, SS - Scrub-Shrub
Wetlands dominated by woody vegetation less than 6 meters (20 feet) tall. Woody vegetation includes tree saplings and trees that are stunted due to environmental conditions.

A - Temporarily Flooded	119 Acres	
(no modifier)	**119 Acres**	**PSSA**
C - Seasonally Flooded	49 Acres	
(no modifier)	**49 Acres**	**PSSC**

FO - Forested

P - Palustrine, FO - Forested
Wetlands dominated by woody vegetation greater than 6 meters (20 feet) tall.

A - Temporarily Flooded	89 Acres	

(no modifier) **89 Acres** PFOA

C - Seasonally Flooded 1 Acres

(no modifier) **1 Acres** PFOC

R - Riverine (Rivers)

2 - Lower Perennial

UB - Unconsolidated Bottom

R - Riverine (Rivers), 2 - Lower Perennial, UB - Unconsolidated Bottom
Stream channels where the substrate is at least 25% mud, silt or other fine particles.

F - Semipermanently Flooded 1 Acres

(no modifier) **1 Acres** R2UBF

x - Excavated **<1 Acres** R2UBFx

3 - Upper Perennial

UB - Unconsolidated Bottom

R - Riverine (Rivers), 3 - Upper Perennial, UB - Unconsolidated Bottom
Stream channels where the substrate is at least 25% mud, silt or other fine particles.

G - Intermittently Exposed 31 Acres

(no modifier) **31 Acres** R3UBG

H - Permanently Flooded 120 Acres

(no modifier) **120 Acres** R3UBH

US - Unconsolidated Shore

R - Riverine (Rivers), 3 - Upper Perennial, US - Unconsolidated Shore
Shorelines with less than 75% areal cover of stones, boulders, or bedrock and less than 30% vegetation cover. The area is also irregularly exposed due to seasonal or irregular flooding and subsequent drying.

A - Temporarily Flooded <1 Acres

(no modifier) **<1 Acres** R3USA

C - Seasonally Flooded 1 Acres

(no modifier) **1 Acres** R3USC

4 - Intermittent

SB - Stream Bed

R - Riverine (Rivers), 4 - Intermittent, SB - Stream Bed
Active channel that contains periodic water flow.

C - Seasonally Flooded 1 Acres

x - Excavated **1 Acres** R4SBCx

Rp - Riparian

1 - Lotic

SS - Scrub-Shrub

(no modifier) **10 Acres** Rp1SS

Rp - Riparian, 1 - Lotic, SS - Scrub-Shrub
This type of riparian area is dominated by woody vegetation that is less than 6 meters (20 feet) tall. Woody vegetation includes tree saplings and trees that are stunted due to environmental conditions.

FO - Forested

(no modifier) **16 Acres** Rp1FO

Rp - Riparian, 1 - Lotic, FO - Forested
This riparian class has woody vegetation that is greater than 6 meters (20 feet) tall.

Introduction to Wetland and Riparian

Within the report area you have requested, wetland and riparian mapping is summarized by acres of each classification present. Summaries are only provided for modern MTNHP wetland and riparian mapping and not for outdated (NWI Legacy) or incomplete (NWI Scalable) mapping efforts; described here. MTNHP has made all three of these datasets and associated metadata available for separate download on the Montana Wetland and Riparian Framework web page.

Wetland and Riparian mapping is one of 15 Montana Spatial Data Infrastructure framework layers considered vital for making statewide maps of Montana and understanding its geography. The wetland and riparian framework layer consists of spatial data representing the extent, type, and approximate location of wetlands, riparian areas, and deep water habitats in Montana.

Wetland and riparian mapping is completed through photointerpretation of 1-m resolution color infrared aerial imagery acquired from 2005 or later. A coding convention using letters and numbers is assigned to each mapped wetland. These letters and numbers describe the broad landscape context of the wetland, its vegetation type, its water regime, and the kind of alterations that may have occurred. Ancillary data layers such as topographic maps, digital elevation models, soils data, and other aerial imagery sources are also used to improve mapping accuracy. Wetland mapping follows the federal Wetland Mapping Standard and classifies wetlands according to the Cowardin classification system of the National Wetlands Inventory (NWI) (Cowardin et al. 1979, FGDC Wetlands Subcommittee 2013). Federal, State, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands differently than the NWI. Similar coding, based on U.S. Fish and Wildlife Service conventions, is applied to riparian areas (U.S. Fish and Wildlife Service 2009). These are mapped areas where vegetation composition and growth is influenced by nearby water bodies, but where soils, plant communities, and hydrology do not display true wetland characteristics. **These data are intended for use at a scale of 1:12,000 or smaller. Mapped wetland and riparian areas do not represent precise boundaries and digital wetland data cannot substitute for an on-site determination of jurisdictional wetlands.**

See a detailed overview, with examples, of both wetland and riparian classification systems and associated codes

Literature Cited

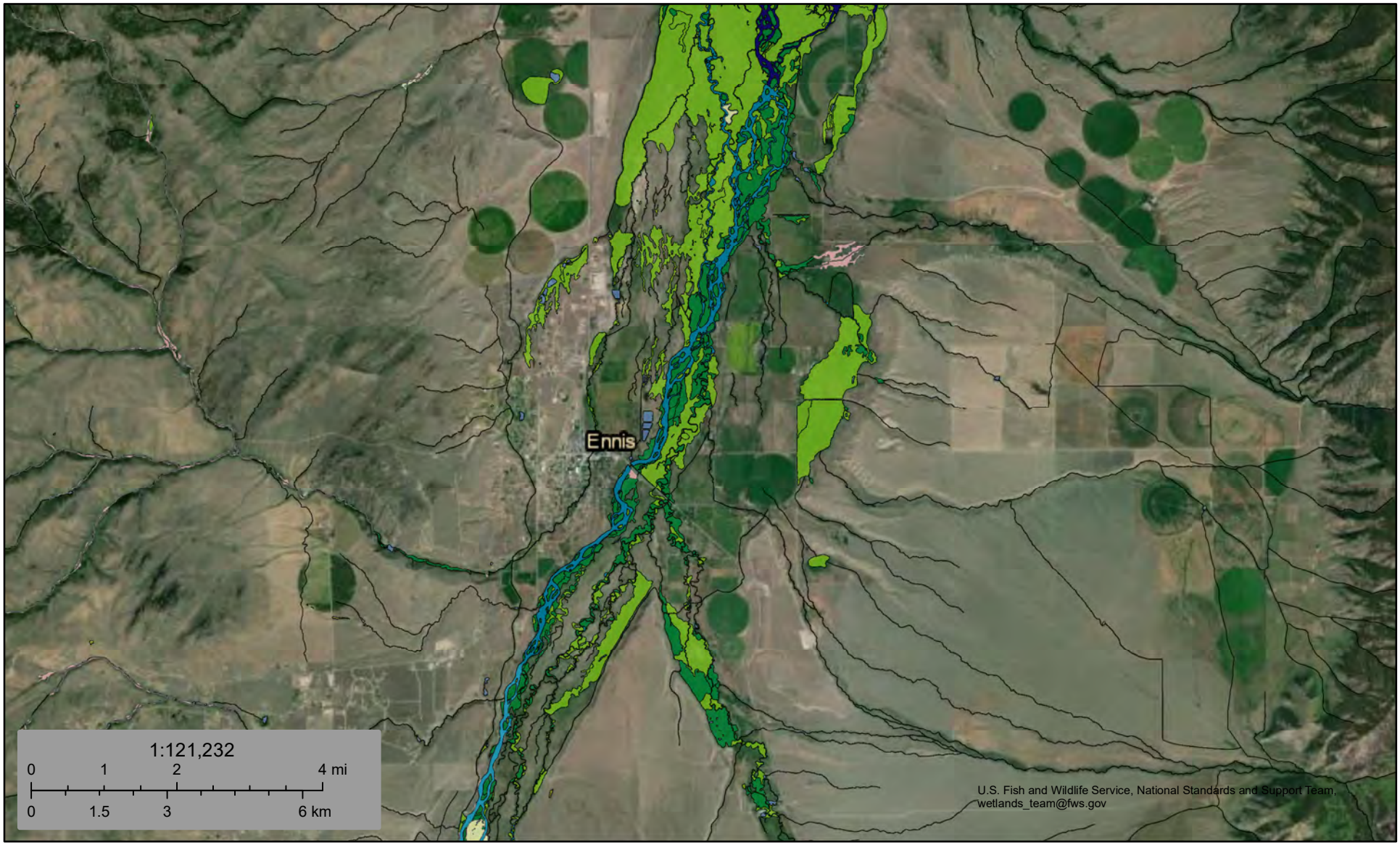
Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Fish and Wildlife Service, FWS/OBS-79/31. Washington, D.C. 103pp.

Federal Geographic Data Committee. 2013. Classification of wetlands and deepwater habitats of the United States. FGDC-STD-004-2013. Second Edition. Wetlands Subcommittee, Federal Geographic Data Committee and U.S. Fish and Wildlife Service, Washington, D.C.

U.S. Fish and Wildlife Services. 2009. A system for mapping riparian areas in the western United States. Division of Habitat and Resource Conservation, Branch of Resource and Mapping Support, Arlington, Virginia.

U.S. Fish and Wildlife Service
National Wetlands Inventory

Ennis Wetland



May 27, 2022

Wetlands

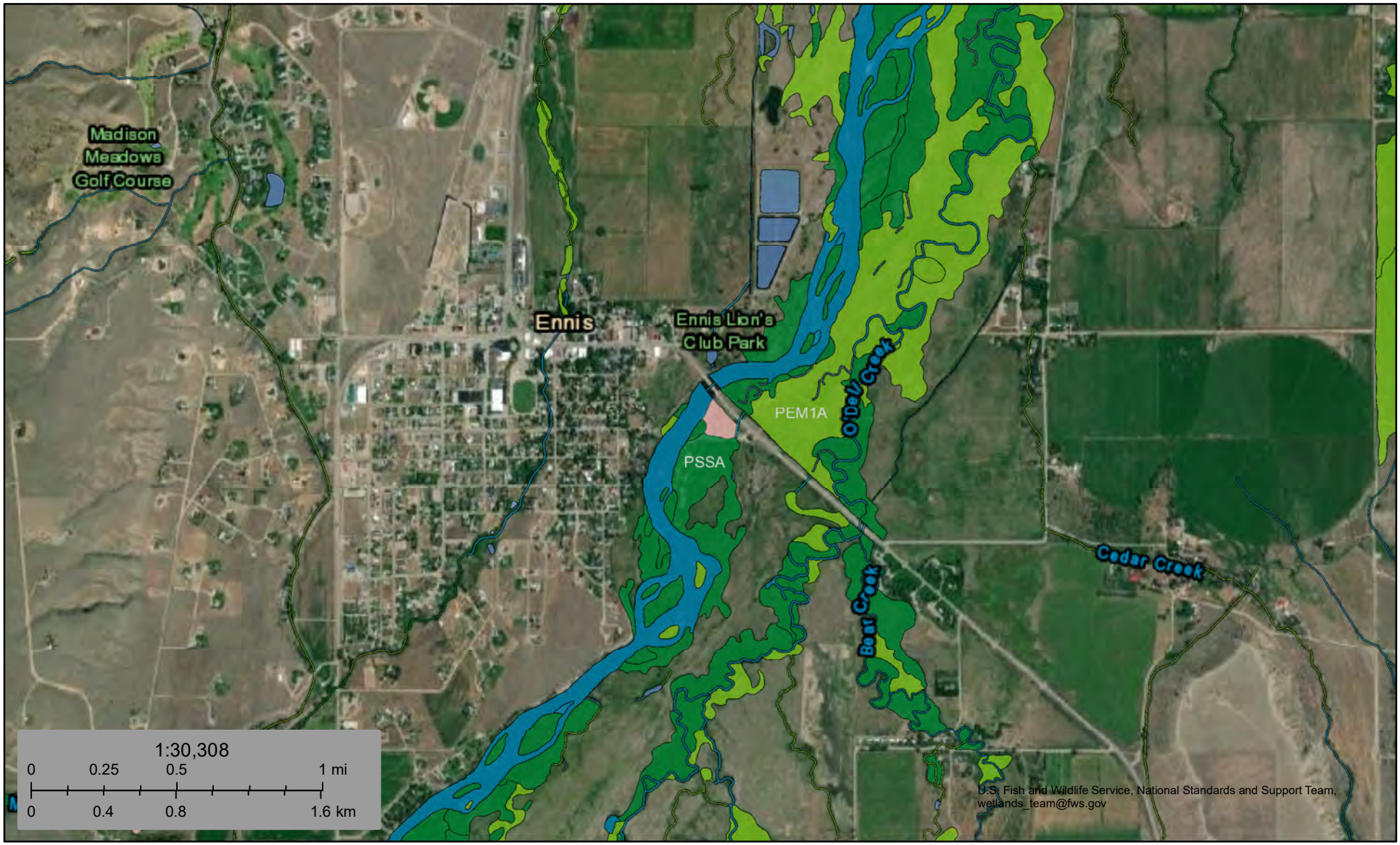
- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

U.S. Fish and Wildlife Service

National Wetlands Inventory

Larger Scale Wetland



May 27, 2022

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

APPENDIX I

2015-2019 ACS Census Data and Target Rate Information

RESOURCES [INDEX]

Consolidated Plan [https://commerce.mt.gov/Consolidated-Plan/]

Past Programs [Past-Programs]

Census and Target Rate [Target-Rate]

Income and Rent Limits [Income-and-Rent-Limits]

TARGET RATE CALCULATION RESOURCE

The Community Development Division (CDD) has updated the U.S. Census Bureau's American Communities Survey (ACS) data set 2015-2019 for the calculation of local government target rates. The Montana Coal Endowment Program (MCEP) and Community Development Block Grant (CDBG) programs use ACS information as the base data set to calculate applicant target rates for community infrastructure systems.

These calculated rates, along with other demographic information, are components of the review and analysis of applications submitted to the programs for funding requests. Applications to be submitted in 2021 or later for MCEP or CDBG programs must use the 2015-2019 ACS data for the calculation of target rates for an applicant.

Low and moderate income (LMI) data is subject to change due to information released by the U.S Department of Housing and Urban Development (HUD).

Search below for 2015-2019 American Communities Survey data used to calculate target rates when applying to the **Montana Coal Endowment Program** and **Community Development Block Group Grant Program.**

Step 1a:
Select a geography type
(All)

OR

Step 1b:
Select a county or counties
(All)

Step 2:
Select a geography
Ennis town

MONTANA
DEPARTMENT OF COMMERCE

Selected Geography	Ennis town
Associated County	*Madison County*
Population	849
Total Households	407
Median Household Income	$46,280
Low & Moderate Income Percent	37.1%
Percent Poverty	5.2%

Target Rates

Water & Wastewater	$88.70
Water Only	$53.99
Wastewater Only	$34.71
Solid Waste Only	$11.57

[#]

Amounts are computed using the 2015-2019 census and target percentage rationale reviewed biennially by Commerce. The target percentages are:

2.3% combined (water and wastewater)
1.4% for water alone
0.9% for wastewater alone
0.3% for solid waste

For example: Community median household income is $25,000 and the residents pay both water and wastewater rates, the calculation would be: $25,000 times 2.3% divided by 12 equals monthly target rate of $47.92. (25,000 x 2.3%)/12 = $47.92)

Having trouble finding data for your community? Some communities may not be listed in the resources above because the American Community Survey (ACS) did not provide 2015-2019 MHI data for those areas. Please contact us [../Contact] [../Contact] if you have any questions about this information.

MAPPING

To see maps of the City/Town/CDP or County in which you are interested, please go to the Census and Economic Information Center [https://ceic.mt.gov/Programs/US-Census-Bureau/Census-Geography-Map] . For more information about the maps or tools available, please contact the Census and Economic Information Bureau [https://ceic.mt.gov/contact]

CONTACTS

Montana Coal Endowment Program (MCEP)	406 841-2770
Community Development Block Grant Program (CDBG)	406 841-2770
Census & Economic Information Center (CEIC)	406 841-2740

DEFINITIONS

Census Designated Place (CDP): Census designated places (CDPs) have been created for each decennial census as the statistical counterparts of incorporated places. CDPs are delineated to provide census data for concentrations of population, housing, and commercial structures that are identifiable by name but are not within an incorporated place. CDP boundaries usually are defined in cooperation with state, local, and tribal officials. These boundaries, which usually coincide with visible features or the boundary of an adjacent incorporated place or other legal entity boundary, have no legal status, nor do these places have officials elected to serve traditional municipal functions.

Household: A household includes all the people who occupy a housing unit as their usual place of residence.

Income of households: This includes the income of the householder and all other individuals 15 years old and over in the household, whether they are related to the householder or not.

Low and Moderate Income Percent: Low and Moderate Income Percent is calculated by U.S. Housing and Urban Development (HUD) using data from the U.S. Census Bureau's Decennial Census, specifically for the Community Development Block Grant Program (CDBG). LMI families are defined as those families whose income does not exceed 80% of the county median income for the previous year or 80% of the median income of the entire non-metropolitan area of the State of Montana, whichever is higher.

Median income: The median income divides the income distribution into two equal groups, one having incomes above the median, and other having incomes below the median.

Notes: Total Population and Total Households are from Summary File (SF) 1, 100% data. Poverty Rates and Median Household Income are from Summary File (SF) 3, Sample data. Low and Moderate Income Percentage was developed by HUD using Census 2010 data.

Sources: U.S. Census Bureau & HUD
Median Household Income
Census Bureau, American Community Survey 2015-2019 Estimates

[#]

Total Population & Households

U.S. Census Bureau, 2015-2019 Census - Summary File 1 (SF1) 100% Data

Low to Moderate Income Percent

HUD 2015 Low and Moderate Income Data

[#]

APPENDIX J

DEQ PWS Compliance Sampling Records and Water Quality Analyses

Drinking Water Branch

Sample and Compliance Schedules

Return Links

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000208	**Federal Type :**	C
Water System Name :	ENNIS TOWN OF	**State Type :**	C
Principal County Served :	MADISON	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000

TCR Schedules

Sample Count	Sample Type	Sample Frequency	Effective Begin Date	Effective End Date	Seasonal Start MM/DD	Seasonal End MM/DD	Analyte Code	Analyte Name
2	RT	MN	06-01-2022		1/1	12/31	3100	COLIFORM (TCR)

Total Number of Schedules Displayed = 1

Frequent Field Sample Schedules

Water System Facility State Asgn ID	Water System Facility Name	Analyte Code	Analyte Name	Days to Monitor per month	Samples Required per day	Effective Begin Date	Effective End Date	Summary Type

Total Number of Schedules Displayed = 0

Non-TCR Group Schedules

Water System Facility State Asgn ID	Water System Facility Name	Analyte Group Code	Analyte Group Name	Sample Count	Sample Type	Sample Frequency	Current Monitoring Period Date Range	Next Monitoring Period Date Range
DS001	DISTRIBUTION SYSTEM	ASBE	CDS ASBESTOS	1	RT	9Y	No Monitoring in Current Period	01-01-2029 to 12-31-2037
DS001	DISTRIBUTION SYSTEM	PBCU	CDS LEAD COPPER ONLY	10	RT	3Y	06-01-2024 to 09-30-2026	06-01-2027 to 09-30-2029
WL003	WELL 2 1979 COMLEY SW GWIC 108663	ARSE	CDS ARSENIC	1	RT	3Y	Monitoring Completed	01-01-2026 to 12-31-2028
WL003	WELL 2 1979 COMLEY SW GWIC 108663	NITR	CDS NITRATE NITRITE	1	RT	YR	01-01-2024 to 12-31-2024	01-01-2025 to 12-31-2025
WL003	WELL 2 1979 COMLEY SW GWIC 108663	INO2	CDS P5 INORGANICS	1	RT	3Y	Monitoring Completed	01-01-2026 to 12-31-2028
WL003	WELL 2 1979 COMLEY SW GWIC 108663	GRAL	CDS RAD GROSS ALPHA	1	RT	9Y	Monitoring Completed	01-01-2026 to 12-31-2034

WL003	WELL 2 1979 COMLEY SW GWIC 108663	COMB	CDS RADIUMS COMBINED	1	RT	9Y	Monitoring Completed	01-01-2026 to 12-31-2034
WL003	WELL 2 1979 COMLEY SW GWIC 108663	SOC	CDS SOC REGULATED	1	RT	3Y	Monitoring Completed	01-01-2026 to 12-31-2028
WL003	WELL 2 1979 COMLEY SW GWIC 108663	VOC1	CDS VOC	1	RT	3Y	Monitoring Completed	01-01-2026 to 12-31-2028
WL003	WELL 2 1979 COMLEY SW GWIC 108663	INO4	CDS W P-2 INORGANICS	1	RT	9Y	Monitoring Completed	01-01-2029 to 12-31-2037
WL003	WELL 2 1979 COMLEY SW GWIC 108663	SWW	STATE WIDE WAIVERS	1	RT	9Y	Monitoring Completed	01-01-2029 to 12-31-2037
WL004	WELL 3 GWIC 277857	ARSE	CDS ARSENIC	1	RT	3Y	Monitoring Completed	01-01-2026 to 12-31-2028
WL004	WELL 3 GWIC 277857	NITR	CDS NITRATE NITRITE	1	RT	YR	01-01-2024 to 12-31-2024	01-01-2025 to 12-31-2025
WL004	WELL 3 GWIC 277857	INO1	CDS P2-5 INORGANICS	1	RT	3Y	Monitoring Completed	01-01-2026 to 12-31-2028
WL004	WELL 3 GWIC 277857	GRAL	CDS RAD GROSS ALPHA	1	RT	9Y	No Monitoring in Current Period	01-01-2026 to 12-31-2034
WL004	WELL 3 GWIC 277857	COMB	CDS RADIUMS COMBINED	1	RT	9Y	No Monitoring in Current Period	01-01-2026 to 12-31-2034
WL004	WELL 3 GWIC 277857	SOC	CDS SOC REGULATED	1	RT	3Y	Monitoring Completed	01-01-2026 to 12-31-2028
WL004	WELL 3 GWIC 277857	VOC1	CDS VOC	1	RT	3Y	Monitoring Completed	01-01-2026 to 12-31-2028

Total Number of Schedules Displayed = 18

Non-TCR Individual Schedules

Water System Facility State Asgn ID	Water System Facility Name	Analyte Code	Analyte Name	Sample Count	Sample Type	Sample Frequency	Current Monitoring Period Date Range	Next Monitoring Period Date Range
WL003	WELL 2 1979 COMLEY SW GWIC 108663	1032	MANGANESE	1	RT	YR	No Monitoring in Current Period	----
WL004	WELL 3 GWIC 277857	1032	MANGANESE	1	RT	YR	No Monitoring in Current Period	----

Total Number of Schedules Displayed = 2

Compliance Schedule

Activity Name	Activity Due Date	Activity Projected Date	Activity Achieved Date	Activity Reported Date
SUBMIT LCN CERTIFICATE	2014-12-29	12-29-2014		
SUBMIT LCN CERTIFICATE	2017-12-29	12-29-2017		
WAIVER (STEP 5) : PUBLIC NOTICE (YEAR 1)	2020-12-31			
WAIVER (STEP 5) : PUBLIC NOTICE (YEAR 1)	2020-12-31			
WAIVER (STEP 5) : PUBLIC NOTICE (YEAR 1)	2020-12-31			
WAIVER (STEP 5) : PUBLIC NOTICE (YEAR 2)	2021-12-31			
WAIVER (STEP 5) : PUBLIC NOTICE (YEAR 2)	2021-12-31			
WAIVER (STEP 5) : PUBLIC NOTICE (YEAR 2)	2021-12-31			
WAIVER (STEP 1) : APPLICATION	2022-06-30			
WAIVER (STEP 1) : APPLICATION	2022-06-30			
WAIVER (STEP 1) : APPLICATION	2022-06-30			
WAIVER (STEP 5) : PUBLIC NOTICE (YEAR 3)	2022-12-31			
WAIVER (STEP 5) : PUBLIC NOTICE (YEAR 3)	2022-12-31			
WAIVER (STEP 5) : PUBLIC NOTICE (YEAR 3)	2022-12-31			
SUBMIT ACCEPTABLE CCR	2024-06-30			
SUBMIT ACCEPTABLE CERTIFICATION	2024-09-30			
LSLI COMPLETE INITIAL LSL INVENTORY	2024-10-16	10-16-2024		
LSLI SUBMIT LEAD SERVICE LINE INVENTORY	2024-10-16	10-16-2024		
WAIVER (STEP 5) : PUBLIC NOTICE (YEAR 5)	2024-12-31			
WAIVER (STEP 5) : PUBLIC NOTICE (YEAR 5)	2024-12-31			
WAIVER (STEP 5) : PUBLIC NOTICE (YEAR 5)	2024-12-31			
WAIVER (STEP 5) : PUBLIC NOTICE (YEAR 6)	2025-12-31			
WAIVER (STEP 5) : PUBLIC NOTICE (YEAR 6)	2025-12-31			
WAIVER (STEP 5) : PUBLIC NOTICE (YEAR 6)	2025-12-31			
WAIVER (STEP 5) : PUBLIC NOTICE (YEAR 7)	2026-12-31			
WAIVER (STEP 5) : PUBLIC NOTICE (YEAR 7)	2026-12-31			
WAIVER (STEP 5) : PUBLIC NOTICE (YEAR 7)	2026-12-31			

WAIVER (STEP 5) : PUBLIC NOTICE (YEAR 8)	2027-12-31			
WAIVER (STEP 5) : PUBLIC NOTICE (YEAR 8)	2027-12-31			
WAIVER (STEP 5) : PUBLIC NOTICE (YEAR 8)	2027-12-31			
WAIVER (STEP 5) : PUBLIC NOTICE (YEAR 9)	2028-12-31			
WAIVER (STEP 5) : PUBLIC NOTICE (YEAR 9)	2028-12-31			
WAIVER (STEP 5) : PUBLIC NOTICE (YEAR 9)	2028-12-31			
WAIVER (STEP 3) : SWP RECCOMENDATION				
WAIVER (STEP 3) : SWP RECCOMENDATION				
WAIVER (STEP 4) : PWS DECISION			12-31-2022	
WAIVER (STEP 3) : SWP RECCOMENDATION				
WAIVER (STEP 2) : ELIGIBILITY REVIEW			12-31-2022	

Total Number of Compliance Schedules Displayed = 38

Disclaimer

If the Current Monitoring Period Date Range reads “Monitoring Completed”, sufficient samples have been collected from the specified water system facility (WSF). If the Current Monitoring Period Date Range reads “Monitoring Partially Completed”, sufficient samples have been collected for some but not all the analytes in the group. A monitoring violation may occur if samples were not collected from the appropriate sampling point, were not analyzed by a certified laboratory, or were not reported on time. Total Coliform Rule (TCR), triggered, confirmation or repeat schedules or schedules with a daily or weekly frequency will not display this message.

The Current Date and Time is: Wed May 08 08:48:03 MDT 2024

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000208	**Federal Type :**	C
Water System Name :	ENNIS TOWN OF	**State Type :**	C
Principal County Served :	MADISON	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	H23100420-001B	**Collection Date :**	10-11-2023

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
1005	ARSENIC	200.8		MRL	.001 MG/L	0.001 MG/L	01-01-2023	12-31-2025
1036	NICKEL	200.8	Y	MRL	.005 MG/L		01-01-2023	12-31-2025
1074	ANTIMONY, TOTAL	200.8	Y	MRL	.001 MG/L		01-01-2023	12-31-2025
1075	BERYLLIUM, TOTAL	200.8	Y	MRL	.001 MG/L		01-01-2023	12-31-2025
1085	THALLIUM, TOTAL	200.8	Y	MRL	.0005 MG/L		01-01-2023	12-31-2025

Total Number of Records Displayed = 5

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000208	**Federal Type :**	C
Water System Name :	ENNIS TOWN OF	**State Type :**	C
Principal County Served :	MADISON	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	H23100420-001C	**Collection Date :**	10-11-2023

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
1038	NITRATE-NITRITE	353.2		MRL	.02 MG/L	1.69 MG/L	01-01-2023	12-31-2023

Total Number of Records Displayed = 1

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000208	**Federal Type :**	C
Water System Name :	ENNIS TOWN OF	**State Type :**	C
Principal County Served :	MADISON	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	H23100420-001D	**Collection Date :**	10-11-2023

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.



Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
2031	DALAPON	515.4	Y	MRL	2.5 UG/L		01-01-2023	12-31-2025
2040	PICLORAM	515.4	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2041	DINOSEB	515.4	Y	MRL	1 UG/L		01-01-2023	12-31-2025
2105	2,4-D	515.4	Y	MRL	1 UG/L		01-01-2023	12-31-2025
2106	2,4-DB	515.4	Y	MRL	1 UG/L			
2110	2,4,5-TP	515.4	Y	MRL	.25 UG/L		01-01-2023	12-31-2025
2206	DICHLORPROP	515.4	Y	MRL	1 UG/L			
2326	PENTACHLOROPHENOL	515.4	Y	MRL	.1 UG/L		01-01-2023	12-31-2025
2440	DICAMBA	515.4	Y	MRL	1 UG/L			

Total Number of Records Displayed = 9

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000208	**Federal Type :**	C
Water System Name :	ENNIS TOWN OF	**State Type :**	C
Principal County Served :	MADISON	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	H23100420-001E	**Collection Date :**	10-11-2023

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
2005	ENDRIN	525.2	Y	MRL	.1 UG/L		01-01-2023	12-31-2025
2010	BHC-GAMMA	525.2	Y	MRL	.1 UG/L		01-01-2023	12-31-2025
2015	METHOXYCHLOR	525.2	Y	MRL	.1 UG/L		01-01-2023	12-31-2025
2020	TOXAPHENE	525.2	Y	MRL	2 UG/L		01-01-2023	12-31-2025
2035	DI(2-ETHYLHEXYL) ADIPATE	525.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2037	SIMAZINE	525.2	Y	MRL	.1 UG/L		01-01-2023	12-31-2025
2039	DI(2-ETHYLHEXYL) PHTHALATE	525.2	Y	MRL	.6 UG/L		01-01-2023	12-31-2025
2042	HEXACHLOROCYCLOPENTADIENE	525.2	Y	MRL	.1 UG/L		01-01-2023	12-31-2025
2045	METOLACHLOR	525.2	Y	MRL	.1 UG/L			
2050	ATRAZINE	525.2	Y	MRL	.1 UG/L		01-01-2023	12-31-2025
2051	LASSO	525.2	Y	MRL	.1 UG/L		01-01-2023	12-31-2025
2065	HEPTACHLOR	525.2	Y	MRL	.1 UG/L		01-01-2023	12-31-2025
2067	HEPTACHLOR EPOXIDE	525.2	Y	MRL	.1 UG/L		01-01-2023	12-31-2025
2070	DIELDRIN	525.2	Y	MRL	.1 UG/L			
2076	BUTACHLOR	525.2	Y	MRL	.1 UG/L			
2077	PROPACHLOR	525.2	Y	MRL	.1 UG/L			
2274	HEXACHLOROBENZENE	525.2	Y	MRL	.1 UG/L		01-01-2023	12-31-2025
2306	BENZO(A)PYRENE	525.2	Y	MRL	.1 UG/L		01-01-2023	12-31-2025
2356	ALDRIN	525.2	Y	MRL	.1 UG/L			
2383	TOTAL POLYCHLORINATED BIPHENYLS (PCB)	525.2	Y	MRL	.5 UG/L		01-01-2020	12-31-2028
2388	AROCLOR 1016	525.2	Y	MRL	.08 UG/L			
2390	AROCLOR 1221	525.2	Y	MRL	2 UG/L			
2392	AROCLOR 1232	525.2	Y	MRL	.5 UG/L			
2394	AROCLOR 1242	525.2	Y	MRL	.3 UG/L			
2396	AROCLOR 1248	525.2	Y	MRL	.1 UG/L			
2398	AROCLOR 1254	525.2	Y	MRL	.1 UG/L			
2400	AROCLOR 1260	525.2	Y	MRL	.2 UG/L			
2595	METRIBUZIN	525.2	Y	MRL	.1 UG/L			
2959	CHLORDANE	525.2	Y	MRL	1 UG/L		01-01-2023	12-31-2025

Total Number of Records Displayed = 29

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000208	**Federal Type :**	C
Water System Name :	ENNIS TOWN OF	**State Type :**	C
Principal County Served :	MADISON	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	H23100420-001F	**Collection Date :**	10-11-2023

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
2030	P-ISOPROPYLTOLUENE	524.2	Y	MRL	.5 UG/L			
2210	CHLOROMETHANE	524.2	Y	MRL	.5 UG/L			
2212	DICHLORODIFLUOROMETHANE	524.2	Y	MRL	.5 UG/L			
2214	BROMOMETHANE	524.2	Y	MRL	.5 UG/L			
2216	CHLOROETHANE	524.2	Y	MRL	.5 UG/L			
2218	TRICHLOROFLUOROMETHANE	524.2	Y	MRL	.5 UG/L			
2246	HEXACHLOROBUTADIENE	524.2	Y	MRL	.5 UG/L			
2248	NAPHTHALENE	524.2	Y	MRL	.5 UG/L			
2378	1,2,4-TRICHLOROBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2380	CIS-1,2-DICHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2408	DIBROMOMETHANE	524.2	Y	MRL	.5 UG/L			
2410	1,1-DICHLOROPROPENE	524.2	Y	MRL	.5 UG/L			
2412	1,3-DICHLOROPROPANE	524.2	Y	MRL	.5 UG/L			
2413	1,3-DICHLOROPROPENE	524.2	Y	MRL	.5 UG/L			
2414	1,2,3-TRICHLOROPROPANE	524.2	Y	MRL	.5 UG/L			
2416	2,2-DICHLOROPROPANE	524.2	Y	MRL	.5 UG/L			
2418	1,2,4-TRIMETHYLBENZENE	524.2	Y	MRL	.5 UG/L			
2420	1,2,3-TRICHLOROBENZENE	524.2	Y	MRL	.5 UG/L			
2422	N-BUTYLBENZENE	524.2	Y	MRL	.5 UG/L			
2424	1,3,5-TRIMETHYLBENZENE	524.2	Y	MRL	.5 UG/L			
2426	TERT-BUTYLBENZENE	524.2	Y	MRL	.5 UG/L			
2428	SEC-BUTYLBENZENE	524.2	Y	MRL	.5 UG/L			
2430	BROMOCHLOROMETHANE	524.2	Y	MRL	.5 UG/L			
2941	CHLOROFORM	524.2	Y	MRL	.5 UG/L			
2942	BROMOFORM	524.2	Y	MRL	.5 UG/L			
2943	BROMODICHLOROMETHANE	524.2	Y	MRL	.5 UG/L			
2944	DIBROMOCHLOROMETHANE	524.2	Y	MRL	.5 UG/L			
2950	TTHM	524.2	Y	MRL	.5 UG/L			
2955	XYLENES, TOTAL	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2964	DICHLOROMETHANE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2965	O-CHLOROTOLUENE	524.2	Y	MRL	.5 UG/L			
2966	P-CHLOROTOLUENE	524.2	Y	MRL	.5 UG/L			
2967	M-DICHLOROBENZENE	524.2	Y	MRL	.5 UG/L			
2968	O-DICHLOROBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2969	P-DICHLOROBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2976	VINYL CHLORIDE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2977	1,1-DICHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2978	1,1-DICHLOROETHANE	524.2	Y	MRL	.5 UG/L			
2979	TRANS-1,2-DICHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2980	1,2-DICHLOROETHANE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2981	1,1,1-TRICHLOROETHANE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025

2982	CARBON TETRACHLORIDE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2983	1,2-DICHLOROPROPANE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2984	TRICHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2985	1,1,2-TRICHLOROETHANE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2986	1,1,1,2-TETRACHLOROETHANE	524.2	Y	MRL	.5 UG/L			
2987	TETRACHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2988	1,1,2,2-TETRACHLOROETHANE	524.2	Y	MRL	.5 UG/L			
2989	CHLOROBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2990	BENZENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2991	TOLUENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2992	ETHYLBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2993	BROMOBENZENE	524.2	Y	MRL	.5 UG/L			
2994	ISOPROPYLBENZENE	524.2	Y	MRL	.5 UG/L			
2996	STYRENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2997	O-XYLENE	524.2	Y	MRL	.5 UG/L			
2998	N-PROPYLBENZENE	524.2	Y	MRL	.5 UG/L			

Total Number of Records Displayed = 57

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000208	**Federal Type :**	C
Water System Name :	ENNIS TOWN OF	**State Type :**	C
Principal County Served :	MADISON	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	H23100420-001G	**Collection Date :**	10-11-2023

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
2021	CARBARYL	531.1	Y	MRL	1 UG/L			
2022	METHOMYL	531.1	Y	MRL	1 UG/L			
2024	METHIOCARB	531.1	Y	MRL	1 UG/L			
2036	OXAMYL	531.1	Y	MRL	1 UG/L		01-01-2023	12-31-2025
2043	ALDICARB SULFOXIDE	531.1	Y	MRL	1 UG/L			
2044	ALDICARB SULFONE	531.1	Y	MRL	1 UG/L			
2046	CARBOFURAN	531.1	Y	MRL	1 UG/L		01-01-2023	12-31-2025
2047	ALDICARB	531.1	Y	MRL	1 UG/L			
2066	3-HYDROXYCARBOFURAN	531.1	Y	MRL	1 UG/L			

Total Number of Records Displayed = 9

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000208	**Federal Type :**	C
Water System Name :	ENNIS TOWN OF	**State Type :**	C
Principal County Served :	MADISON	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	H23100099-001A	**Collection Date :**	10-03-2023

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
1025	FLUORIDE	4500F-C		MRL	.1 MG/L	0.5 MG/L	01-01-2023	12-31-2025

Total Number of Records Displayed = 1

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000208	**Federal Type :**	C
Water System Name :	ENNIS TOWN OF	**State Type :**	C
Principal County Served :	MADISON	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	H23100099-001B	**Collection Date :**	10-03-2023

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
1005	ARSENIC	200.8		MRL	.001 MG/L	0.002 MG/L	01-01-2023	12-31-2025
1010	BARIUM	200.8		MRL	.05 MG/L	0.10 MG/L	01-01-2023	12-31-2025
1015	CADMIUM	200.8	Y	MRL	.001 MG/L		01-01-2023	12-31-2025
1020	CHROMIUM	200.8	Y	MRL	.005 MG/L		01-01-2023	12-31-2025
1035	MERCURY	245.1	Y	MRL	.0001 MG/L		01-01-2023	12-31-2025
1036	NICKEL	200.8	Y	MRL	.005 MG/L		01-01-2023	12-31-2025
1045	SELENIUM	200.8	Y	MRL	.001 MG/L		01-01-2023	12-31-2025
1074	ANTIMONY, TOTAL	200.8	Y	MRL	.001 MG/L		01-01-2023	12-31-2025
1075	BERYLLIUM, TOTAL	200.8	Y	MRL	.001 MG/L		01-01-2023	12-31-2025
1085	THALLIUM, TOTAL	200.8	Y	MRL	.0005 MG/L		01-01-2023	12-31-2025

Total Number of Records Displayed = 10

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000208	**Federal Type :**	C
Water System Name :	ENNIS TOWN OF	**State Type :**	C
Principal County Served :	MADISON	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	H23100099-001C	**Collection Date :**	10-03-2023

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.



Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
1038	NITRATE-NITRITE	353.2		MRL	.01 MG/L	0.68 MG/L	01-01-2023	12-31-2023

Total Number of Records Displayed = 1

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000208	**Federal Type :**	C
Water System Name :	ENNIS TOWN OF	**State Type :**	C
Principal County Served :	MADISON	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	H23100099-001D	**Collection Date :**	10-03-2023

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.



Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
2031	DALAPON	515.4	Y	MRL	2.5 UG/L		01-01-2023	12-31-2025
2040	PICLORAM	515.4	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2041	DINOSEB	515.4	Y	MRL	1 UG/L		01-01-2023	12-31-2025
2105	2,4-D	515.4	Y	MRL	1 UG/L		01-01-2023	12-31-2025
2106	2,4-DB	515.4	Y	MRL	1 UG/L			
2110	2,4,5-TP	515.4	Y	MRL	.25 UG/L		01-01-2023	12-31-2025
2206	DICHLORPROP	515.4	Y	MRL	1 UG/L			
2326	PENTACHLOROPHENOL	515.4	Y	MRL	.1 UG/L		01-01-2023	12-31-2025
2440	DICAMBA	515.4	Y	MRL	1 UG/L			

Total Number of Records Displayed = 9

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000208	**Federal Type :**	C
Water System Name :	ENNIS TOWN OF	**State Type :**	C
Principal County Served :	MADISON	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	H23100099-001E	**Collection Date :**	10-03-2023

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
2005	ENDRIN	525.2	Y	MRL	.1 UG/L		01-01-2023	12-31-2025
2010	BHC-GAMMA	525.2	Y	MRL	.1 UG/L		01-01-2023	12-31-2025
2015	METHOXYCHLOR	525.2	Y	MRL	.1 UG/L		01-01-2023	12-31-2025
2020	TOXAPHENE	525.2	Y	MRL	2 UG/L		01-01-2023	12-31-2025
2035	DI(2-ETHYLHEXYL) ADIPATE	525.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2037	SIMAZINE	525.2	Y	MRL	.1 UG/L		01-01-2023	12-31-2025
2039	DI(2-ETHYLHEXYL) PHTHALATE	525.2	Y	MRL	.6 UG/L		01-01-2023	12-31-2025
2042	HEXACHLOROCYCLOPENTADIENE	525.2	Y	MRL	.1 UG/L		01-01-2023	12-31-2025
2045	METOLACHLOR	525.2	Y	MRL	.1 UG/L			
2050	ATRAZINE	525.2	Y	MRL	.1 UG/L		01-01-2023	12-31-2025
2051	LASSO	525.2	Y	MRL	.1 UG/L		01-01-2023	12-31-2025
2065	HEPTACHLOR	525.2	Y	MRL	.1 UG/L		01-01-2023	12-31-2025
2067	HEPTACHLOR EPOXIDE	525.2	Y	MRL	.1 UG/L		01-01-2023	12-31-2025
2070	DIELDRIN	525.2	Y	MRL	.1 UG/L			
2076	BUTACHLOR	525.2	Y	MRL	.1 UG/L			
2077	PROPACHLOR	525.2	Y	MRL	.1 UG/L			
2274	HEXACHLOROBENZENE	525.2	Y	MRL	.1 UG/L		01-01-2023	12-31-2025
2306	BENZO(A)PYRENE	525.2	Y	MRL	.1 UG/L		01-01-2023	12-31-2025
2356	ALDRIN	525.2	Y	MRL	.1 UG/L			
2383	TOTAL POLYCHLORINATED BIPHENYLS (PCB)	525.2	Y	MRL	.5 UG/L			
2388	AROCLOR 1016	525.2	Y	MRL	.08 UG/L			
2390	AROCLOR 1221	525.2	Y	MRL	2 UG/L			
2392	AROCLOR 1232	525.2	Y	MRL	.5 UG/L			
2394	AROCLOR 1242	525.2	Y	MRL	.3 UG/L			
2396	AROCLOR 1248	525.2	Y	MRL	.1 UG/L			
2398	AROCLOR 1254	525.2	Y	MRL	.1 UG/L			
2400	AROCLOR 1260	525.2	Y	MRL	.2 UG/L			
2595	METRIBUZIN	525.2	Y	MRL	.1 UG/L			
2959	CHLORDANE	525.2	Y	MRL	1 UG/L		01-01-2023	12-31-2025

Total Number of Records Displayed = 29

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000208	**Federal Type :**	C
Water System Name :	ENNIS TOWN OF	**State Type :**	C
Principal County Served :	MADISON	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	H23100099-001F	**Collection Date :**	10-03-2023

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
2030	P-ISOPROPYLTOLUENE	524.2	Y	MRL	.5 UG/L			
2210	CHLOROMETHANE	524.2	Y	MRL	.5 UG/L			
2212	DICHLORODIFLUOROMETHANE	524.2	Y	MRL	.5 UG/L			
2214	BROMOMETHANE	524.2	Y	MRL	.5 UG/L			
2216	CHLOROETHANE	524.2	Y	MRL	.5 UG/L			
2218	TRICHLOROFLUOROMETHANE	524.2	Y	MRL	.5 UG/L			
2246	HEXACHLOROBUTADIENE	524.2	Y	MRL	.5 UG/L			
2248	NAPHTHALENE	524.2	Y	MRL	.5 UG/L			
2378	1,2,4-TRICHLOROBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2380	CIS-1,2-DICHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2408	DIBROMOMETHANE	524.2	Y	MRL	.5 UG/L			
2410	1,1-DICHLOROPROPENE	524.2	Y	MRL	.5 UG/L			
2412	1,3-DICHLOROPROPANE	524.2	Y	MRL	.5 UG/L			
2413	1,3-DICHLOROPROPENE	524.2	Y	MRL	.5 UG/L			
2414	1,2,3-TRICHLOROPROPANE	524.2	Y	MRL	.5 UG/L			
2416	2,2-DICHLOROPROPANE	524.2	Y	MRL	.5 UG/L			
2418	1,2,4-TRIMETHYLBENZENE	524.2	Y	MRL	.5 UG/L			
2420	1,2,3-TRICHLOROBENZENE	524.2	Y	MRL	.5 UG/L			
2422	N-BUTYLBENZENE	524.2	Y	MRL	.5 UG/L			
2424	1,3,5-TRIMETHYLBENZENE	524.2	Y	MRL	.5 UG/L			
2426	TERT-BUTYLBENZENE	524.2	Y	MRL	.5 UG/L			
2428	SEC-BUTYLBENZENE	524.2	Y	MRL	.5 UG/L			
2430	BROMOCHLOROMETHANE	524.2	Y	MRL	.5 UG/L			
2941	CHLOROFORM	524.2	Y	MRL	.5 UG/L			
2942	BROMOFORM	524.2	Y	MRL	.5 UG/L			
2943	BROMODICHLOROMETHANE	524.2	Y	MRL	.5 UG/L			
2944	DIBROMOCHLOROMETHANE	524.2	Y	MRL	.5 UG/L			
2950	TTHM	524.2	Y	MRL	.5 UG/L			
2955	XYLENES, TOTAL	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2964	DICHLOROMETHANE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2965	O-CHLOROTOLUENE	524.2	Y	MRL	.5 UG/L			
2966	P-CHLOROTOLUENE	524.2	Y	MRL	.5 UG/L			
2967	M-DICHLOROBENZENE	524.2	Y	MRL	.5 UG/L			
2968	O-DICHLOROBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2969	P-DICHLOROBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2976	VINYL CHLORIDE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2977	1,1-DICHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2978	1,1-DICHLOROETHANE	524.2	Y	MRL	.5 UG/L			
2979	TRANS-1,2-DICHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2980	1,2-DICHLOROETHANE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2981	1,1,1-TRICHLOROETHANE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025

2982	CARBON TETRACHLORIDE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2983	1,2-DICHLOROPROPANE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2984	TRICHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2985	1,1,2-TRICHLOROETHANE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2986	1,1,1,2-TETRACHLOROETHANE	524.2	Y	MRL	.5 UG/L			
2987	TETRACHLOROETHYLENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2988	1,1,2,2-TETRACHLOROETHANE	524.2	Y	MRL	.5 UG/L			
2989	CHLOROBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2990	BENZENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2991	TOLUENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2992	ETHYLBENZENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2993	BROMOBENZENE	524.2	Y	MRL	.5 UG/L			
2994	ISOPROPYLBENZENE	524.2	Y	MRL	.5 UG/L			
2996	STYRENE	524.2	Y	MRL	.5 UG/L		01-01-2023	12-31-2025
2997	O-XYLENE	524.2	Y	MRL	.5 UG/L			
2998	N-PROPYLBENZENE	524.2	Y	MRL	.5 UG/L			

Total Number of Records Displayed = 57

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000208	**Federal Type :**	C
Water System Name :	ENNIS TOWN OF	**State Type :**	C
Principal County Served :	MADISON	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	H23100099-001G	**Collection Date :**	10-03-2023

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
2021	CARBARYL	531.1	Y	MRL	1 UG/L			
2022	METHOMYL	531.1	Y	MRL	1 UG/L			
2024	METHIOCARB	531.1	Y	MRL	1 UG/L			
2036	OXAMYL	531.1	Y	MRL	1 UG/L		01-01-2023	12-31-2025
2043	ALDICARB SULFOXIDE	531.1	Y	MRL	1 UG/L			
2044	ALDICARB SULFONE	531.1	Y	MRL	1 UG/L			
2046	CARBOFURAN	531.1	Y	MRL	1 UG/L		01-01-2023	12-31-2025
2047	ALDICARB	531.1	Y	MRL	1 UG/L			
2066	3-HYDROXYCARBOFURAN	531.1	Y	MRL	1 UG/L			

Total Number of Records Displayed = 9

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000208	**Federal Type :**	C
Water System Name :	ENNIS TOWN OF	**State Type :**	C
Principal County Served :	MADISON	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	H22120136-001A	**Collection Date :**	12-06-2022

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
1038	NITRATE-NITRITE	353.2	N	MRL	.02 MG/L	1.44 MG/L	01-01-2022	12-31-2022

Total Number of Records Displayed = 1

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000208	**Federal Type :**	C
Water System Name :	ENNIS TOWN OF	**State Type :**	C
Principal County Served :	MADISON	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	H22120136-002A	**Collection Date :**	12-06-2022

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
1038	NITRATE-NITRITE	353.2	N	MRL	.01 MG/L	0.58 MG/L	01-01-2022	12-31-2022

Total Number of Records Displayed = 1

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000208	**Federal Type :**	C
Water System Name :	ENNIS TOWN OF	**State Type :**	C
Principal County Served :	MADISON	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	2211286-01	**Collection Date :**	11-07-2022

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
1032	MANGANESE	200.8	Y	MRL	.005 MG/L	0.0 MG/L	01-01-2022	12-31-2022

Total Number of Records Displayed = 1

Drinking Water Branch

Chem/Rad Sample Results

Return Links

Chem/Rad Samples

Water System Detail

Water Systems

Water System Search

County Map

Glossary

Water System No. :	MT0000208	**Federal Type :**	C
Water System Name :	ENNIS TOWN OF	**State Type :**	C
Principal County Served :	MADISON	**Primary Source :**	GW
Status :	A	**Activity Date :**	02-14-2000
Lab Sample No. :	2211286-02	**Collection Date :**	11-07-2022

This list displays sample/results of all non-microbial analytes (TSAANLYT.TYPE_CODE <> MOR) associated to the selected sample. Results for Microbial Analytes are not included.

Analyte Code	Analyte Name	Method Code	Less than Indicator	Level Type	Reporting Level	Concentration level	Monitoring Period Begin Date	Monitoring Period End Date
1032	MANGANESE	200.8	Y	MRL	.005 MG/L	0.0 MG/L	01-01-2022	12-31-2022

Total Number of Records Displayed = 1

APPENDIX K

Preliminary Hydrogeologic Evaluations

TECHNICAL MEMORANDUM

Ennis Municipal Water Supply Hydrogeologic Report and Exploration Recommendations

PREPARED FOR:	Town of Ennis
PREPARED BY:	Bruce Lauerman RG, CHG
REVIEWED BY:	
DATE:	October 21, 2021
PROJECT NUMBER:	1-18184 TO 5

This technical memorandum (TM) presents the findings of a recent literature and data review regarding the existing Town of Ennis municipal water supply wells, a brief field visit and previous efforts to explore for a redundant water supply. Proposed options for next steps are presented along with exploration recommendations.

Background

The Town of Ennis (Town) is located in southwest Montana along the west bank of the Madison River in Madison County. Figure 1 is a Location Map (USGS Ennis 7.5-Minute Quadrangle).

As identified in a GWE Technical Memorandum dated April 27, 2021, Ennis' existing water supply is sourced from two groundwater wells. Production Wells #2 and #3 were constructed in 1979 and 2014 respectively. Well #2 is located at the intersection of Armitage Street and Comely Way. This well produces 350 gpm, which is the maximum flow rate allowed by water right. Well #3 was constructed near the intersection First Street and Grizzly Street to replace Well #1, which had reached the end of its useful life and was subsequently abandoned. Well #3 was demonstrated to produce 350 gpm, which allows the Town to utilize the well at 235 gpm per DEQ standards. However, the water right for this well limits the withdrawals to 200 gpm.

Montana Department of Environmental Quality Circular DEQ-1 has been adopted by the Montana Water Quality Division as its standard for Community Water Systems. DEQ-1, Section 3.2.1.2 states: "A minimum of two sources of groundwater must be provided." The Town currently meets this standard.

Based on the DEQ-1, Section 3.2.1.1: "The total developed groundwater source capacity for systems utilizing gravity storage or pumped storage, unless otherwise specified by MDEQ, must equal or exceed the design maximum day demand with the largest producing well out of service."

Ennis' current maximum day demand, as discussed in the prior TM, is 266 gpm. With both wells in operation, a maximum flow rate of 550 gpm is available. However, with the largest-producing well (Well #2) out of service, the system would produce 200 gpm and could not meet the current maximum day demand of 266 gpm).

When locating a redundant groundwater supply source for the Town several factors need to be considered including, hydrogeology, source protection, proximity to the Town's existing water infrastructure, planned and expected growth and the price and availability of real estate. In 2011 and

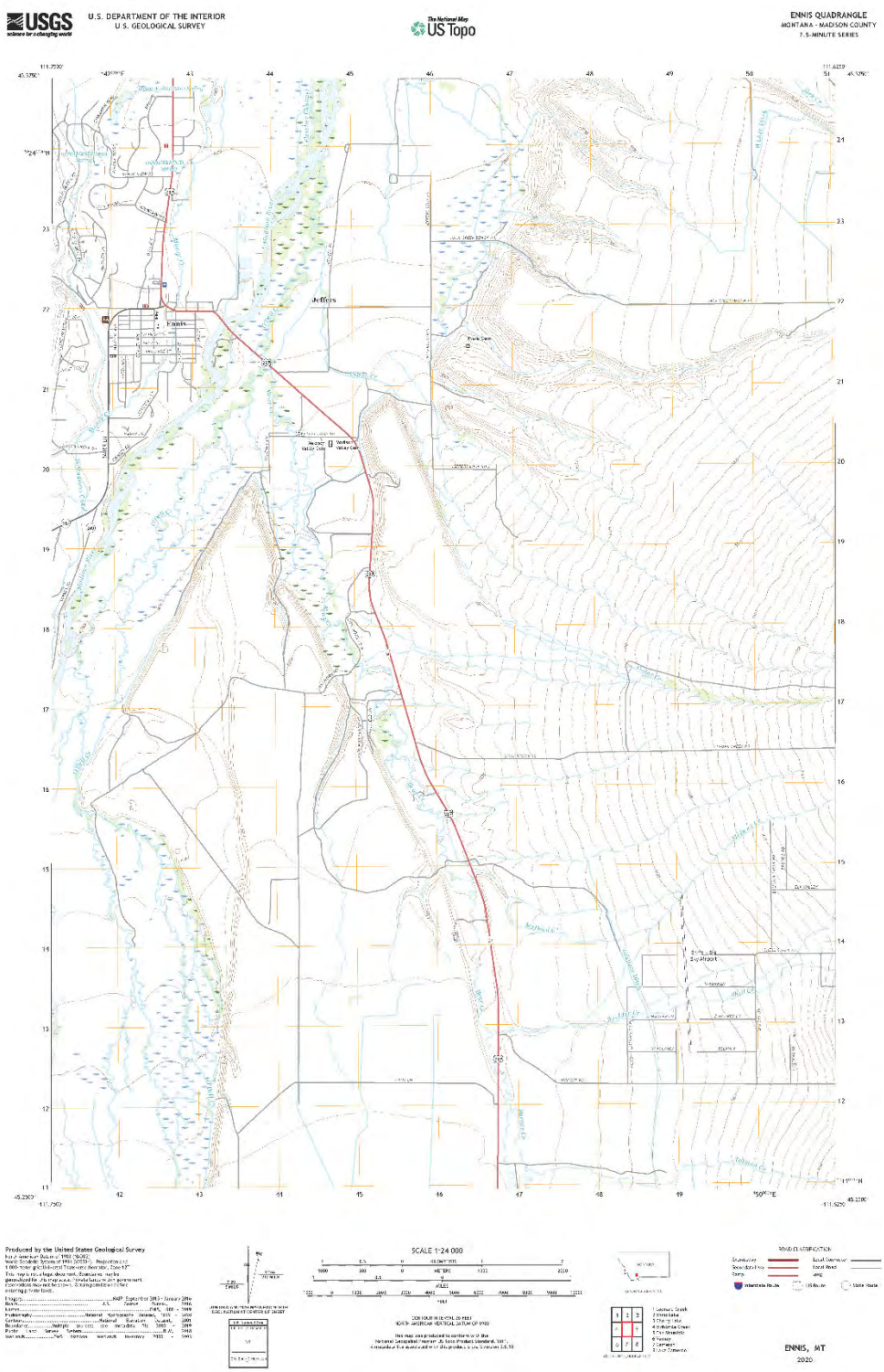


Figure 1 – Location Map

2012, the Town attempted to develop a redundant supply well on land purchased south of the Rodeo Grounds, but the results were considered unsuccessful at the time.

The purpose of this Technical Memorandum is to present findings of GWE's previous and current research, identify potential options for consideration and make recommendations for exploration of a redundant water supply for the Town of Ennis.

Geologic Setting

The Town of Ennis is located within the Madison River Valley at an elevation of approximately 4,950 feet above mean sea level (amsl). The Valley is bounded to the west by the Tobbacco Root Mountains and the Gravelly Range to the west and south, and by the Madison Range to the east. These complex mountain ranges extend upwards of 11,000 feet amsl. The Madison River flows north through the valley.

Figure 2 is a geologic map of the Madison Valley near Ennis (MBMG Open File 543, 2007). In the area of Ennis, the valley sediments are comprised primarily of Quaternary alluvial and fluvial deposits nearer the Madison River (Qalo and Qal) and Quaternary alluvial terraces or benches (Qat) westwards towards Quaternary and older Tertiary basin-fill (QTbf) foothills bounded and underlain by undifferentiated metamorphics (Amt). The massive Cedar Creek Alluvial Fan (Qalf and Qtbf) lies across the Madison River to the east of Ennis.

The Town of Ennis is characterized by two distinct topographic zones: the lower elevation portion of town, along the Madison River (Qalo), and a bench (Qat) elevated 15-20 feet including generally the west-northwest and south portion of Town.

The valley alluvial deposits are generally unconsolidated, variably-stratified and well-graded sands and gravels with significant interbedded clays. These complex alluvial deposits are reported to extend hundreds of feet beneath the valley floor.

Hydrogeology

Ennis averages 13.4 inches of precipitation annually (Western Regional Climate Center, 2021). Agricultural land in the valley bottom along the river is heavily irrigated, and large pivot and ditch irrigation occurs on relatively dry alluvial terraces and fans in the area. In addition to the Madison River, prominent surface water features in the study area include Moore Creek, the West Madison Canal (aka Spring Creek Ditch) and ponds and irrigation associated with the Madison Meadows Golf Course. Basin-fill groundwater is recharged in the valley by the Madison River and its tributaries, leakage from irrigation ditches, irrigation and precipitation.

Well Log Query Results

The Montana Bureau of Mines & Geology (MBMG) maintains the Groundwater Information Center (GWIC) database of hydrogeologic information in Montana. GWIC includes well completion logs for many (but not all) water wells. Information on the logs may include lithologies and water encountered during drilling, well construction, completion and hydraulic testing data. While these logs vary considerably in detail and completeness of recorded information making detailed hydrogeologic correlations difficult, with careful consideration useful information can be inferred from the data recorded.

The GWIC database was queried for all currently listed wells within four (4) Sections in and around Ennis (T6S R1W Sections 4 and 5; T5S R1W Sections 32 and 33). Pertinent well logs are included as Appendix A. Some observations regarding the data set can be made from the information reported in the well logs:

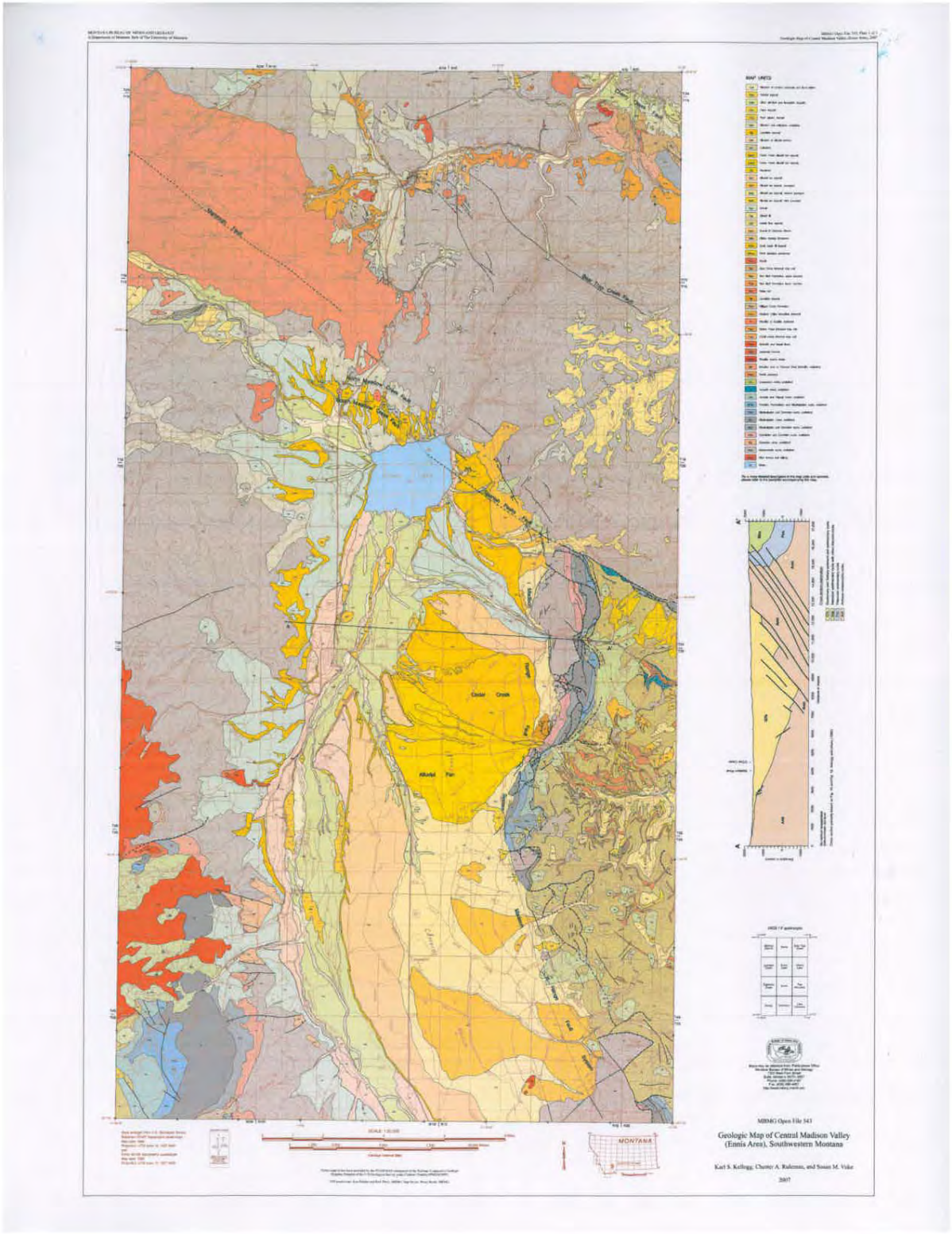


Figure 2 - Geologic Map

- 228 water wells (excluding monitoring wells and a few wells with insufficient logs) were included in the query results.
- Water wells are completed primarily in alluvial water bearing zones, and to a depth of less than 200 feet.
- 76% of the searched wells are reported to produce less than 50 gpm; only 2% of the wells produce greater than 150 gpm
- Wells drilled to a depth of greater than 250 feet reported an average well yield of 32 gpm. There is no positive correlation between increased well depths (beyond 200 feet) and greater well yield.
- Only 4 wells identified in the search reported credible well yields in excess of 150 gpm:
  - Town of Ennis Well #2 and Well #3
  - Two (2) Valley Garden Golf Village (VGGV) wells

The locations of these four higher yield wells and other wells of interest are shown on Figure 3 and the well logs are included in Appendix A.

Interpretation

The well logs indicate over 75% of wells in the area produce less than 50 gpm. This statistic may be skewed due to domestic wells being drilled only to a depth that provides necessary water for household or agricultural use. However, 36% of wells yielding less than 50 gpm are drilled to a depth of greater than 100 feet; and 76% of those deeper wells are greater than 200 feet in depth.

Most of these deep, low yield wells are located west of Town in Section 5, which begins to transition into bedrock at depth. Poor yield, deep wells also occur north of town in the southeast quarter of Section 32 and to a lesser extent the northwest quarter of Section 33. These northern locations are notable in that they are also within a half mile of the high-capacity VGGV wells and in proximity to other relatively good producing wells.

Of the water wells producing at least 100 gpm, 15 of 17 wells are drilled to a depth of greater than 100 feet. The two exceptions include a Rodeo Grounds well reported to produce 100 gpm from a depth of 58 feet, (this result was estimated from an air-lift test, not a pumping test) and a domestic just north of Ennis along Moore Creek (72 feet deep/100 gpm).

Wells reported to produce greater than 150 gpm are completed to depths ranging from 140 to 200 feet and screened at various depths and elevations. Lateral marker beds and common, prominent water-bearing units are not evident when comparing the well logs

Note the VGGV wells are in proximity to one another but discretely screened in intervals with approximately 20 feet difference in elevation. The Town of Ennis Well #2 and Well #3 are located approximately 1,600 feet apart but encountered notably different sediment sequences and are also completed at different screened elevations.

Discussion

It is clear from the research that there is no regional aquifer to target. The alluvial terraces or benches in and around Ennis may be considered an aquifer, but the hydrogeologic framework created from complex depositional environments can be characterized by discontinuous water-bearing sediments of varying depth, thickness, lateral occurrence and productivity. Siting high-capacity wells in such hydrogeologic terrains is challenging.

As shown on Figure 3, the Town of Ennis owns two of the four high-capacity wells identified in the study area (Ennis Well #2 and Ennis Well #3). The other two most productive wells are public water supply wells owned by the Valley Garden Golf Village (identified on the figure as VGGV wells). All these wells are located on the bench with the exception of Ennis Well #3 which is near the lateral edge of the bench and nearest the Madison River.

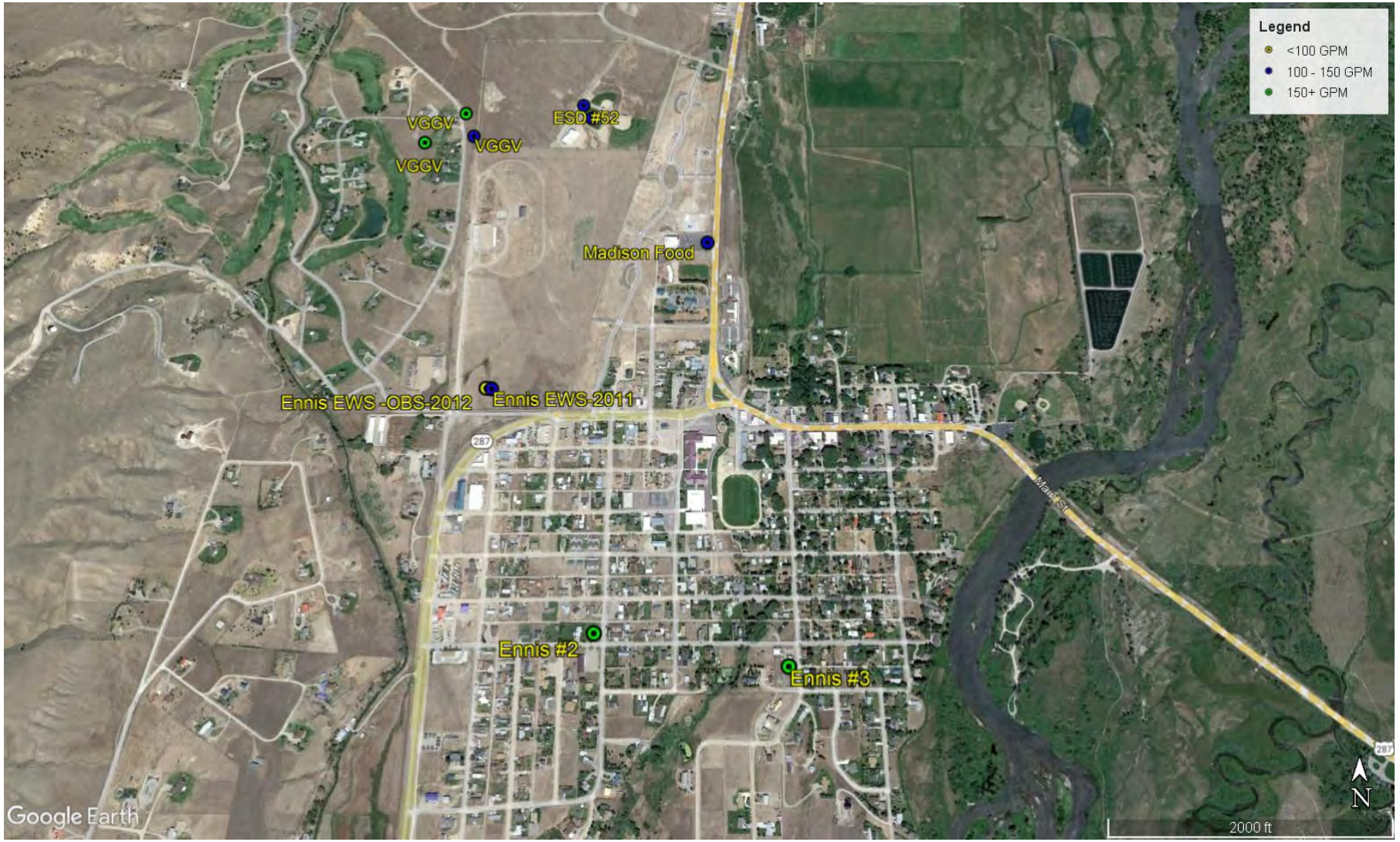


Figure 3 - Wells of Interest

Also shown on the map are two exploration wells drilled by the Town in 2011 and 2012 on bench land immediately south of the Rodeo Grounds property (EWS-2011 and EWS OBS-2012, respectively). These wells have at times been referred to as the Rodeo Grounds wells but are in fact on Town land purchased from the Rodeo Grounds for exploration purposes. These wells are not associated with wells owned by the Ennis Rodeo Association.

Figure 3 also identifies other wells of interest in the vicinity of the Rodeo Grounds as discussed below under Option 6.

Figure 4 identifies seven (7) areas of potential exploration for a redundant well based on a number of criteria including:

- The occurrence of the four high-capacity wells
- Hydrogeologic and groundwater production Information from the GWIC query
- 2011/2012 exploration wells near the Rodeo Grounds
- Proximity of infrastructure and potential growth to the north of Town

A discussion of each of the proposed exploration areas, is provided here. The options are numerical, from south to north and do not represent rankings.

Option 1 Southeast Bench

This location is an open, largely undeveloped bench at the south end of 2nd Street. In the southern half of Section 4, the GWIC search identified six (6) wells drilled to depths of 80 to 185 feet reported to produce between 50 and 100 gpm, and two (2) wells reported to produce 120-125 gpm. In addition, the database lists four (4) wells in "Section 4" only which are reported to yield 50 gpm from depths of less than 50 feet. These latter wells are not known to be located in the southern half of Section 4, however.

The site lies between the Madison River and Moore Creek, potential sources of recharge to aquifers. A test well would need to be set back appropriately from these streams, and further research would be needed to evaluate potential hydrologic connections to surface water. Still, a deeper well drilled in this area could perhaps be proven to not impact surface water.

This area would appear to be attractive for residential development and land prices or wellhead protection measures could be prohibitive. This location may be advantageous with respect to the current Town's water distribution system.

Option 2 Vicinity of Ennis Well #3

The area of Ennis east of the bench is known from former Ennis Well #1 and current Ennis Well #3 to yield in excess of 300 gpm. In addition, one well is reported in this quarter Section to produce 120 gpm from a depth of 45 feet and two (2) shallow wells producing 50 gpm.

This area is clearly within the Town's current distribution system. However, there are concerns with siting a new well in a residential area and it is understood that the Town may prefer a location other than this in order to provide for effective redundancy in the future. River impacts apply may apply here as at Option 1. Real estate pricing may also be a consideration for this area.

Option 3 West Ennis Bench

This is the general location of Ennis Well #2 and includes much of west Ennis. In addition to Ennis Well #2, the database lists eight (8) wells in the northwest quarter of Section 4 which produce between 50 and 100 gpm from wells completed to depths ranging from 33 to 125 feet. The School District #52 irrigation well is reported to produce 90 gpm from a depth of 262 feet. However, this well was drilled in 1953, the well log is not very complete and mentions the casing is "…perforated, at various levels."

The reported completion of the School District #52 irrigation well raises an important issue which also may apply to Ennis Well #2 which is constructed with four (4) slotted intervals (75-85 ft; 97-105 ft; 112-

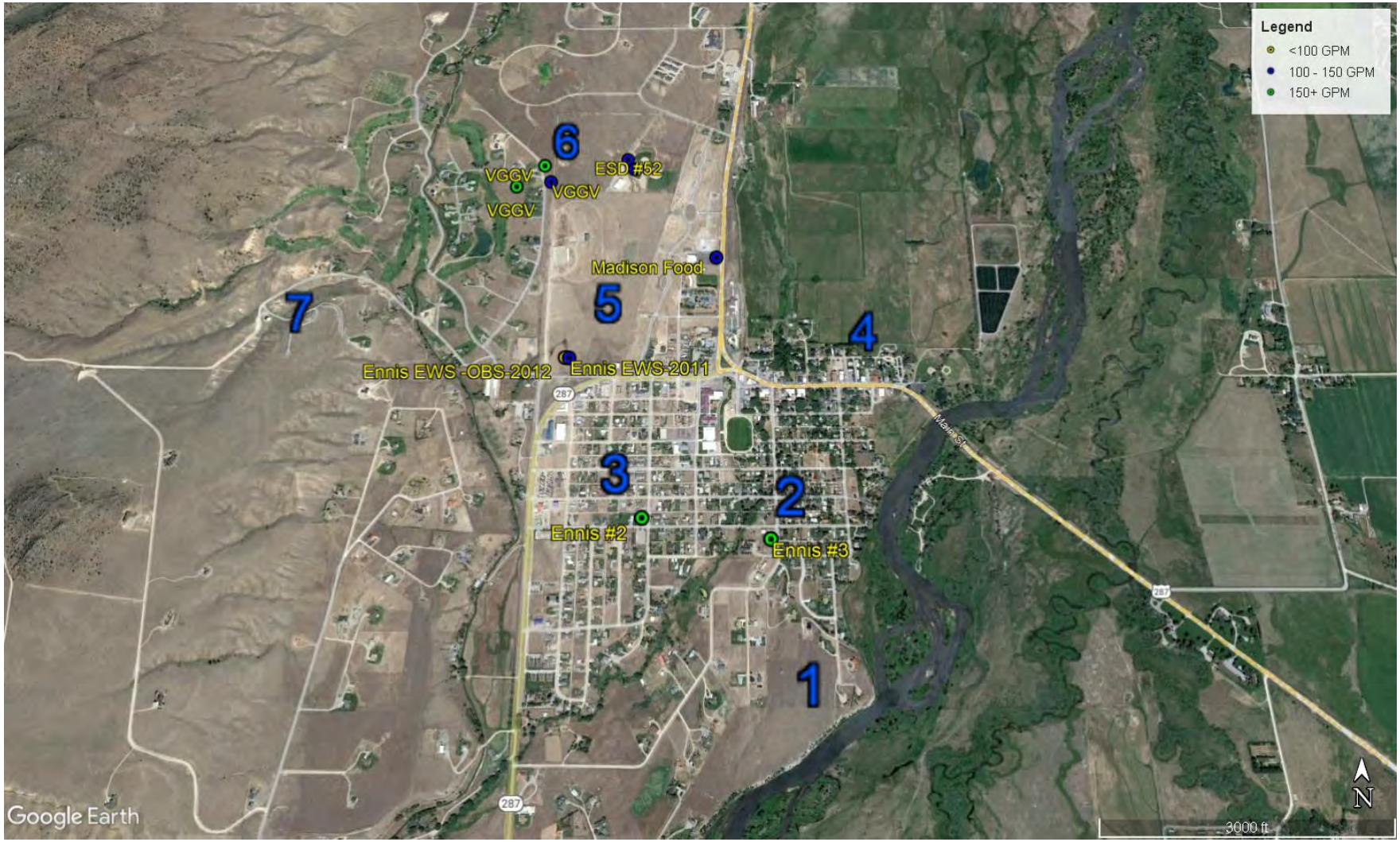


Figure 4 - Exploration Options

120 ft and 130-140 ft). The pumping test information would indicate that pumping of this well at 400 gpm dewatered the upper two slotted intervals. The well is reported to currently operated at 350 gpm and it is unclear what the corresponding pumping water levels are. However, dewatering slotted or screened zones is problematic for a number of reasons, and this scenario could not be duplicated in permitting a new well. It may be that Ennis Well #2 produces much water from the deeper slotted intervals and a well could be constructed to depth and not screened at shallower depths. These issues would need to be evaluated prior to proceeding with exploration based on the Ennis #2 yield.

This location may have the real estate pricing issues similar to Options 1 and 2. Another consideration is west Ennis, especially along Hwy 287, is light industrial and may pose a greater risk of groundwater contamination.

Option 4 Immediately North of Downtown Ennis
This is low-lying agricultural land in the southeast quarter of Section 33. There is little information in the GWIC regarding water well production in this area, but it is off the bench and in closer proximity to the Madison River. It would appear to be favorable with respect to infrastructure, and perhaps for future growth. However, the area is also in close proximity to the commercial sector of Ennis and there is known legacy groundwater contamination from leaking underground fuel storage tanks (LUSTs) which would need to be fully understood before proceeding with exploration in this area.

Option 5 South of the Rodeo Grounds
This location is bench land north of Hwy 287 and south of the Rodeo Grounds and includes the existing EWS-2011 and EWS OBS-2012 test wells constructed on a two-acre Town of Ennis parcel. This is the southwest quadrant of Section 33.

The GWIC data base does report a 100 gpm well completed to a depth of 72 feet, and a 150 gpm well drilled to 118 feet Madison Foods). The actual Rodeo Grounds is located in this quadrant and the Ennis Rodeo Association reportedly owns two (2) wells; one producing 30 gpm from a depth of 85 feet and another producing 100 gpm from a depth of 58 feet. The latter well demonstrates the need to verify actual well locations as it is listed in GWIC as being the northwest corner of the northwest quadrant of Section 33, about ½ mile from the actual Rodeo Grounds.

Test well EWS-2011 was drilled in August 2011 and screened at a depth of 200-220 feet. Initial testing indicated the well might produce 100 gpm. Because several water bearing zones were bypassed during the drilling of the test well, it was decided to drill a shallower observation well (EWS OBS-2012) and observe the degree of hydraulic connection between the wells in order to evaluate a potential multiple well scenario on the property. Recall the discussion at the Option 3 site with the constraints of constructing and permitting a single well with multiple screened intervals.

The observation well was completed 45 feet west of EWS-2011 and screened at a depth of 58-78 feet. In July 2012 pumping test was performed which reportedly demonstrated no response in the observation well from pumping of the test well at rates of up to 50 gpm (maximum pumping rate during the test).

This abbreviated aquifer testing was encouraging in that it suggests the possibility a “well field” could be explored at this site; two or more wells completed at different depths to produce an acceptable quantity of water. More work would be needed to thoroughly investigate this approach, including concentrated redevelopment of the two wells and the performance of more rigorous aquifer tests.

This area appears reasonably located with respect to the Town’s water infrastructure and is relatively undeveloped. There may be an opportunity to purchase additional property adjacent to the Town’s existing two-acre parcel if needed for an expanded well field.

Option 6 Rodeo Grounds North
This area is on the bench in the northeast quadrant of Section 32. In addition to the two high-capacity VGGV wells identified above, GWIC lists four (4) wells reported to produce over 100 or more : VGGV well (121 feet deep/140 gpm); two Ennis School District #52 wells at the Bus Barns (125 feet deep/120 gpm; 205 feet deep/100gpm) and Madison Food well (118 feet deep/150 gpm).

Another five (5) wells in the area are completed to depths ranging from 56 to 200 feet which produce 50-60 gpm. While these 50 gpm wells did not encounter the prolific water zones the Town seeks, it does suggest the occurrence of relatively transmissive alluvial deposits and may be an area of interest for exploration.

The high-capacity VGGV wells appear to be an anomaly in the area. The exact location of the wells located in the northeast quadrant of Section 32 has not been field verified, but the wells are known to be in relatively close proximity to the West Madison Canal. The canal is likely a significant source of recharge to the subsurface. Irrigation of the Madison Meadows Golf Course is another potential recharge mechanism locally.

This location is further removed from the Town's existing water distribution and may pose similar real estate cost considerations as some of the other proposed locations. However, the location may become more attractive as development growth extends northward.

Option 7 Ennis Water Storage Tank
The Ennis water storage tank is located in the southwest quadrant of Section 32, on Centennial Drive and about ¼ mile southwest of the southern extent of the Madison Meadows Golf Course. The tank sits at an elevation of approximately 5,135 feet amsl.

The GWIC database identifies only one well in this quadrant; a reported 285-foot deep well that yields 15 gpm. Near the tank, the adjoining southwest corner of the southeast quadrant of Section 32 GWIC lists six (6) wells with yields reported to range from 5-30 gpm. Half of the wells are drilled to depths ranging from 340 to 600 feet. The low-capacity wells listed in these areas encountered a veneer of relatively clay-rich sediments overlying occasional fine-grained sedimentary rocks and terminated in granite.

This location is proximal to the Town's water infrastructure but is not a target environment for high-capacity wells.

Recommendations

- The locations of certain wells identified in the GWIC search should be field verified to validate some assumptions made about the proposed locations, namely Option 6.
- The static and operating pumping water level in Ennis Well #2 should be verified.
- GWE recommends a practical approach is to revisit the Ennis test well and observation well site south of the Rodeo Grounds. These wells are existing Town of Ennis assets. Concentrated well redevelopment/rehabilitation and detailed aquifer testing and analyses may provide a viable option for a wellfield approach on Town property in proximity to water distribution infrastructure.
- Options 1 and 6 offer the next best water production opportunities.
- Options 2 and 3 are less optimal from a redundancy perspective.
- Options 4 has inherent water quality risks to be considered.
- Option 7 is a low probability location for water production.

Appendix 1
Well Logs

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View scanned well log (5/15/2008 1:45:37 PM)

Site Name: CITY OF ENNIS
GWIC Id: 108663
DNRC Water Right: 21774

Section 1: Well Owner(s)
1) CITY OF ENNIS (MAIL)
N/A
ENNIS MT 59729 [09/16/1979]

Section 2: Location

Township	Range	Section	Quarter Sections
06S	01W	4	SW¼ SW¼ SE¼ NW¼

County MADISON **Geocode**

Latitude	Longitude	Geomethod	Datum
45.342369	-111.735222	TRS-SEC	NAD83

Ground Surface Altitude **Ground Surface Method** **Datum Date**

Addition **Block** **Lot**

Section 3: Proposed Use of Water
PUBLIC WATER SUPPLY (1)

Section 4: Type of Work
Drilling Method: CABLE TOOL
Status: NEW WELL

Section 5: Well Completion Date
Date well completed: Monday, July 16, 1979

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	142	12

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
0	142	12				54 LB STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
75	85	12			5/8 X 3 SLOTS
97	105	12			5/8 X 3 SLOTS
112	120	12			5/8 X 3 SLOTS
130	140	12			5/8 X 3 SLOTS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	30	CEMENT	

Section 7: Well Test Data

Total Depth: 142
Static Water Level: 28
Water Temperature:

Pump Test *

Depth pump set for test _ feet.
400 gpm pump rate with _ feet of drawdown after 10.5 hours of pumping.
Time of recovery _ hours.
Recovery water level _ feet.
Pumping water level 105 feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log
Geologic Source
120SDMS - SEDIMENTS (TERTIARY)

From	To	Description
0	20	BOULDERS
20	35	SMALL BOULDERS SOME WATER
35	75	SANDY CLAY
75	85	COARSE SAND SOME WATER
85	95	SANDY CLAY
95	105	SAND SMALL GRAVEL SOME WATER
105	112	SANDY CLAY
112	122	COARSE SAND GRAVEL & WATER
122	130	COARSE SAND AND CLAY
130	142	COARSE SAND PEA GRAVEL & WATER

Driller Certification
All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:
Company: AQUA
License No: WWC-281
Date Completed: 7/16/1979

MONTANA WELL LOG REPORT

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Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View scanned well log (3/27/2017 1:31:17 PM)

Site Name: TOWN OF ENNIS
GWIC Id: 277857

Section 1: Well Owner(s)
1) TOWN OF ENNIS (MAIL)
328 W MAIN STREET
ENNIS MT 59729 [04/04/2014]

Section 2: Location

Township	Range	Section	Quarter Sections
06S	01W	4	SW¼ SW¼ NE¼

County MADISON

Geocode

Latitude	Longitude	Geomethod	Datum
45.343394	-111.730308	MAP	NAD27

Ground Surface Altitude **Ground Surface Method** **Datum Date**

Addition **Block** **Lot**

Section 3: Proposed Use of Water
PUBLIC WATER SUPPLY (1)

Section 4: Type of Work
Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date
Date well completed: Friday, April 4, 2014

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	40	14
40	150	10

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	130	10	0.375		WELDED	A53B STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
130	150	7.5		.070	SCREEN-CONTINUOUS-STAINLESS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	40	SMOOTH GROUT	Y

Section 7: Well Test Data

Total Depth: 150
Static Water Level: 57
Water Temperature:

Air Test *

200 gpm with drill stem set at 140 feet for 12 hours.
Time of recovery 0.17 hours.
Recovery water level 57 feet.
Pumping water level _ feet.

Pump Test *

Depth pump set for test 128 feet.
350 gpm pump rate with 79 feet of drawdown after 24 hours of pumping.
Time of recovery 3 hours.
Recovery water level 57 feet.
Pumping water level _ feet.

* *During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

Geologic Source
Unassigned

From	To	Description
0	25	BOULDERS
25	65	SILT AND CLAY-BROWN AND YELLOW
65	105	SMALL GRAVELS
105	110	SILT-BROWN
110	120	GRAVELS
120	139	SILT-BROWN/YELLOW
139	150	GRAVELS

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards.

This report is true to the best of my knowledge.

Name:	MIKE DOWNEY
Company:	OKEEFE DRILLING CO
License No:	WWD-90
Date Completed:	4/4/2014

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps

Site Name: CITY OF ENNIS * TW-01
GWIC Id: 262627

Section 1: Well Owner(s)
1) CITY OF ENNIS (MAIL)
P.O. BOX 147
ENNS MT 59729 [08/11/2011]

Section 2: Location

Township	Range	Section	Quarter Sections
05S	01W	33	SE¼ SW¼ SW¼ SW¼

County
MADISON

Geocode

Latitude	Longitude	Geomethod	Datum
45.3496	-111.73958	NAV-GPS	NAD83

Ground Surface Altitude **Ground Surface Method** **Datum Date**

Addition **Block** **Lot**

Section 3: Proposed Use of Water
PUBLIC WATER SUPPLY (1)

Section 4: Type of Work
Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date
Date well completed: Thursday, August 11, 2011

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	30	16
30	220	12

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-3	200.3	12	0.375		WELDED	A53B STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
199.3	220	11.5		0.100 IN	SCREEN-CONTINUOUS-STAINLESS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	30	BENTONITE GROUT	

Section 7: Well Test Data

Total Depth: 220
Static Water Level: 26.23
Water Temperature:

Pump Test *

Depth pump set for test 190 feet.
109 gpm pump rate with 144.42 feet of drawdown after 2 hours of pumping.
Time of recovery 0.75 hours.
Recovery water level 35.65 feet.
Pumping water level _ feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks
WELL ID: TW1

Section 9: Well Log
Geologic Source
100UDFD - CENOZOIC UNDIFFERENTIATED

From	To	Description
0	24	PREDOMINATELY POORLY SORTED COARSE SAND & SMALL GRAVEL W/ COBBLES: CLAST OF MIXED LITHOLOGY; BECOMING FINER W/ DEPTH.
24	43	FINE TO MEDIUM GRAINED SAND W/ AMPLE SILT & CLAY, SOME COARSE SAND; PREDOMINATELY SAND IN SILT & CLAY MATRIX
43	45	POORLY SORTED MEDIUM SAND TO MEDIUM GRAVEL
45	50	SILT TO MEDIUM SAND; TAN TO BROWN, AMPLE FINE MAFIC GRAINS
50	61	SILT & CLAY INTERBEDDED W/ FINE SAND; CLAY IS RUSTY BROWN; BECOMING FINER W/ DEPTH
61	75	COARSE SAND, GRAVEL & COBBLES: PRODUCING WATER
75	81	COARSE SAND, GRAVEL & COBBLES, AS ABOVE, BUT W/ INCREASING FINE COMPONENT; POSSIBLY INTERBEDDED W/ SILT & CLAY BEDS; 61-81 PRODUCING AS MUCH AS 100 GPM ON AIR LIFT
81	105	PREDOMINATELY POORLY SORTED COARSE SAND & SMALL GRAVEL W/ COBBLES; CLASTS OF MIXED LITHOLOGY; BECOMING FINER W/ DEPTH
105	138	POORLY SORTED SILT TO GRAVEL DOMINATED BY COARSE SAND & SMALL GRAVEL; AMPLE CUTTINGS OF FINE TO MEDIUM SAND IN SILT-CLAY MATRIX & SOME MOD. WELL-INDURATED SANDSTONE; APPEARS TO BE INTERBEDDED SANDY CLAY, SANDSTONE & UNCONSOLIDATED

		SAND & GRAVEL. 10-20 GPM
138	147	VERY FINE TO COARSE SAND W/ LITTLE SILT OR CLAY; SAND IS TIGHT & NOT PRODUCING MUCH WATER; SOME COARSE GRAVEL & SMALL COBBLES; HOLE CAN BE DRILLED OPEN AHEAD OF CASING
147	158	FINE TO MEDIUM SAND IN SILT/CLAY MATRIX; TAN TO BROWN; FINE FRACTION INCREASING W/ DEPTH
158	161	POORLY SORTED FINE SAND TO SMALL GRAVEL; SOME CLAY BOUND MATERIAL; APPEARS TO BE COARSE SAND & SMALL GRAVEL INTERBEDDED W/ SANDY TIGHT CLAY. 30-50 GPM ON AIR LIFT.
161	171	SANDY TIGHT CLAY; POORLY SORTED CLAY TO SMALL GRAVEL; SOME LITHIFIED SANDSTONE, INCREASING IN FREQUENCY W/ DEPTH. NO WATER
171	175	POORLY SORTED SAND & GRAVEL; MED. TO COARSE SAND W/ SMALL GRAVEL; A FEW SCATTERED BEDS OF CLAYBOUND SAND. 30-40 GPM ON AIR LIFT.
175	182	CLAYBOUND SAND & SMALL GRAVEL; FINE TO COARSE SAND IN DENSE TAN-BROWN SILTY CLAY. NO WATER

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:	DAVE POTTS
Company:	POTTS DRILLING INC
License No:	WWC-512
Date Completed:	8/11/2011

Site Name: CITY OF ENNIS
GWIC Id: 262627
Additional Lithology Records

From	To	Description
183	188	COARSE SAND TO SMALL GRAVEL W/ A FEW THIN SANDSTONE BEDS; WATER PRODUCTION INCREASES W/ DEPTH. 30-40 GPM ON AIR LIFT.
188	194	CLAYBOUND SAND & SMALL GRAVEL; VERY LITTLE WATER
194	207	COARSE SAND & SMALL GRAVEL; SANDSTONE @ ABOUT 203-204. PRODUCING GOOOD WATER W/ SOME MINOR LOSS IN SANDSTONE ZONE. PRODUCING @ LEAST 50 GPM.
207	211	VARIABLY LITHIFIED SANDSTONE; GREYISH BROWN, GENERALLY FINE TO MEDIUM GRAINED; VERY LITTLE WATER PRODUCTION
211	220	COARSE SAND TO GRAVEL W/ A FEW COBBLES & THIN SANDSTONE BEDS; HOLE TD @ 221 (BIT ONLY) IN SANDSTONE; HOLE STAYING OPEN. PRODUCES @ LEAST 50 GPM.

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps

Site Name: CITY OF ENNIS
GWIC Id: 267753

Section 1: Well Owner(s)

1) CITY OF ENNIS (MAIL)
P.O. BOX 147
ENNIS MT 59729 [06/06/2012]

Section 2: Location

Township	Range	Section	Quarter Sections
05S	01W	33	SE¼ SW¼ SW¼ SW¼

County
MADISON

Geocode

Latitude	Longitude	Geomethod	Datum
45.3496	-111.73978	NAV-GPS	NAD83

Ground Surface Altitude	Ground Surface Method	Datum Date

Addition **Block** **Lot**

Section 3: Proposed Use of Water

MONITORING (1)

Section 4: Type of Work

Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Wednesday, June 6, 2012

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	78	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	65.8	6	0.25		WELDED	A53B STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
58	78	4.5			FACTORY SLOTTED

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	25	BENTONITE GRANULES	Y

Section 7: Well Test Data

Total Depth: 78
Static Water Level: 22
Water Temperature:

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

Geologic Source
Unassigned

From	To	Description
0	23	SAND TO MEDIUM COBBLES
23	27	SAND, TO MEDIUM GRAVEL
27	40	SAND, FINE TO MEDIUM, MIXED SMALL GRAVEL
40	48	SAND, COURSE TO MEDIUM GRAVEL
48	61	CLAY, SILTY TO SANDY
61	78	SAND, COURSE TO LARGE GRAVEL

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name: DAVE POTTS
Company: POTTS DRILLING INC
License No: MWC-185
Date Completed: 6/6/2012

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View hydrograph for this site
View field visits for this site
View scanned well log (5/7/2008 8:32:27 AM)

Site Name: MADISON FOOD
GWIC Id: 165282

Section 1: Well Owner(s)
1) MADISON FOOD (MAIL)
PO BOX 708
ENNIS MT 59729 [07/03/1997]

Section 2: Location

Township	Range	Section	Quarter Sections
05S	01W	33	NW¼ SE¼ NE¼ SW¼

County
MADISON

Geocode

Latitude	Longitude	Geomethod	Datum
45.35368	-111.73283	NAV-GPS	NAD83

Ground Surface Altitude	Ground Surface Method	Datum	Date
4950	MAP	NGVD29	7/20/2011

Measuring Point Altitude	MP Method	Datum	Date Applies
4952.3	MAP	NGVD29	7/20/2011 2:31:00 PM

Addition **Block** **Lot**

Section 3: Proposed Use of Water
DOMESTIC (1)

Section 4: Type of Work
Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date
Date well completed: Thursday, July 3, 1997

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	20	10
20	120	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	118	6	0.250		WELDED	STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
118	120	6			OPEN BOTTOM

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	20	BENTONITE	

Section 7: Well Test Data

Total Depth: 118
Static Water Level: 39
Water Temperature:

Air Test *

150 gpm with drill stem set at _ feet for 2 hours.
Time of recovery _ hours.
Recovery water level _ feet.
Pumping water level _ feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log
Geologic Source
112SNGR - SAND AND GRAVEL (PLEISTOCENE)

From	To	Description
0	35	RIVER BOULDERS & GRAVEL
35	91	LIGHT BROWN CLAY
91	120	SAND & GRAVEL

Driller Certification
All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:
Company: MADISON DRILLING & PUMP SUPPLY
License No: WWC-557
Date Completed: 7/3/1997

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps

Site Name: ENNIS SCHOOL DISTRICT #52
GWIC Id: 220829

Section 1: Well Owner(s)

1) ENNIS SCHOOL DISTRICT #52, ENNIS SCHOOL DISTRICT #52 (MAIL)
P.O. BOX 517
ENNIS MT 59729 [06/17/2005]

Section 2: Location

Township	Range	Section	Quarter Sections
05S	01W	33	SE¼ SW¼ NW¼

County MADISON

Geocode

Latitude	Longitude	Geomethod	Datum
45.3566	-111.7361	NAV-GPS	NAD27

Ground Surface Altitude **Ground Surface Method** **Datum** **Date**

Addition **Block** **Lot**
MCMULLIN #1 MINOR

Section 3: Proposed Use of Water

IRRIGATION (1)

Section 4: Type of Work

Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Friday, June 17, 2005

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	205	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	203	6	0.250		WELDED	A53B STEEL

There are no completion records assigned to this well.

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	20	BENTONITE	Y

Section 7: Well Test Data

Total Depth: 205
Static Water Level: 39
Water Temperature:

Air Test *

100 gpm with drill stem set at 205 feet for 2 hours.
Time of recovery 1 hours.
Recovery water level 39 feet.
Pumping water level _ feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

Geologic Source
Unassigned

From	To	Description
0	1	TOPSOIL
1	20	GRAVEL
20	120	SAND
120	205	GRAVEL

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:
Company: MADISON DRILLING & PUMP SUPPLY
License No: WWC-557
Date Completed: 6/17/2005

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps

Site Name: ENNIS SCHOOL DISTRICT #52
GWIC Id: 220828

Section 1: Well Owner(s)

1) ENNIS SCHOOL DISTRICT #52, ENNIS SCHOOL DISTRICT #52 (MAIL)
P.O. BOX 517
ENNIS MT 59729 [06/16/2005]

Section 2: Location

Township	Range	Section	Quarter Sections
05S	01W	33	NE¼ SW¼ NW¼

County
MADISON

Geocode

Latitude	Longitude	Geomethod	Datum
45.3577	-111.7364	NAV-GPS	NAD27

Ground Surface Altitude	Ground Surface Method	Datum	Date

Addition	Block	Lot
MCMULLIN #1 MINOR		

Section 3: Proposed Use of Water

IRRIGATION (1)

Section 4: Type of Work

Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Thursday, June 16, 2005

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	125	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	123	6	0.250		WELDED	A53B STEEL

There are no completion records assigned to this well.

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	20	BENTONITE	Y

Section 7: Well Test Data

Total Depth: 125
Static Water Level: 35
Water Temperature:

Air Test *

120 gpm with drill stem set at 125 feet for 2 hours.
Time of recovery 1 hours.
Recovery water level 35 feet.
Pumping water level _ feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

Geologic Source
Unassigned

From	To	Description
0	1	TOPSOIL
1	50	GRAVEL
50	55	CLAY
55	60	GRAVEL
60	70	CLAY
70	125	GRAVEL

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:
Company: MADISON DRILLING & PUMP SUPPLY
License No: WWC-557
Date Completed: 6/16/2005

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps

Site Name: VALLEY GARDEN GOLF VILLAGE HOME OWNERS ASSOC.
GWIC Id: 230218

Section 1: Well Owner(s)

1) WALCH, DOUG (MAIL)
P.O. BOX 951
ENNIS MT 59729 [08/02/2006]
2) WALCH, DOUG (WELL)
64 TOBACCO RD.
ENNIS MT 59729 [08/02/2006]

Section 2: Location

Township	Range	Section	Quarter Sections
05S	01W	32	SE¼ SE¼ NE¼

County MADISON **Geocode**

Latitude	Longitude	Geomethod	Datum
45.357	-111.7402	NAV-GPS	NAD27

Ground Surface Altitude **Ground Surface Method** **Datum Date**

Addition **Block** **Lot**

Section 3: Proposed Use of Water

PUBLIC WATER SUPPLY (1)

Section 4: Type of Work

Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Wednesday, August 2, 2006

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	20	12
0	140	8

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	137	8	0.25		WELDED	A53B STEEL
20	100	6		180.0	SOLVENT WELD	PVC-SDR 26

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
100	140	6		.025	FACTORY SLOTTED

Annular Space (Seal/Grout/Packer)

			Cont.

Section 7: Well Test Data

Total Depth: 140
Static Water Level: 20.44
Water Temperature:

Air Test *

250 gpm with drill stem set at 140 feet for 8 hours.
Time of recovery 1.5 hours.
Recovery water level 20.44 feet.
Pumping water level _ feet.

Pump Test *

Depth pump set for test 120 feet.
250 gpm pump rate with _ feet of drawdown after _ hours of pumping.
Time of recovery _ hours.
Recovery water level _ feet.
Pumping water level _ feet.

* *During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

Geologic Source

Unassigned

From	To	Description
0	5	COARSE SAND WITH SILT. CALCAREOUS.
5	8	SAND AND GRAVEL.
8	15	SAND AND GRAVEL,SOME COBBLES AND BOULDERS.LOST CIRCULATION AT 15 FEET
15	25	COBBLES AND BOULDERS
25	33	GRAVEL (FIRST WATER AT 28 FEET).
33	58	CLAYSTONE/SILTSTONE WITH SOME SAND AND GRAVEL. WILL PRODUCE 15 GPM
58	80	CLAYSTONE/SILTSTONE WITH SOME SAND AND GRAVEL
80	87	SAND GRAVEL. 50GPM
87	97	CLAY WITH SAND AND GRAVEL
97	107	SAND AND GRAVEL WITH CLAY
107	120	SAND AND GRAVEL WTIH CLAY. 60GPM AT 110 FEET. 75GPM AT 118 FEET
120	133	COARSE SAND.
133	160	COARSE SAND AND GRAVEL. 200 TO 250 GPM AT 140 FEET

From	To	Description	Fed?
0	23	BENTONITE SLURRY	Y

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name: MONTE DAVIS
Company: MADISON DRILLING & PUMP SUPPLY
License No: WWC-557
Date Completed: 8/2/2006

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

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Plot this site in State Library Digital Atlas
Plot this site in Google Maps

Site Name: VALLY GARDEN GOLF VILLAGE HOMER OWNERS ASSOC.
GWIC Id: 230226

Section 1: Well Owner(s)

1) WALSH, DOUG (MAIL)
P.O. BOX 951E
ENNIS MT 59729 [08/09/2006]
2) WALSH, DOUG (WELL)
64 TOBACCO RD.
ENNIS MT 59729 [08/09/2006]

Section 2: Location

Township	Range	Section	Quarter Sections
05S	01W	32	SE¼ SE¼ NE¼

County MADISON **Geocode**

Latitude	Longitude	Geomethod	Datum
45.3562	-111.7421	NAV-GPS	NAD27

Ground Surface Altitude **Ground Surface Method** **Datum Date**

Addition **Block** **Lot**

Section 3: Proposed Use of Water

PUBLIC WATER SUPPLY (1)

Section 4: Type of Work

Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Wednesday, August 9, 2006

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	20	12

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2.5	100	8	0.25		WELDED	A53B STEEL
20	160	6		180.0	SOLVENT WELD	PVC-SDR 26

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
160	200	6		.025	FACTORY SLOTTED

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?

Section 7: Well Test Data

Total Depth: 200
Static Water Level: 29
Water Temperature:

Air Test *

500 gpm with drill stem set at 200 feet for 8 hours.
Time of recovery 1.5 hours.
Recovery water level 29 feet.
Pumping water level _ feet.

Pump Test *

Depth pump set for test 160 feet.
300 gpm pump rate with 36 feet of drawdown after 24 hours of pumping.
Time of recovery 24 hours.
Recovery water level 29 feet.
Pumping water level _ feet.

* *During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

Geologic Source
Unassigned

From	To	Description
0	15	CLAY WITH SAND.
15	20	COARSE SAND AND GRAVEL
20	35	COARSE SAND AND GRAVEL
35	40	CLAY WITH SAND
40	45	CLAY WITH SAND AND GRAVEL
45	49	CLAY WITH FIND SAND
49	60	CLAY.PLASTIC
60	80	CLAY .LENSES OF SAND AND GRAVEL
80	90	SAND AND GRAVEL .FIRST WATER 50-75GPM
90	111	COARSE SAND GRAVEL AND CLAY FLOW TO 5GPM
111	145	COARSE SAND AND GRAVEL. FLOW 100GPM.120FT. 150GPM.140FT.
145	200	COARSE SAND AND GRAVEL FLOW 300GPM.160FT.400GPM.180FT.

Driller Certification

All work performed and reported in this well log is in

0	20	BENTONITE SLURRY

compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name: MONTE DAVIS
Company: MADISON DRILLING & PUMP SUPPLY
License No: WWC-557
Date Completed: 8/9/2006

Presented by:

GreatWest ENGINEERING

Hydrogeologic Testing and Analysis

TOWN OF ENNIS

Test Wells EWS - 2011 and EWS-OBS-2012

January 2023

Client Commitment *Empowered Employees* *Quality Solutions*

TECHNICAL MEMORANDUM

HYDROGEOLOGIC TESTING AND ANALYSIS
TEST WELLS EWS-2011 AND EWS-OBS-2012
TOWN OF ENNIS, MONTANA

PREPARED FOR:	Town of Ennis
PREPARED BY:	Bruce Lauerman, RG, CHG
REVIEWED BY:	Collette Anderson, PE
DATE:	January 12, 2023
PROJECT NUMBER:	1-18184

This Technical Memorandum (TM) presents the methods and findings of hydrogeologic testing performed on two (2) Town of Ennis (Town) test wells (EWS-2011 and EWS-OBS-2012) in June and September 2022. The Great West Engineering (GWE) scope of work included oversight of well rehabilitation activities, pumping tests performed on each of the wells, water quality sampling, analysis of hydrogeologic data collected and preparation of this report with findings. The work was conducted in accordance with Town of Ennis On-Call Services Task Order 5.

BACKGROUND

In August 2011 and June 2012, the Town completed two exploratory test wells (EWS-2011 and EWS OBS-2012, respectively) at a 2-acre parcel the Town purchased from the Ennis Rodeo Grounds (**Figure 1**). EWS-2011 is a nominal 12-inch diameter well, screened and completed to depth of 220 feet below ground surface (bgs). The shallower Well EWS OBS-2012 is a nominal 6-inch diameter well with a 4-inch screen completed to a depth of 78 feet bgs. Both wells are completed in unconsolidated geologic units mapped as Quaternary Alluvium (Qal). The well logs are attached as **Appendix A**.

In July 2012 GWE conducted a short-term aquifer testing using EWS-2011 as the pumping well and EWS OBS-2012 (about 45 feet to the west) as an observation well. The results of the initial short-term pumping test suggested EWS-2011 might produce a maximum yield on the order of 175 gallons per minutes (gpm). No drawdown was observed in EWS OBS-2012 during the duration of the test, and it was speculated that no hydraulic connection likely existed between the two wells. No pumping was performed on Well EWS-OBS-2012 at the time.

The Town elected to not pursue further work on the test wells at that time. In mid-2021 GWE was asked to renew groundwater exploration for additional municipal water supply. GWE performed a desktop analysis and suggested various options, including assessment and ranking of various exploration drill targets, and a preferred option of revisiting the subject wells to confirm well yields and evaluate well connectivity and the potential of the property as a municipal wellfield including one or more production wells. (**Ennis Municipal Water Supply, Hydrogeologic Report and Exploration Recommendations, October 2021**). GWE's proposal for well rehabilitation and subsequent pumping tests on each or the wells was approved on August 9, 2021.

FIELD INVESTIGATION

The Town contracted with O'Keefe Drilling (O'Keefe) based in Butte, Montana to perform well rehabilitations and short-term pumping tests on both test wells. GWE oversaw the activities and collected hydrogeologic data and information.

On June 1-2, 2022, O'Keefe performed well rehabilitation on both wells using "air-bursting"; an enhanced air-lifting and agitation technique used to clean the screened intervals of the wells and remove finer-grained sediments from the natural formation surrounding the screens.

At Well EWS-2011, air-bursting activities lasted approximately 5 hours and produced significant amounts of sediment; roughly 1.5 cubic yards (yd^3) of finer-grained sediment followed by < 0.5 yd^3 of medium to coarse, poorly-graded sand. Well EWS-OBS-2012 was airburst for approximately 7 hours and produced <0.5 yd^3 of silt sediments.

Due to driller availability, the pumping tests on the subject wells were not conducted until September 2022.

On September 15, a step-rate pumping test was first conducted at Well EWS-2011 to determine a suitable pumping rate for a subsequent continuous discharge pumping test. A 20 HP submersible pump was set with the pump intake at a depth of 187 ft below top of casing (TOC). The pumping rate was incrementally stepped at 95, 135 and 160 gpm while recording water levels in both the pumping well and observation well EWS-OBS-2012. Step intervals ranged from 30 to 105 minutes each. Upon cessation of pumping, recovery water levels were also recorded. The results suggested a pumping rate of 150 gpm be used for the continuous discharge test on Well EWS-2011.

On September 16, Well EWS-2011 was pumped continuously for 12 hours while again recording water levels in both wells. Near the end of the pumping test, a water quality sample was collected from the pumping well to be analyzed for general chemistry. Recovery water levels were recorded once pumping was ceased.

On September 19, a step-rate pumping test was performed on Well EWS-OBS-2012. The 20 HP submersible pump intake was set at a depth of 53.5 ft below TOC. The pumping rate was incrementally stepped at 10, 20, 30, 50, 60, 70 and 75 gpm for 30-minute intervals while recording water levels in both the pumping well and observation well EWS-2011. Upon cessation of pumping, recovery water levels were recorded. Step discharge test results suggested a pumping rate of 60 gpm be used for the continuous discharge test on Well EWS-OBS-2012.

On September 20, Well EWS-OBS-2012 was pumped continuously for 8 hours while again recording water levels in both wells. Near the end of the pumping test, a water quality sample was collected from the pumping well to be analyzed for general chemistry. Recovery water levels were recorded once pumping was ceased.

In all pumping tests, a pressure transducer was used to record water levels in the pumping well while using a well sounder in both the pumping well and observation well to records water levels. All water produced during pumping tests was discharged into a swale approximately 100 yards northwest of the wells to avoid directly recharging the aquifer during testing.

RESULTS

Hydrogeologic Analysis of Pumping Tests

Data logger and aquifer test data sheets for step-rate and continuous discharge tests at wells EWS-2011 and EWS-0BS-2012 are included as **Appendix B**. All measurements are relative to top of well casing (TOC).

The data suggests the following:

- At no time during pumping of Well EWS-2011, was any negative response observed in Well EWS-OBS-2012.
- Conversely, at no time during pumping of Well EWS-OBS-2012 was any negative response observed in Well EWS-2011.

Also included in **Appendix B** are hydrogeologic analyses of data generated during the pumping tests using *AQTESOLV* software. Results for the Theis curve and Cooper-Jacob analysis of the constant discharge aquifer tests are provided, as well as a copy of the input data and output report for the graphical analyses.

Based on a number of factors including static water levels measured in each well, the lack of response in either well from pumping of the other and distinct aquifer characteristics and water quality (discussed below), it is inferred that the wells penetrate separate and discrete water-bearing zones within the local aquifer. In the data analyses, it is assumed each of the water-bearing zones are isotropic-homogenous, and each of infinite aerial extent.

Well EWS-2011

The deeper zone penetrated by Well EWS-2011 is considered confined; the static water level is above the depth groundwater was encountered when drilling the well, and no response to pumping the deeper well was observed in the shallow well. The graphical analyses assumed a saturated thickness (b) of 190 feet and a vertical to horizontal hydraulic conductivity anisotropy of 0.1. The Theis curve match for EWS-2011 aquifer test data resulted in a transmissivity value (T) of 302 ft^2/day. The hydraulic conductivity (K) for this discrete area of deeper zone was calculated at 1.6 ft/day by dividing the transmissivity value by the saturated thickness. Storativity (S) is not calculated using the Theis solution because the pumping test is considered a single well test; no connection was observed between the wells, therefor Well EWS-OBS-2012 is not considered an "observation well" for purposes of estimating aquifer parameters.

Well EWS-OBS-2012

The shallower water-bearing zone intercepted by EWS-OBS-2012 is considered unconfined. The graphical analyses assumed a saturated thickness (b) of 78 feet and a vertical to horizontal hydraulic conductivity anisotropy of 0.1. The Cooper Jacob curve match for EWS-OBS-2012 constant discharge test data resulted in a T value of 3143 ft^2/day. The K for this discrete area of the shallow zone was calculated at 40.3 ft/day by dividing the transmissivity by the saturated thickness. Storativity (S) can be estimated by the Cooper Jacob method at $5.99x10^{-21}$.

Water Quality

Water quality samples were collected from each of the wells near the end of the respective constant discharge tests. The samples were submitted to Energy Labs in Helena, Montana and analyzed for general chemistry including select physical properties, inorganics, dissolved metals and nitrogen. The results are summarized in **Table 1** below. The Energy Lab analytical reports are included as **Appendix C**.

TABLE 1

ANALYTE*	EWS-2011	EW2-OBS-2012
pH (std units)	8.1	7.7
Conductivity (umhos/cm)	259	384
Total Dissolved Solids	147	236
Alkalinity (CaCO3)	120	150
Bicarbonate (HCO3)	140	190
Carbonate (CO3)	<4	<4
Sulfate (SO4)	8	25
Nitrogen (nitrate+nitrite)	0.36	0.66
Calcium	30	39
Magnesium	6	14
Potassium	5	5
Sodium	14	18

*All units in mg/l unless otherwise noted

The reported chemistry indicates that water from both wells to be a calcium bicarbonate water of near-neutral pH. The waters are of generally good quality for the analytes reported. However, the water sample collected from the shallow water-bearing zone in Well EWS-OBS-2012 is generally more mineralized than

in the deeper water penetrated by Well ES-2011, particularly with respect to Total Dissolved Solids (236 vs 147 mg/l, respectively).

DISCUSSION

Well redevelopment of idled Ennis test wells EWS-2011 and EWS-OBS-2012 was a necessary precursor to conducting aquifer testing. Air-bursting activities successfully removed significant sediment from the well screens and immediate aquifer materials surrounding the screened intervals. The treatment provided a modest increase in well efficiencies (specific capacity) but was not expected to significantly improve existing aquifer yields.

Relatively short-term, single-well, constant discharge tests conducted at deep well EWS-2011 (12 hours @ 150 gpm) and shallow well EWS-OBS-2012 (8 hours @ 60 gpm) successfully demonstrated no direct hydraulic connection between the two wells. Water chemistry results support the assumption of the wells each intercepting two discrete water bearing zones within the local aquifer.

The difference in hydraulic conductivity (K) and transmissivity (T) estimated from the pumping tests is further evidence of two discrete water-bearing zones; the shallower zone is less productive but more hydraulically efficient than the lower zone. The K value (1.6 ft/day) for lower the zone intercepted by Well EWS-2011 is fairly low for Qal deposits in Western Montana; suggesting a significant amount of fines (silt and clay sized particles) in the lower water-bearing matrix.

The pumping tests indicates under current conditions deep well EWS-2011 yields a maximum sustainable pumping rate of approximately 150 gpm and shallow well EWS-OBS-2012 can independently sustain a pumping rate of approximately 60 gpm. However, the Montana Department of Water Quality (DEQ) would limit operation of each well to 2/3 of their demonstrated capacity; EWS-2011 (100 gpm) and EWS-OBS-2012 (40 gpm). DEQ permitting would require an additional 24-hour continuous discharge test for each well.

A brief forward projection analysis using the results from the single-well, continuous discharge pumping test at Well EWS-2011 suggests the potential to develop another deep well on the subject property while operating Well EWS-2011 at a permitted 100 gpm (Appendix B). However, such analysis is limited without a true “observation well” completed in the same water-bearing zone.

CONCLUSIONS

Ennis test wells EWS-2011 and EWS-OBS-2012 were successfully redeveloped to facilitate aquifer tests and evaluate the potential for conversion to municipal production wells. The results indicate the two wells, while in close proximity to one another, are not hydraulically connected. Upon completing 24-hour continuous discharge pumping tests on each well, deep well EWS-2011 could likely be permitted for approximately 100 gpm and shallow well EWS-OBS-2012 for roughly 40 gpm.

Further evaluation of the potential to develop incremental wells on the subject 2-acre parcel would require installation of an additional test well to serve as a true “observation well” used in additional pumping tests in determining well interference effects.

Appendix A

Well Logs

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Return to menu
Plot this site in State Library Digital Atlas
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Site Name: CITY OF ENNIS * TW-01
GWIC Id: 262627

Section 1: Well Owner(s)
1) CITY OF ENNIS (MAIL)
P.O. BOX 147
ENNS MT 59729 [08/11/2011]

Section 2: Location

Township	Range	Section	Quarter Sections
05S	01W	33	SE¼ SW¼ SW¼ SW¼

County
MADISON

Geocode

Latitude	Longitude	Geomethod	Datum
45.3496	-111.73958	NAV-GPS	NAD83

Ground Surface Altitude **Ground Surface Method** **Datum Date**

Addition **Block** **Lot**

Section 3: Proposed Use of Water
PUBLIC WATER SUPPLY (1)

Section 4: Type of Work
Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date
Date well completed: Thursday, August 11, 2011

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	30	16
30	220	12

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-3	200.3	12	0.375		WELDED	A53B STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
199.3	220	11.5		0.100 IN	SCREEN-CONTINUOUS-STAINLESS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	30	BENTONITE GROUT	

Section 7: Well Test Data

Total Depth: 220
Static Water Level: 26.23
Water Temperature:

Pump Test *

Depth pump set for test 190 feet.
109 gpm pump rate with 144.42 feet of drawdown after 2 hours of pumping.
Time of recovery 0.75 hours.
Recovery water level 35.65 feet.
Pumping water level _ feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks
WELL ID: TW1

Section 9: Well Log
Geologic Source
100UDFD - CENOZOIC UNDIFFERENTIATED

From	To	Description
0	24	PREDOMINATELY POORLY SORTED COARSE SAND & SMALL GRAVEL W/ COBBLES: CLAST OF MIXED LITHOLOGY; BECOMING FINER W/ DEPTH.
24	43	FINE TO MEDIUM GRAINED SAND W/ AMPLE SILT & CLAY, SOME COARSE SAND; PREDOMINATELY SAND IN SILT & CLAY MATRIX
43	45	POORLY SORTED MEDIUM SAND TO MEDIUM GRAVEL
45	50	SILT TO MEDIUM SAND; TAN TO BROWN, AMPLE FINE MAFIC GRAINS
50	61	SILT & CLAY INTERBEDDED W/ FINE SAND; CLAY IS RUSTY BROWN; BECOMING FINER W/ DEPTH
61	75	COARSE SAND, GRAVEL & COBBLES: PRODUCING WATER
75	81	COARSE SAND, GRAVEL & COBBLES, AS ABOVE, BUT W/ INCREASING FINE COMPONENT; POSSIBLY INTERBEDDED W/ SILT & CLAY BEDS; 61-81 PRODUCING AS MUCH AS 100 GPM ON AIR LIFT
81	105	PREDOMINATELY POORLY SORTED COARSE SAND & SMALL GRAVEL W/ COBBLES; CLASTS OF MIXED LITHOLOGY; BECOMING FINER W/ DEPTH
105	138	POORLY SORTED SILT TO GRAVEL DOMINATED BY COARSE SAND & SMALL GRAVEL; AMPLE CUTTINGS OF FINE TO MEDIUM SAND IN SILT-CLAY MATRIX & SOME MOD. WELL-INDURATED SANDSTONE; APPEARS TO BE INTERBEDDED SANDY CLAY, SANDSTONE & UNCONSOLIDATED

		SAND & GRAVEL. 10-20 GPM
138	147	VERY FINE TO COARSE SAND W/ LITTLE SILT OR CLAY; SAND IS TIGHT & NOT PRODUCING MUCH WATER; SOME COARSE GRAVEL & SMALL COBBLES; HOLE CAN BE DRILLED OPEN AHEAD OF CASING
147	158	FINE TO MEDIUM SAND IN SILT/CLAY MATRIX; TAN TO BROWN; FINE FRACTION INCREASING W/ DEPTH
158	161	POORLY SORTED FINE SAND TO SMALL GRAVEL; SOME CLAY BOUND MATERIAL; APPEARS TO BE COARSE SAND & SMALL GRAVEL INTERBEDDED W/ SANDY TIGHT CLAY. 30-50 GPM ON AIR LIFT.
161	171	SANDY TIGHT CLAY; POORLY SORTED CLAY TO SMALL GRAVEL; SOME LITHIFIED SANDSTONE, INCREASING IN FREQUENCY W/ DEPTH. NO WATER
171	175	POORLY SORTED SAND & GRAVEL; MED. TO COARSE SAND W/ SMALL GRAVEL; A FEW SCATTERED BEDS OF CLAYBOUND SAND. 30-40 GPM ON AIR LIFT.
175	182	CLAYBOUND SAND & SMALL GRAVEL; FINE TO COARSE SAND IN DENSE TAN-BROWN SILTY CLAY. NO WATER

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:	DAVE POTTS
Company:	POTTS DRILLING INC
License No:	WWC-512
Date Completed:	8/11/2011

Site Name: CITY OF ENNIS
GWIC Id: 262627
Additional Lithology Records

From	To	Description
183	188	COARSE SAND TO SMALL GRAVEL W/ A FEW THIN SANDSTONE BEDS; WATER PRODUCTION INCREASES W/ DEPTH. 30-40 GPM ON AIR LIFT.
188	194	CLAYBOUND SAND & SMALL GRAVEL; VERY LITTLE WATER
194	207	COARSE SAND & SMALL GRAVEL; SANDSTONE @ ABOUT 203-204. PRODUCING GOOOD WATER W/ SOME MINOR LOSS IN SANDSTONE ZONE. PRODUCING @ LEAST 50 GPM.
207	211	VARIABLY LITHIFIED SANDSTONE; GREYISH BROWN, GENERALLY FINE TO MEDIUM GRAINED; VERY LITTLE WATER PRODUCTION
211	220	COARSE SAND TO GRAVEL W/ A FEW COBBLES & THIN SANDSTONE BEDS; HOLE TD @ 221 (BIT ONLY) IN SANDSTONE; HOLE STAYING OPEN. PRODUCES @ LEAST 50 GPM.

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Return to menu
Plot this site in State Library Digital Atlas
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Site Name: CITY OF ENNIS
GWIC Id: 267753

Section 1: Well Owner(s)

1) CITY OF ENNIS (MAIL)
P.O. BOX 147
ENNIS MT 59729 [06/06/2012]

Section 2: Location

Township	Range	Section	Quarter Sections
05S	01W	33	SE¼ SW¼ SW¼ SW¼

County
MADISON

Geocode

Latitude	Longitude	Geomethod	Datum
45.3496	-111.73978	NAV-GPS	NAD83

Ground Surface Altitude	Ground Surface Method	Datum Date

Addition **Block** **Lot**

Section 3: Proposed Use of Water

MONITORING (1)

Section 4: Type of Work

Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date

Date well completed: Wednesday, June 6, 2012

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	78	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	65.8	6	0.25		WELDED	A53B STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
58	78	4.5			FACTORY SLOTTED

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	25	BENTONITE GRANULES	Y

Section 7: Well Test Data

Total Depth: 78
Static Water Level: 22
Water Temperature:

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log

Geologic Source
Unassigned

From	To	Description
0	23	SAND TO MEDIUM COBBLES
23	27	SAND, TO MEDIUM GRAVEL
27	40	SAND, FINE TO MEDIUM, MIXED SMALL GRAVEL
40	48	SAND, COURSE TO MEDIUM GRAVEL
48	61	CLAY, SILTY TO SANDY
61	78	SAND, COURSE TO LARGE GRAVEL

Driller Certification

All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name: DAVE POTTS
Company: POTTS DRILLING INC
License No: MWC-185
Date Completed: 6/6/2012

Appendix B

EWS-2011 and EWS-0BS-2012 Testing Data

AQUIFER TEST DATA

Owner ENNIS, MT Address _____ County _____ State _____

Date 9/15/22 Company performing test O'Keefe Measured by B Lauerman

Well No. EWS-2011 Distance from pumping well _____ Type of test Step discharge EWS-2011 Test No. 1

Measuring equipment In-situ pressure xd and solinst sounder digital flow meter

Time Data
Pump on: Date 9/15 Time 0816 (t,)
Pump off: Date 9/15 Time 1250 (t')
Duration of aquifer test: Pumping 4hr 34 min Recovery _____

Water Level Data
Static water level 27.70
Measuring point TOC
Elevation of measuring point —

Discharge Data
How Q measured VFD
Depth of pump/air line intake 187 TOC
Previous pumping? Yes ____ No X
Duration _____ End _____

Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		
9/14/22	1105							27.70						static
9/15/22	0802							27.81						static
9/15/22	0816	–												start pump
	0817	1												
	0818	2												~100 gpm
	0819	3						59.3						
	0820	4						63.1				110		very 98-110
	0825	8						90.3						
	0826	10						91.9				100		
	0828	12						93.8						
	0830	14						93.6				99		
	0832	16						94.3						
	0834	18						95.4				101		
	0834	20						96				101		
	0835	23						96.6						
	0841	25						97						
	0845	29						97.5						
	0847	30						97.75						
	0850	34						98.15				98		
	0857							98.65						
	0900							98.8						
	0903	47						99.05						
	0909	53						99.30						
	0915	58						99.50						
	0918	61						99.70						
	0930	74						100.15						
	0935	79						100.3				92		
	0942	86						100.52						

AQUIFER TEST DATA

Owner ENNIS Address _____ County _____ State _____

Date 9/15/22 Company performing test _____ Measured by R. Lancaster

Well No. EWS-2011 Distance from pumping well _____ Type of test Step Q. test Test No. 1

Measuring equipment _____

Time Data
Pump on: Date 9/15/22 Time 0816 (t_1)
Pump off: Date _____ Time _____ (t'_1)
Duration of aquifer test:
Pumping _____ Recovery _____

Water Level Data
Static water level _____
Measuring point _____
Elevation of measuring point _____

Discharge Data
How Q measured _____
Depth of pump/air line _____
Previous pumping? Yes ____ No ____
Duration _____ End _____

Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		Comments
9/15	0946	90						100.54				93		
	0958	102						100.80				92		
	0959	103						100.81						
	1000	104										140		1. STEP to 130 g/m
	1001	105						101.3						
	1002	106						112.7				130		
	1003	107						114-				135		
	1004	108						119-				130		
	1005	109						121.5				129		
	1007	111						123.9				130		
	1009	114						127.4				133		
	1017	121						128.8				130		
	1019	124						129.2						
	1022	126						129.4				128		
	1024	128						129.6						
	1029	131						129.9						
	1032	134						130.4				126		
	1036	140						130.4				125		
	1039	143						130.5				124		
	1046	150						130.5				124		
	1054	158												Increase → 145
	1056	160						135.9				140		trying to hold 130-140
	1058	162										138		
	1059	163						137.9				136		
	1109	168						138.8				134		
	1107	171						139						
	1117	184						139.6				132		
	1119	183						139.7						
	1120	184												STEP to 160

AQUIFER TEST DATA

Owner ENWLS 4 Address _____ County _____ State _____

Date 9/15/22 Company performing test _____ Measured by B Lauerman

Well No. EWS-2011 Distance from pumping well _____ Type of test STEP Q Test No. 1

Measuring equipment _____

Time Data
Pump on: Date _____ Time _____ (t_i)
Pump off: Date _____ Time _____ (t'_i)
Duration of aquifer test:
Pumping _____ Recovery _____

Water Level Data
Static water level _____
Measuring point _____
Elevation of measuring point _____

Discharge Data
How Q measured _____
Depth of pump/air line _____
Previous pumping? Yes ____ No ____
Duration _____ End _____

Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		
	1121	185						148				179		~179
	1122	186						154.2				172		~172
	1127	191						156						
	1124	188						158.4				167		
	1125	189						156.5						
	1126	190						160.2				164		
	1127	191						160.9						
	1128	192						161.45						
	1130	194						162.2						
	1131	195						162.6				161		
	1134	198						165.4						
	1138	202						166.2						
	1140	204						166.9						
	1147	211						167.9				160		
	1150	214						168.2						
	1153	217						167.5				160		
	1157	221						168.75						
	1159	223						168.8						
	1200	224						168.9				160		
	1208	232						169.3				158		
	1214	238						169.5				159		
	1218	242						169.68				158		
	1222	246						169.3				158		
	1223	247						169.3				158		
	1230	254						169.5				158		
	1238	262						169.85				158		
	1245	269						170.1				158		
	1250	274						170.25				157		

AQUIFER TEST DATA

Owner ENNIS Address _____ County _____ State _____

Date 9/15/22 Company performing test _____ Measured by B. Lawrence

Well No. EW8-2011 Distance from pumping well _____ Type of test Step Q Test No. 1

Measuring equipment _____

Time Data
Pump on: Date _____ Time _____ (t_1)
Pump off: Date _____ Time _____ (t'_1)
Duration of aquifer test:
Pumping _____ Recovery _____

Water Level Data
Static water level _____
Measuring point _____
Elevation of measuring point _____

Discharge Data
How Q measured _____
Depth of pump/air line _____
Previous pumping? Yes ____ No ____
Duration _____ End _____

Comments on factors affecting test data: RECOVERY

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		
9/15	1251	275												Pump off
	1252		1					145.3						
		2.	2					128.8						
			3					119.7						
			4					104						
			5					94.7						
		4	6					88.4						
			7					83.1						
			8					78.7						
			9					75-						
			10					72.1						
			11					69.5						
			12					67.1						
			13					65.2						
			14					63.5						
			15					62.0						
			16					60.6						
			17					59.4						
			18					58.3						
			—											
			—											
			21					55.5						
			22					54.8						
			28					51.3						
			30					50.4						
			31					49.9						
			33					49.1						
			38					47.4						
		40	40					46.8						

AQUIFER TEST DATA

Owner ENNIS Address _____ County _____ State _____

Date 9/15/22 Company performing test _____ Measured by _____

Well No. ENS-2011 Distance from pumping well _____ Type of test STEP 4 Test No. _____

Measuring equipment _____

Time Data
Pump on: Date _____ Time _____ (t_p)
Pump off: Date _____ Time _____ (t'_p)
Duration of aquifer test:
Pumping _____ Recovery _____

Water Level Data
Static water level _____
Measuring point _____
Elevation of measuring point _____

Discharge Data
How Q measured _____
Depth of pump/air line _____
Previous pumping? Yes ____ No ____
Duration _____ End _____

Comments on factors affecting test data: RECOVERY

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'	Water level measurement	Correction or Conversion	Water level	Water level change s or s'	Discharge measurement	Rate
				43			46.05			
				52			44.1			
				58			43			
				70			41.3			
				75			40.75			
				85			39.8			
				93			39.1			
				112			37.85			
				115			37.68			
				120			37.40			
				132			36.85			
				141			36.46			
				154			35.97			
				160			35.75			
				312			32.75			
9/16	0550			1019			29.41			

AQUIFER TEST DATA

Owner ENNIS Address _____ County _____ State _____

Date 9/15/22 Company performing test O'Keefe Measured by _____

Well No. EWS-OBS-2019 Distance from pumping well 44' Type of test EWS-2511 Step discharge Test No. 1

Measuring equipment Solinst Sounder OBSERVATION WELL

Time Data
Pump on: Date _____ Time _____ (t_p)
Pump off: Date _____ Time _____ (t'_p)
Duration of aquifer test:
Pumping _____ Recovery _____

Water Level Data
Static water level 22.49
Measuring point TOC
Elevation of measuring point —

Discharge Data
How Q measured _____
Depth of pump/air line _____
Previous pumping? Yes ____ No ____
Duration _____ End _____

Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		Comments
9/14/22	1110							22.43						static
9/15/22	0805							22.49						static
	0816	—												START Pump
	0835	19						22.33						
	0846	30						22.33						
	0910	54						22.33						
	0916	60						22.33						
	1018	120						22.33						
	1043	147						22.30						
	1100	164						22.28						
	1132	196						22.23						
	1224	248						22.2						
	1243	267						22.21						1250 Pump off
	1346	270						22.43						
	1522	306						22.40			RECOVERY			
	1804	588						22.49						
9/16	0558	1426						22.45						

AQUIFER TEST DATA

Owner ENNIS Address _____ County _____ State _____

Date 9/14/22 Company performing test O'Keefe Measured by R. Lawerman

Well No. EWS-2022 Distance from pumping well _____ Type of test Constant Q 150 gpm Test No. 2

Measuring equipment In situ pressure xd, Solinst Sonde digital stop-on flow meter

Time Data
Pump on: Date 9/14 Time 0610 (t.)
Pump off: Date 9/16 Time 1812 (t'.)
Duration of aquifer test:
Pumping 12 Recovery 95

Water Level Data
Static water level 29.41
Measuring point TOC 12"
Elevation of measuring point _____

Discharge Data
How Q measured VFD
Depth of pump/air line 1148 ft 187 TOC
Previous pumping? Yes X No ___
Duration 4.5 hrs End 9/15

Comments on factors affecting test data: 12:51

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		
9/14	0608					29.41								static after sky kit
	0611	1				57.8								0610 pump on
		2				75.1								
		3				84.5								
		4				96.2						158		
		5				101.6								
		6				108.1								
		7				111.6								
		8				115.7						153		
		9				119.4								
		10				122.4								
		11				125						152		
		12				127.1								
		13				128.1								
		14				129.3								
		15				131.1								
		16				132.4								
		18				136.2						151		
		20				136.8								
		21				137.6								
		22				138.3						151		
		23				139.2								
		24				140.5								
		25				141.2								
		26				142.4								
		27				142.2						151		
		28				142.5								
		29				143.5								
		30				144.15								

AQUIFER TEST DATA

Owner ENNIS Address _____ County _____ State _____

Date 9/16/22 Company performing test _____ Measured by B Laverman

Well No. EWS-2011 Distance from pumping well _____ Type of test Constant 150 gpm Test No. 2

Measuring equipment _____

Time Data
Pump on: Date _____ Time _____ (t_1)
Pump off: Date _____ Time _____ (t'_1)
Duration of aquifer test:
Pumping _____ Recovery _____

Water Level Data
Static water level _____
Measuring point _____
Elevation of measuring point _____

Discharge Data
How Q measured _____
Depth of pump/air line _____
Previous pumping? Yes ____ No ____
Duration _____ End _____

Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		
	0642	32				145.1								
		33				145.4								
		34				145.7						151		
		35				145.9								
	0651	40				147.9						153		
		42				148.7								
		48				149.75						131		
		51				150.1								
		54				154.05						155		
		58				154.55								
	0714	60				154.9								
		64				155.45								
		68				155.8						153		
		71				156.1						153		
		75				156.5								
		80				156.8						152		
		87				157.25								
		100				157.85						151		
		110				158.25								
		115				158.45								
		120				158.67						149		
		140				159.3						149		
		155				159.7						147		
		170				160						146		
		180				160.25								
		195										147		
		200				160.6								
		210				160.82								
		220				161 –						146		

AQUIFER TEST DATA

Owner ENNIS Address _____ County _____ State _____

Date 9/16/22 Company performing test _____ Measured by _____

Well No. EWS-2014 Distance from pumping well _____ Type of test Constant @ 150 gpm Test No. 2

Measuring equipment _____

Time Data
Pump on: Date _____ Time _____ (t_i)
Pump off: Date _____ Time _____ (t'_i)
Duration of aquifer test:
Pumping _____ Recovery _____

Water Level Data
Static water level _____
Measuring point _____
Elevation of measuring point _____

Discharge Data
How Q measured _____
Depth of pump/air line _____
Previous pumping? Yes ____ No ____
Duration _____ End _____

Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		
9/16	1011	240				161.3						145		
		255				161.5						145		
	1046	275				161.8						144		
		300				162.05						143		
		322				162.37						143		
		345				162.62						143		
		380				163						143		
		400				163.17								
	1252	401												normal VFD
		404				165.2						147		
		406				165.7								
		407				165.8								
		408				166-								
		409				166.1						146		
		410				166.19								
		412				166.29						146		
		414				166.36								
		416				166.43						144		
		420				166.50								
		424				166.58						146		
		428				166.61						145		
		432				166.66								
		438				166.6						145		
		439				166.58								thunderstorms ?
		441				166.55						145		
		444				166.57						145		
		448				166.65								raining
		452				166.76						145		
		460				166.86								

AQUIFER TEST DATA

Owner ENNIS Address _____ County _____ State _____

Date 9/16/22 Company performing test _____ Measured by B. Lawerman

Well No. EWS-20H Distance from pumping well _____ Type of test Constant @ 150 gpm Test No. 2

Measuring equipment _____

Time Data
Pump on: Date _____ Time _____ (t_1)
Pump off: Date _____ Time _____ (t'_1)
Duration of aquifer test:
Pumping _____ Recovery _____

Water Level Data
Static water level _____
Measuring point _____
Elevation of measuring point _____

Discharge Data
How Q measured _____
Depth of pump/air line _____
Previous pumping? Yes ____ No ____
Duration _____ End _____

Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		
9/16	1355	464				166.92						144		
		468				166.97						145		
		470				167.01						145		
		476				167.1								
		504				167.28						144		
		520				167.58						144		
		532				167.64						145		skies clearing
		546				167.78						144		
		556				167.82								
		571				167.80						143		
		574				167.8						143		
		579				168.7						150		increase VFD
		580				169.2						146		" "
		581				169.65						148		
		582				170.2						149		
		583				170.57								
		584				170.8								
		585				170.94						148		
		586				171.07								
		589				171.31						147		
		591				171.4								
		594				171.52								
		596				171.55						148		
		598				171.57								
	1611	600				171.58						147		
		604				171.7						147		
		611				171.83								
		619				171.89						146		
		627				171.95						146		

AQUIFER TEST DATA

Owner Ennis Address _____ County _____ State _____

Date 9/16/22 Company performing test _____ Measured by _____

Well No. EWS-2011 Distance from pumping well _____ Type of test Constant @ 150 gpm Test No. 2

Measuring equipment _____

Time Data
Pump on: Date _____ Time _____ (t_p)
Pump off: Date _____ Time _____ (t'_p)
Duration of aquifer test:
Pumping _____ Recovery _____

Water Level Data
Static water level _____
Measuring point _____
Elevation of measuring point _____

Discharge Data
How Q measured _____
Depth of pump/air line _____
Previous pumping? Yes ___ No ___
Duration _____ End _____

Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		
9/16	1651	640				172.03						146		
		646				172.15								
		655				172.24						146		
		664				172.25								
		674				172.34						146		
		682				172.44						146		
		693				172.55						146		
		704				172.61						146		
		711				172.65						146		
		717				172.70						146		
	1811	720				172.72						146		
	1812	721												Pump OFF
							RECOVERY							
	1813		1			151.5								
			2			134.9								
			3			122.1								
			4			112.2								
			5			104								
			6			97.4								
			7			91								
			8			86.8								
			9			83.4								
			10			80.4								
			11			78.								
			12			75.95								
			13			74.1								
			14			72.4								
			15			70.96								

AQUIFER TEST DATA

Owner ENNLS Address _____ County _____ State _____

Date 9/16/22 Company performing test _____ Measured by B Lawrence

Well No. EW5-2011 Distance from pumping well _____ Type of test Constant Q 150 gpm Test No. 2

Measuring equipment _____

Time Data
Pump on: Date _____ Time _____ (t_i)
Pump off: Date _____ Time _____ (t'_i)
Duration of aquifer test:
Pumping _____ Recovery _____

Water Level Data
Static water level _____
Measuring point _____
Elevation of measuring point _____

Discharge Data
How Q measured _____
Depth of pump/air line _____
Previous pumping? Yes ___ No ___
Duration _____ End _____

Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		RECOVERY
			20			65.4								
			25			62.2								clear skies
	1042		30			59.65								
	1047		35			57.70								
			40			56.18								
			45			54.80								
			50			53.60								
			55			52.60								
			60			51.40								
			65			50.90								
			70			50.25								
			75			49.55								
			80			49-								
			95			47.45								
			1.0											

AQUIFER TEST DATA

Owner ENNIS Address _____ County _____ State _____

Date 9/16/22 Company performing test O'Keefe Measured by B. Lauerman

Well No. ENNIS OBS 2022 Distance from pumping well 44' Type of test Constant @ 1570 gpm Test No. 2

Measuring equipment Solinst Sounder OBSERVATION WELL

Time Data
Pump on: Date 9/16 Time 0610 (t)
Pump off: Date 9/16 Time 1812 (t')
Duration of aquifer test: Pumping 12 hr Recovery 100m

Water Level Data
Static water level 22.45
Measuring point TOC
Elevation of measuring point —

Discharge Data
How Q measured _____
Depth of pump/air line _____
Previous pumping? Yes ___ No X
Duration _____ End _____

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		Comments on factors affecting test data
9/16	0558					22.45								STATIC
	0610													Pump on
		18	✓			22.22								
		36				22.22								
		74				22.24								
	0810	120				22.29								
		143				22.30								
		173				22.31								
		221				22.34								
	1011	241				22.35								
		302				22.38								
	1159	349				22.39								
		397				22.40								
		411				22.39								
		441				22.39								
		468				22.39								
		508				22.39								
		537				22.38								
		578				22.38								
		611				22.38								
	1658	648				22.38								
	1734	684				22.39								
	1800	710				22.41								
	1809	719				22.42								
	1810	720				22.42								
	1812					—								PUMP OFF
								RECOVERY						
	1828		16			22.64								
			26			22.66								

AQUIFER TEST DATA

Owner ENNIS Address _____ County _____ State _____

Date 9/16/22 Company performing test _____ Measured by _____

Well No. ENN-OBS-2022 Distance from pumping well 44' Type of test Continuous Q 150 gpm Test No. 2

Measuring equipment OBSERVATION WELL

Time Data
Pump on: Date _____ Time _____ (t_p)
Pump off: Date _____ Time _____ (t'_p)
Duration of aquifer test:
Pumping _____ Recovery _____

Water Level Data
Static water level _____
Measuring point _____
Elevation of measuring point _____

Discharge Data
How Q measured _____
Depth of pump/air line _____
Previous pumping? Yes ____ No ____
Duration _____ End _____

Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		
														RECOVERY
9/16	1848		36			22.67								
	1856		44			22.67								
	1903		51			22.67								
	1908		56			22.67								
	1917		45			22.67								
	1923		71			22.67								
	1932		80			22.66								
	1945		93			22.65								
	1952		100			22.65								

AQUIFER TEST DATA

Owner ENNIS Address _____ County _____ State _____

Date 9/19/22 Company performing test O'Keefe Measured by B Lenarmon

Well No. EWS-OBS-2012 Distance from pumping well _____ Type of test step Q test Test No. 3

Measuring equipment in-line totalizing flow meter, pressure xd, Solinst sounder

Time Data
Pump on: Date 9/19/22 Time 1430 (t.)
Pump off: Date 9/19/22 Time 1801 (t'.)
Duration of aquifer test:
Pumping 3.5 Recovery _____

Water Level Data
Static water level 22.42
Measuring point TOC 6"
Elevation of measuring point _____

Discharge Data
How Q measured flow meter
Depth of pump/air line _____
Previous pumping? Yes ____ No ____
Duration _____ End _____

Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		
9/19/22	1210					22.42								
	1430													PUMP ON
		1												
		2				25.4						11		
		3				24.82						9		
		4				24.52						8		
		5				24.8						10		
		6				24.85						10.3		
		7				24.87						10.3		
		8				24.85						10		
		9				24.85						10.1		
		10				24.85						10		
		11				24.84						10		
		12				24.85								
		13				—								
		14				24.87						10.3		
		15				24.87						10		
		17				24.88								
		18				24.88						10		
		19				24.89						10		
		24				24.92						10		
		25				24.92						10.1		
		27				24.93						10.1		
		28				24.92						10		
		30				24.94								
		31												STEP to 20 gpm
		32				27.07						21		
		33				27.29								
		34				27.34						20.6		

AQUIFER TEST DATA

Owner ENNIS Address _____ County _____ State _____

Date 9/19/22 Company performing test _____ Measured by B. Lawrence

Well No. EWS-OBS-2012 Distance from pumping well _____ Type of test STEP Q Test No. 3

Measuring equipment _____

Time Data
Pump on: Date _____ Time _____ (t_p)
Pump off: Date _____ Time _____ (t_p')
Duration of aquifer test:
Pumping _____ Recovery _____

Water Level Data
Static water level _____
Measuring point _____
Elevation of measuring point _____

Discharge Data
How Q measured _____
Depth of pump/air line _____
Previous pumping? Yes ____ No ____
Duration _____ End _____

Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'	Water level measurement	Correction or Conversion	Water level	Water level change s or s'	Discharge measurement	Rate		Comments
9/19	1505	36			27.43					20.4		
		37			27.45							
		38			27.52					20.6		
		39			27.56							
		40			27.5+					20.6		
		42			27.62					20.5		
		44			27.66					20.7		
		46			27.69					20.5		
		48			27.71					20.5		
		50			27.73					20.5		
		52			27.75					20.6		
		OM										
		54			27.72					20.3		
		58			27.72					20.3		
		60			27.74					20.4		
		61										STEP to 30 gpm
		62			29.67					30.1		
		63			30.02					30.3		
		64			30.03					30.1		
		65			30.05							
		66			30.10					30.1		
		68			30.14					30		
		70			30.21					30		
		72			30.41					30.3		
		74			30.45					30.5		
		76			30.47					30.5		
		78			30.51					30.3		
		80			30.54					30.4		
		82			30.56					30.4		

AQUIFER TEST DATA

Owner ENNIS Address _____ County _____ State _____

Date 9/19/22 Company performing test _____ Measured by B Lawerence

Well No. EWS-OBS-2012 Distance from pumping well _____ Type of test STEP Q Test No. 3

Measuring equipment _____

Time Data
Pump on: Date _____ Time _____ (t_1)
Pump off: Date _____ Time _____ (t'_1)
Duration of aquifer test:
Pumping _____ Recovery _____

Water Level Data
Static water level _____
Measuring point _____
Elevation of measuring point _____

Discharge Data
How Q measured _____
Depth of pump/air line _____
Previous pumping? Yes ___ No ___
Duration _____ End _____

Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'	Water level measurement	Correction or Conversion	Water level	Water level change s or s'	Discharge measurement	Rate	Comments
9/19	1554	84			30.57					30.3	
		86			30.60					30.3	
		88			30.63					30.2	
		90			30.64						
		91									step to 50 gpm
		92			34.3					50	
		93			35.07					49.8	
		94			3533						
		95			35.55					50	
		96			35.67						
		97			35.72						
		98			35.78						
		99			35.86						
		100			35.92						
		102			36.0					49.8	
		104			36.05						
		106			36.11					49.6	
		108			36.14					49.6	
		110			36.18						
		112			36.35					50	
		114			36.37					50	
		116			36.40					50	
		118			36.40					50	
		120			36.43					50	
		121									STEP to Q = 60
		122			38.80					60	
		123			38.99					60	
		124			39.01						
		125			39.09						

AQUIFER TEST DATA

Owner ENNIS Address _____ County _____ State _____

Date 9/19/22 Company performing test _____ Measured by B Lawerence

Well No. ENN-OBS-2012 Distance from pumping well _____ Type of test STEP Q Test No. 3

Measuring equipment _____

Time Data
Pump on: Date _____ Time _____ (t_1)
Pump off: Date _____ Time _____ (t'_1)
Duration of aquifer test:
Pumping _____ Recovery _____

Water Level Data
Static water level _____
Measuring point _____
Elevation of measuring point _____

Discharge Data
How Q measured _____
Depth of pump/air line _____
Previous pumping? Yes ____ No ____
Duration _____ End _____

Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		
9/19	1436	126				39.15								
		127				39.20								
		128				39.24						59.8		
		129				39.29								
		130				39.30						60		
		132				39.34								
		134				39.43								
		136				39.48						60		
		138				39.53								
		140				39.59						60		
		142				39.61								
		144				39.65						59.8		
		146				39.7.								
		148				39.75								
		150				39.78						50.7		
		151				[illegible]								STEP to Q = 70 gpm
		152				41.95						70		
		153				42.42						70		
		154				42.56								
		155				42.60								
		156				[illegible]								
		157				42.64					-	69.8		
		158				42.72						70		
		159				42.75								
		160				42.81						70		
		162				—								
		164				42.90						70		
		166				42.95						69.8		
		168				42.99						70		

AQUIFER TEST DATA

Owner ENNIS Address _____ County _____ State _____

Date 9/19/22 Company performing test _____ Measured by B. Lautzenhiser

Well No. ENTS OBS 2012 Distance from pumping well _____ Type of test STEP Q Test No. 3

Measuring equipment _____

Time Data
Pump on: Date _____ Time _____ (t_i)
Pump off: Date _____ Time _____ (t'_i)
Duration of aquifer test:
Pumping _____ Recovery _____

Water Level Data
Static water level _____
Measuring point _____
Elevation of measuring point _____

Discharge Data
How Q measured _____
Depth of pump/air line _____
Previous pumping? Yes ___ No ___
Duration _____ End _____

Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		Comments
9/19		170				43.07								
		172				43.09								
		174				43.14								
		176				43.19						70		
		178				43.22								
	1730	180				43.26						69.5		
		181												STEP to Q = 75 gpm
		183				44.87						75.5		Value with drawn = 79 gpm
		184				—								
		185				44.98						75.5		
		186				45—								
		187				45.03								
		188				45.06								
		189				45.09								
		190				—						—		
		192				45.15						76		
		194				45.20								
		196				45.21						75.5		
		198				45.27								
		200				45.32								
		202				45.32						76		
		204				45.35								
		206				45.36								
		208				45.40						75.5		
		210				45.46								
	1801	211												PUMP OFF
			1			28.9								RECOVERY
			2			27.1								
			3			26.48								

AQUIFER TEST DATA

Owner ENNIS Address _____ County _____ State _____

Date 9/19/22 Company performing test _____ Measured by B Lauerman

Well No. ENS-OBS-2012 Distance from pumping well _____ Type of test STEP DR Test No. 3

Measuring equipment _____

Time Data
Pump on: Date _____ Time _____ (t_p)
Pump off: Date _____ Time _____ (t_p')
Duration of aquifer test:
Pumping _____ Recovery _____

Water Level Data
Static water level _____
Measuring point _____
Elevation of measuring point _____

Discharge Data
How Q measured _____
Depth of pump/air line _____
Previous pumping? Yes ____ No ____
Duration _____ End _____

Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		Comments
9/19	1805		4			26.1								RECOVERY
			5			25.8								
			6			25.6								
			8			25.27								
			10			25.02								
			12			24.9								
			14			24.35								
			18			24.21								
	1821		20			24.11								
9/20	0744		823			22.52								

AQUIFER TEST DATA

Owner Ennis Address County State

Date 9/19/22 Company performing test Measured by B. Lawrence

Well No. EWS-2011 Distance from pumping well 44' Type of test observation well Test No. 3

Measuring equipment Solinst Sounder PTW Q on EWS-OBS-2012

Time Data
Pump on: Date Time (t,)
Pump off: Date Time (t')
Duration of aquifer test:
Pumping Recovery

Water Level Data
Static water level 28.62
Measuring point
Elevation of measuring point

Discharge Data
How Q measured
Depth of pump/air line
Previous pumping? Yes No
Duration End

Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		
9/19	1200					28.62								STATIC
	1400													PUMP ON
	1416	16				28.59								
		26				28.59								
		41				28.57								
		57				28.56								
		67				28.55								
		91				28.53								
		101				28.51								
		119				28.50								
		147				28.48								
		162				28.47								
		169				28.46								
		179				28.46								
		210				28.45								
	1801	211							RECOVERY					PUMP OFF
			14			28.54								
	1820		19			28.55								
9/20	0740		819			28.52								

AQUIFER TEST DATA

Owner ENNIS Address _____ County _____ State _____

Date 9/20/22 Company performing test _____ Measured by B. Lawrence

Well No. EWS-OBS-2012 Distance from pumping well _____ Type of test Constant Q 60 gpm Test No. 4

Measuring equipment Totalizing in line flow meter, pressure xd, Solinst sounder

Time Data
Pump on: Date 9/20 Time 0830 (t)
Pump off: Date 9/20 Time 1631 (t')
Duration of aquifer test: Pumping 8 hr Recovery 70m.

Water Level Data
Static water level 22.52
Measuring point TOC
Elevation of measuring point —

Discharge Data
How Q measured flow meter
Depth of pump/air line 53.5 in hole
Previous pumping? Yes X No ____
Duration 3.5 hr End 9/19 1801

Comments on factors affecting test data
TOTALIZER
START 329911.7
END 358,824.7
28,913 gal
60.2 gpm

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		Comments
9/20/22	0744					22.52								Static
	0830													pump on Q = 60 gpm
		1				34.55								
		2				35.80								
		3				36.30						58		
		4				36.66								
		5				36.89								
		6				37.60								
		7				37.87						60		
		8				37.91								
		9				38.01								
		10				38.12						60		
		11				38.23								
		12				38.30								
		13				38.35								
		14				38.42								
		15				38.51						60		
		16				38.53								
		17				38.57								
		18				38.61								
		19				38.70								
		20				38.74						59.5		
		22				38.79								
		24				38.86						59.8		
		26				38.94								
		28				39.								
		30				39.04								
		32				39.11								
		34				39.19						59.5		

AQUIFER TEST DATA

Owner EWNIS Address _____ County _____ State _____

Date 9/20/22 Company performing test _____ Measured by _____

Well No. EWS-085-2012 Distance from pumping well _____ Type of test Constant Q 60 gpm Test No. 4

Measuring equipment _____

Time Data
Pump on: Date _____ Time _____ (t_1)
Pump off: Date _____ Time _____ (t'_1)
Duration of aquifer test:
Pumping _____ Recovery _____

Water Level Data
Static water level _____
Measuring point _____
Elevation of measuring point _____

Discharge Data
How Q measured _____
Depth of pump/air line _____
Previous pumping? Yes ____ No ____
Duration _____ End _____

Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		
9/20/22	0836	34				39.21						59		
		38				39.28								adjust up
		42				39.31								
		44				39.57						60.5		
		46				39.64						60		
		48				39.67								
		50				39.70								
		52				39.73								
		54				39.76								
		56				39.79								
		58				—								
		60				39.85						60		
		65				39.85								
		67				39.88								
		70				39.89								
		76				39.94								
		80				40-						60		
		85				40.05								
		90				40.09								
		95				40.13						60		
		106				40.15								
		120				40.15								
		130				40.18						59.5		
		135				40.15								adjust up
		140				40.38						60.5		
		145				40.31						60		
		150				40.24						59.5		adjust up
		160				40.47						60.5		
		187				40.54						60.5		

AQUIFER TEST DATA

Owner ENNIS Address _____ County _____ State _____

Date 9/20/22 Company performing test _____ Measured by B Lawmon

Well No. EW2-OBS-2012 Distance from pumping well _____ Type of test Constant Q 60gpm Test No. 4

Measuring equipment _____

Time Data
Pump on: Date _____ Time _____ (t_p)
Pump off: Date _____ Time _____ (t'_p)
Duration of aquifer test:
Pumping _____ Recovery _____

Water Level Data
Static water level _____
Measuring point _____
Elevation of measuring point _____

Discharge Data
How Q measured _____
Depth of pump/air line _____
Previous pumping? Yes ____ No ____
Duration _____ End _____

Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		
9/20/22	1140	190				40.54								
		204				40.51						60		
		220				40.50						59.5		
		236				40.58								adjust flow
	1240	250				40.63						60		
		282				40.60						60		
		290				40.64								
		302				40.58						59.7		adjust flow
		310				40.61						60		
		320				40.68						60.5		
		335				40.68						60		
		340				40.73								
		350				40.68						59.8		adjust flow
	1430	360				40.74						60		
		384				40.70								
		390				40.61						59.5		adjust flow
		392										60.5		
		394				40.73								
		400				40.69								
		410				40.71						60		
		420				40.79						60		
		430				40.78								
		442				40.78						60		
		450				40.79						60		
		460				40.80						60		
		470				40.76						60		
		480				40.76						60		
		481												Pump off

AQUIFER TEST DATA

Owner ENNIS Address _____ County _____ State _____

Date 9/20/22 Company performing test _____ Measured by B. Lawrence

Well No. ENN-08S 2017 Distance from pumping well _____ Type of test Constant Q Gypsum Test No. 4

Measuring equipment _____

Time Data
Pump on: Date 9/20/22 Time 0830 (t_p)
Pump off: Date 9/28/22 Time 1631 (t'_p)
Duration of aquifer test:
Pumping 8 hr Recovery 70

Water Level Data
Static water level 22.52
Measuring point TOC
Elevation of measuring point _____

Discharge Data
How Q measured _____
Depth of pump/air line _____
Previous pumping? Yes ____ No ____
Duration _____ End _____

Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		
						40.76								RECOVERY
	1632		1			27.65								
			2			26.70								
			3			26.22								
			4			25.90								
			5			25.65								
			6			25.45								
			7			25.27								
			8			25.13								
			9			25.00								
			10			24.90								
			11			24.80								
			12			24.73								
			13			24.65								
			14			24.65								
			15			24.61								
			20			24.35								
			25			24.08								
			30			23.94								
			60			23.42								
			65			23.37								
			70			23.32								

AQUIFER TEST DATA

Owner ENNIS Address _____ County _____ State _____

Date 9/20/22 Company performing test _____ Measured by B. Lavern

Well No. EWS-2011 Distance from pumping well 44' Type of test Constant Q 60 gpm Test No. 4-

Measuring equipment Observation well Solinst Sonde

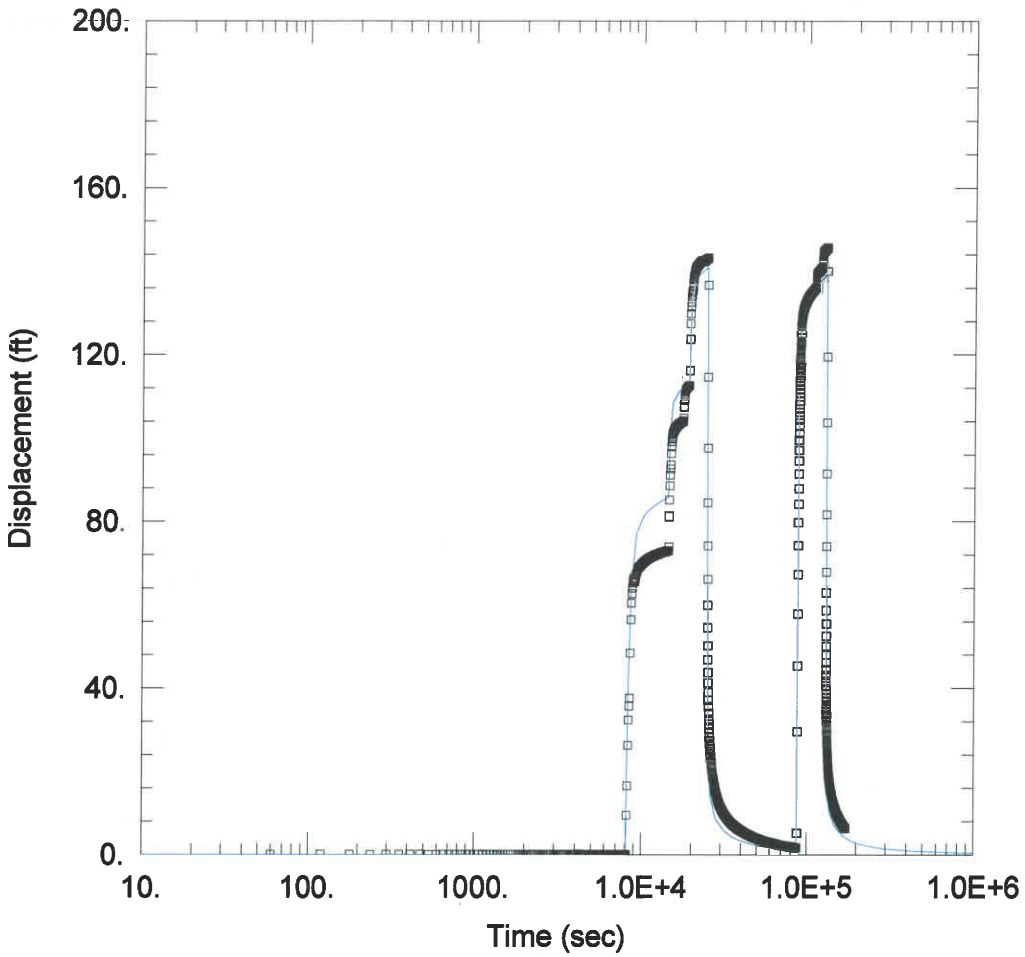
Time Data
Pump on: Date _____ Time _____ (t_1)
Pump off: Date _____ Time _____ (t'_1)
Duration of aquifer test:
Pumping _____ Recovery _____

Water Level Data
Static water level _____
Measuring point _____
Elevation of measuring point _____

Discharge Data
How Q measured _____
Depth of pump/air line _____
Previous pumping? Yes ____ No ____
Duration _____ End _____

Comments on factors affecting test data

Date	Clock time	Time since pump started t	Time since pump stopped t'	t/t'		Water level measurement	Correction or Conversion	Water level	Water level change s or s'		Discharge measurement	Rate		
9/20/22	0740					28.50								
		1												Pump on Q = 60 gpm
		7				28.46								
		23				28.41								
		33				28.41								
		49				28.41								
		01				28.41								
		144				28.41								
		150				28.39								
		234				28.37								
		313				28.37								
		383				28.35								
		411				28.35								
		461				28.34								
		481						Pump off				RECOVERY		
			12			28.41								
			23			28.43								
			31			28.42								
			61			28.42								



WELL TEST ANALYSIS

Data Set: C:\Users\william.craig\Desktop\GWE-Bruce Lauerman\EWS-150gpm-12hr_TheisStep.aqt
Date: 10/11/22 Time: 09:46:48

PROJECT INFORMATION

Test Well: EWS_OBS_2012
Test Date: 9/19/2022

AQUIFER DATA

Saturated Thickness: 190. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EWS	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
▫ EWS	0	0

SOLUTION

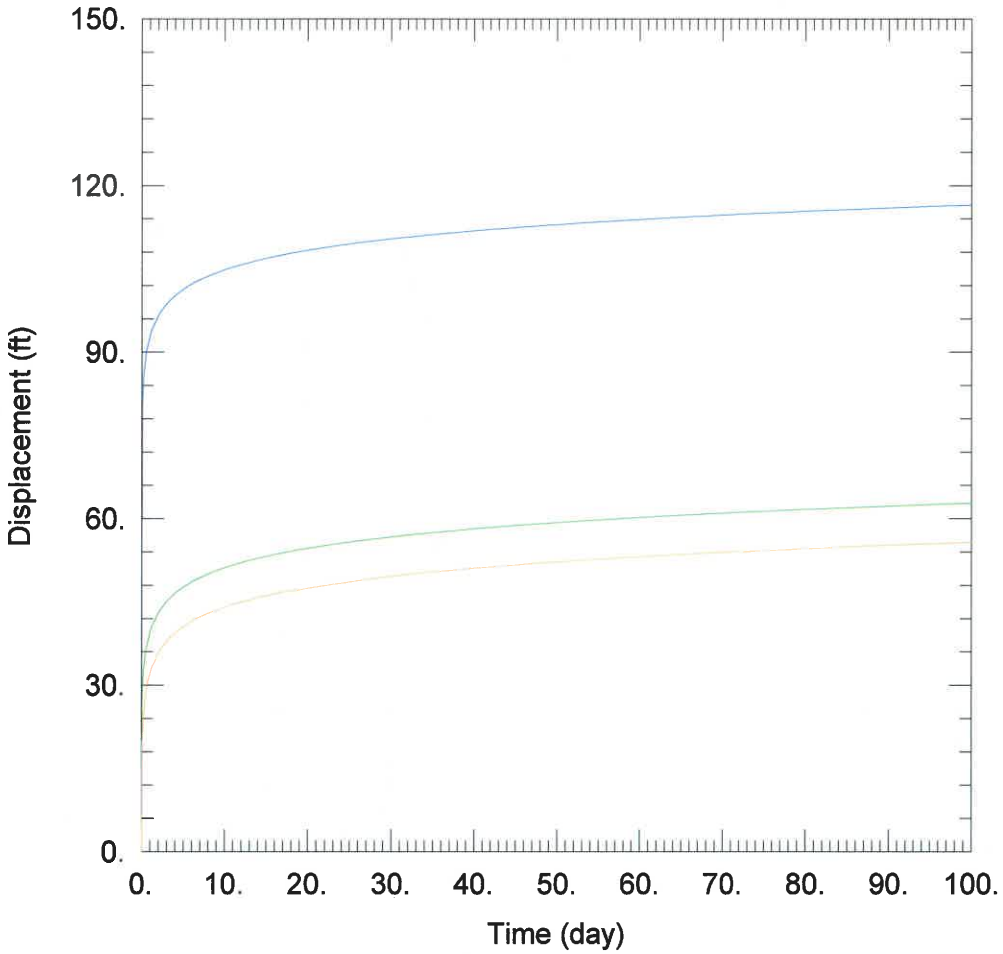
Aquifer Model: Confined
Solution Method: Dougherty-Babu

T = 462.8 ft^2/day
Kz/Kr = 0.1
r(w) = 0.5 ft
C = 0. sec^2/ft^5

S = 1.542E-9
Sw = 0.
r(c) = 0.5 ft
P = 2.

Step Test Model: Jacob-Rorabaugh
Time (t) = 1. sec Rate (Q) in cu. ft/sec

$s(t) = 0.Q + 0.Q^{2.}$
W.E. = 0.% (Q from last step)



WELL TEST ANALYSIS

Data Set: C:\Users\william.craig\Desktop\GWE-Bruce Lauerman\forward_100gpm.aqt
Date: 10/11/22 Time: 13:28:09

PROJECT INFORMATION

Test Well: EWS_OBS_2012
Test Date: 9/19/2022

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
Pumping	0	0

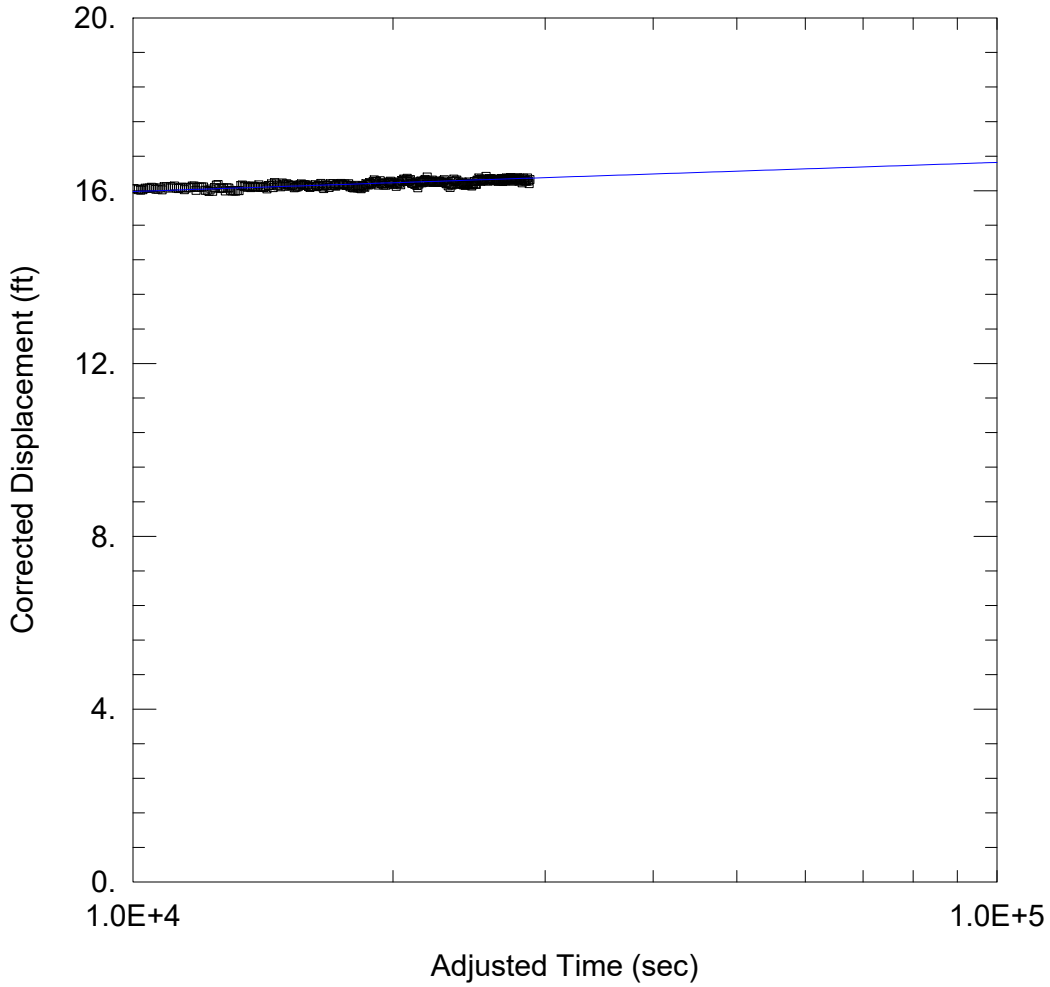
Observation Wells

Well Name	X (ft)	Y (ft)
Pumping	0	0
Obs	0	100
Obs 2	0	200

SOLUTION

Aquifer Model: Confined
Solution Method: Theis

T = 302.3 ft^2/day
S = 2.85E-5
Kz/Kr = 0.1
b = 190. ft



WELL TEST ANALYSIS

Data Set: C:\Users\william.craig\Desktop\GWE-Bruce Lauerman\EWS-OBS-60gpm-8hr.aqt
Date: 01/05/23 Time: 15:08:33

PROJECT INFORMATION

Test Well: EWS_OBS_2012
Test Date: 9/19/2022

AQUIFER DATA

Saturated Thickness: 78. ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
EWS OBS	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
▫ EWS OBS	0	0

SOLUTION

Aquifer Model: Unconfined Solution Method: Cooper-Jacob

T = 3143.3 ft^2/day S = 5.988E-21

Data Set: C:\Users\william.craig\Desktop\GWE-Bruce Lauerman\EWS-OBS-60gpm-8hr.aqt
Date: 01/05/23
Time: 15:11:43

PROJECT INFORMATION

Test Date: 9/19/2022
Test Well: EWS_OBS_2012

AQUIFER DATA

Saturated Thickness: 78. ft
Anisotropy Ratio (Kz/Kr): 0.1

PUMPING WELL DATA

No. of pumping wells: 1

Pumping Well No. 1: EWS OBS

X Location: 0. ft
Y Location: 0. ft

Casing Radius: 0.5 ft
Well Radius: 0.5 ft

Fully Penetrating Well

No. of pumping periods: 2

Pumping Period Data

Time (sec)	Rate (gal/min)	Time (sec)	Rate (gal/min)
6.659E+4	60.	9.54E+4	0.

OBSERVATION WELL DATA

No. of observation wells: 1

Observation Well No. 1: EWS OBS

X Location: 0. ft
Y Location: 0. ft

Radial distance from EWS OBS: 0. ft

Fully Penetrating Well

No. of Observations: 481

Observation Data

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
6.66E+4	8.487	8.106E+4	18.31
6.666E+4	12.76	8.112E+4	18.2
6.672E+4	13.6	8.118E+4	18.34
6.678E+4	14.08	8.124E+4	18.31
6.684E+4	14.4	8.13E+4	18.25
6.69E+4	14.52	8.136E+4	18.27
6.696E+4	15.51	8.142E+4	18.22
6.702E+4	15.5	8.148E+4	18.33
6.708E+4	15.65	8.154E+4	18.3
6.714E+4	15.63	8.16E+4	18.24
6.72E+4	15.8	8.166E+4	18.31
6.726E+4	15.88	8.172E+4	18.28
6.732E+4	15.99	8.178E+4	18.24
6.738E+4	16.02	8.184E+4	18.26
6.744E+4	16.07	8.19E+4	18.27
6.75E+4	16.19	8.196E+4	18.19

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
6.756E+4	16.18	8.202E+4	18.21
6.762E+4	16.2	8.208E+4	18.21
6.768E+4	16.29	8.214E+4	18.24
6.774E+4	16.27	8.22E+4	18.28
6.78E+4	16.36	8.226E+4	18.31
6.786E+4	16.46	8.232E+4	18.27
6.792E+4	16.42	8.238E+4	18.28
6.798E+4	16.5	8.244E+4	18.27
6.804E+4	16.54	8.25E+4	18.27
6.81E+4	16.6	8.256E+4	18.23
6.816E+4	16.62	8.262E+4	18.2
6.822E+4	16.69	8.268E+4	18.23
6.828E+4	16.64	8.274E+4	18.23
6.834E+4	16.72	8.28E+4	18.22
6.84E+4	16.7	8.286E+4	18.28
6.846E+4	16.81	8.292E+4	18.23
6.852E+4	16.78	8.298E+4	18.25
6.858E+4	16.77	8.304E+4	18.26
6.864E+4	16.82	8.31E+4	18.32
6.87E+4	16.89	8.316E+4	18.21
6.876E+4	16.82	8.322E+4	18.17
6.882E+4	16.89	8.328E+4	18.28
6.888E+4	16.9	8.334E+4	18.25
6.894E+4	16.88	8.34E+4	18.26
6.9E+4	16.96	8.346E+4	18.2
6.906E+4	16.95	8.352E+4	18.31
6.912E+4	16.95	8.358E+4	18.26
6.918E+4	17.24	8.364E+4	18.31
6.924E+4	17.31	8.37E+4	18.26
6.93E+4	17.29	8.376E+4	18.24
6.936E+4	17.3	8.382E+4	18.3
6.942E+4	17.29	8.388E+4	18.29
6.948E+4	17.28	8.394E+4	18.29
6.954E+4	17.37	8.4E+4	18.32
6.96E+4	17.33	8.406E+4	18.29
6.966E+4	17.39	8.412E+4	18.27
6.972E+4	17.37	8.418E+4	18.31
6.978E+4	17.39	8.424E+4	18.26
6.984E+4	17.41	8.43E+4	18.27
6.99E+4	17.39	8.436E+4	18.31
6.996E+4	17.41	8.442E+4	18.22
7.002E+4	17.43	8.448E+4	18.25
7.008E+4	17.47	8.454E+4	18.2
7.014E+4	17.45	8.46E+4	18.18
7.02E+4	17.48	8.466E+4	18.23
7.026E+4	17.43	8.472E+4	18.26
7.032E+4	17.47	8.478E+4	18.19
7.038E+4	17.46	8.484E+4	18.21
7.044E+4	17.49	8.49E+4	18.18
7.05E+4	17.52	8.496E+4	18.16
7.056E+4	17.57	8.502E+4	18.26
7.062E+4	17.53	8.508E+4	18.23
7.068E+4	17.57	8.514E+4	18.2
7.074E+4	17.49	8.52E+4	18.31
7.08E+4	17.54	8.526E+4	18.29
7.086E+4	17.53	8.532E+4	18.27
7.092E+4	17.58	8.538E+4	18.34
7.098E+4	17.5	8.544E+4	18.31
7.104E+4	17.64	8.55E+4	18.3
7.11E+4	17.61	8.556E+4	18.37
7.116E+4	17.59	8.562E+4	18.43
7.122E+4	17.64	8.568E+4	18.39
7.128E+4	17.67	8.574E+4	18.38
7.134E+4	17.65	8.58E+4	18.27
7.14E+4	17.68	8.586E+4	18.34
7.146E+4	17.7	8.592E+4	18.4

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
7.152E+4	17.73	8.598E+4	18.31
7.158E+4	17.75	8.604E+4	18.31
7.164E+4	17.65	8.61E+4	18.27
7.17E+4	17.68	8.616E+4	18.32
7.176E+4	17.73	8.622E+4	18.27
7.182E+4	17.76	8.628E+4	18.33
7.188E+4	17.7	8.634E+4	18.36
7.194E+4	17.78	8.64E+4	18.34
7.2E+4	17.68	8.646E+4	18.39
7.206E+4	17.81	8.652E+4	18.36
7.212E+4	17.77	8.658E+4	18.29
7.218E+4	17.74	8.664E+4	18.34
7.224E+4	17.77	8.67E+4	18.31
7.23E+4	17.74	8.676E+4	18.23
7.236E+4	17.75	8.682E+4	18.31
7.242E+4	17.8	8.688E+4	18.36
7.248E+4	17.83	8.694E+4	18.33
7.254E+4	17.78	8.7E+4	18.28
7.26E+4	17.83	8.706E+4	18.41
7.266E+4	17.83	8.712E+4	18.38
7.272E+4	17.77	8.718E+4	18.45
7.278E+4	17.81	8.724E+4	18.39
7.284E+4	17.79	8.73E+4	18.44
7.29E+4	17.77	8.736E+4	18.47
7.296E+4	17.82	8.742E+4	18.38
7.302E+4	17.72	8.748E+4	18.4
7.308E+4	17.77	8.754E+4	18.44
7.314E+4	17.8	8.76E+4	18.33
7.32E+4	17.79	8.766E+4	18.32
7.326E+4	17.82	8.772E+4	18.32
7.332E+4	17.76	8.778E+4	18.29
7.338E+4	17.79	8.784E+4	18.35
7.344E+4	17.78	8.79E+4	18.26
7.35E+4	17.78	8.796E+4	18.19
7.356E+4	17.79	8.802E+4	18.3
7.362E+4	17.79	8.808E+4	18.38
7.368E+4	17.81	8.814E+4	18.39
7.374E+4	17.85	8.82E+4	18.34
7.38E+4	17.75	8.826E+4	18.35
7.386E+4	17.75	8.832E+4	18.41
7.392E+4	17.78	8.838E+4	18.44
7.398E+4	17.7	8.844E+4	18.41
7.404E+4	17.79	8.85E+4	18.52
7.41E+4	17.79	8.856E+4	18.36
7.416E+4	17.82	8.862E+4	18.37
7.422E+4	17.81	8.868E+4	18.4
7.428E+4	17.84	8.874E+4	18.37
7.434E+4	17.9	8.88E+4	18.42
7.44E+4	17.74	8.886E+4	18.35
7.446E+4	17.79	8.892E+4	18.38
7.452E+4	17.85	8.898E+4	18.36
7.458E+4	17.89	8.904E+4	18.38
7.464E+4	17.79	8.91E+4	18.35
7.47E+4	17.79	8.916E+4	18.38
7.476E+4	17.8	8.922E+4	18.4
7.482E+4	17.78	8.928E+4	18.36
7.488E+4	18.	8.934E+4	18.35
7.494E+4	18.07	8.94E+4	18.36
7.5E+4	18.05	8.946E+4	18.39
7.506E+4	18.01	8.952E+4	18.43
7.512E+4	17.99	8.958E+4	18.34
7.518E+4	17.98	8.964E+4	18.31
7.524E+4	17.97	8.97E+4	18.33
7.53E+4	17.98	8.976E+4	18.25
7.536E+4	17.94	8.982E+4	18.31
7.542E+4	17.94	8.988E+4	18.2

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
7.548E+4	17.93	8.994E+4	18.29
7.554E+4	17.94	9.0E+4	18.27
7.56E+4	17.91	9.006E+4	18.39
7.566E+4	18.03	9.012E+4	18.45
7.572E+4	18.06	9.018E+4	18.39
7.578E+4	18.1	9.024E+4	18.39
7.584E+4	18.11	9.03E+4	18.42
7.59E+4	18.02	9.036E+4	18.3
7.596E+4	18.16	9.042E+4	18.36
7.602E+4	18.13	9.048E+4	18.3
7.608E+4	18.08	9.054E+4	18.31
7.614E+4	18.14	9.06E+4	18.31
7.62E+4	18.08	9.066E+4	18.36
7.626E+4	18.07	9.072E+4	18.28
7.632E+4	18.13	9.078E+4	18.32
7.638E+4	18.14	9.084E+4	18.26
7.644E+4	18.13	9.09E+4	18.29
7.65E+4	18.15	9.096E+4	18.33
7.656E+4	18.2	9.102E+4	18.31
7.662E+4	18.16	9.108E+4	18.36
7.668E+4	18.15	9.114E+4	18.31
7.674E+4	18.13	9.12E+4	18.27
7.68E+4	18.12	9.126E+4	18.24
7.686E+4	18.13	9.132E+4	18.29
7.692E+4	18.18	9.138E+4	18.31
7.698E+4	18.17	9.144E+4	18.38
7.704E+4	18.18	9.15E+4	18.31
7.71E+4	18.2	9.156E+4	18.29
7.716E+4	18.18	9.162E+4	18.41
7.722E+4	18.15	9.168E+4	18.4
7.728E+4	18.15	9.174E+4	18.48
7.734E+4	18.18	9.18E+4	18.44
7.74E+4	18.13	9.186E+4	18.38
7.746E+4	18.22	9.192E+4	18.45
7.752E+4	18.22	9.198E+4	18.43
7.758E+4	18.18	9.204E+4	18.41
7.764E+4	18.23	9.21E+4	18.45
7.77E+4	18.21	9.216E+4	18.42
7.776E+4	18.24	9.222E+4	18.54
7.782E+4	18.17	9.228E+4	18.44
7.788E+4	18.17	9.234E+4	18.39
7.794E+4	18.19	9.24E+4	18.44
7.8E+4	18.21	9.246E+4	18.46
7.806E+4	18.13	9.252E+4	18.43
7.812E+4	18.18	9.258E+4	18.46
7.818E+4	18.2	9.264E+4	18.43
7.824E+4	18.19	9.27E+4	18.41
7.83E+4	18.24	9.276E+4	18.41
7.836E+4	18.24	9.282E+4	18.45
7.842E+4	18.11	9.288E+4	18.4
7.848E+4	18.2	9.294E+4	18.42
7.854E+4	18.21	9.3E+4	18.43
7.86E+4	18.21	9.306E+4	18.38
7.866E+4	18.21	9.312E+4	18.44
7.872E+4	18.11	9.318E+4	18.44
7.878E+4	18.11	9.324E+4	18.4
7.884E+4	18.08	9.33E+4	18.47
7.89E+4	18.15	9.336E+4	18.4
7.896E+4	18.08	9.342E+4	18.38
7.902E+4	18.2	9.348E+4	18.47
7.908E+4	18.27	9.354E+4	18.43
7.914E+4	18.29	9.36E+4	18.4
7.92E+4	18.16	9.366E+4	18.48
7.926E+4	18.18	9.372E+4	18.44
7.932E+4	18.19	9.378E+4	18.48
7.938E+4	18.09	9.384E+4	18.46

Time (sec)	Displacement (ft)	Time (sec)	Displacement (ft)
7.944E+4	18.19	9.39E+4	18.43
7.95E+4	18.18	9.396E+4	18.5
7.956E+4	18.11	9.402E+4	18.43
7.962E+4	18.09	9.408E+4	18.39
7.968E+4	18.09	9.414E+4	18.41
7.974E+4	18.09	9.42E+4	18.47
7.98E+4	18.11	9.426E+4	18.43
7.986E+4	18.1	9.432E+4	18.46
7.992E+4	18.25	9.438E+4	18.46
7.998E+4	18.27	9.444E+4	18.44
8.004E+4	18.22	9.45E+4	18.49
8.01E+4	18.24	9.456E+4	18.39
8.016E+4	18.21	9.462E+4	18.46
8.022E+4	18.23	9.468E+4	18.4
8.028E+4	18.19	9.474E+4	18.42
8.034E+4	18.24	9.48E+4	18.34
8.04E+4	18.23	9.486E+4	18.45
8.046E+4	18.21	9.492E+4	18.48
8.052E+4	18.22	9.498E+4	18.4
8.058E+4	18.27	9.504E+4	18.4
8.064E+4	18.21	9.51E+4	18.4
8.07E+4	18.21	9.516E+4	18.39
8.076E+4	18.2	9.522E+4	18.49
8.082E+4	18.22	9.528E+4	18.39
8.088E+4	18.16	9.534E+4	18.31
8.094E+4	18.26	9.54E+4	18.43
8.1E+4	18.26		

SOLUTION

Pumping Test
Aquifer Model: Unconfined
Solution Method: Cooper-Jacob

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
T	3143.3	ft^2/day
S	5.988E-21	

K = T/b = 40.3 ft/day (0.01422 cm/sec)
Ss = S/b = 7.677E-23 1/ft

Appendix C

Energy Lab Analytical Reports

ANALYTICAL SUMMARY REPORT

October 12, 2022

Great West Engineering
PO Box 4817
Helena, MT 59604-4817

Work Order: H22090616

Project Name: Ennis Exploration

Energy Laboratories Inc Helena MT received the following 1 sample for Great West Engineering on 9/21/2022 for analysis.

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
H22090616-001	EWS-OBS-2012	09/20/22 9:30	09/21/22	Aqueous	Metals by ICP/ICPMS, Dissolved Alkalinity to pH 4.5 Conductivity Anions by Ion Chromatography Nitrogen, Nitrate + Nitrite pH Preparation, Dissolved Filtration MCAWW Solids, Total Dissolved

The analyses presented in this report were performed by Energy Laboratories, Inc., 3161 E. Lyndale Ave., Helena, MT 59604, unless otherwise noted. Any exceptions or problems with the analyses are noted in the report package. Any issues encountered during sample receipt are documented in the Work Order Receipt Checklist.

The results as reported relate only to the item(s) submitted for testing. This report shall be used or copied only in its entirety. Energy Laboratories, Inc. is not responsible for the consequences arising from the use of a partial report.

If you have any questions regarding these test results, please contact your Project Manager.

Report Approved By:

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client: Great West Engineering
Project: Ennis Exploration
Lab ID: H22090616-001
Client Sample ID: EWS-OBS-2012

Report Date: 10/12/22
Collection Date: 09/20/22 09:30
DateReceived: 09/21/22
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL PROPERTIES							
pH	7.7	s.u.	H	0.1		A4500-H B	09/22/22 10:36 / ljs
pH Measurement Temp	14.1	°C				A4500-H B	09/22/22 10:36 / ljs
Conductivity @ 25 C	384	umhos/cm		5		A2510 B	09/22/22 10:36 / ljs
Solids, Total Dissolved TDS @ 180 C	236	mg/L	D	20		A2540 C	09/22/22 09:05 / amh
INORGANICS							
Alkalinity, Total as CaCO3	150	mg/L		4		A2320 B	09/25/22 12:25 / SRW
Bicarbonate as HCO3	190	mg/L		4		A2320 B	09/25/22 12:25 / SRW
Carbonate as CO3	ND	mg/L		4		A2320 B	09/25/22 12:25 / SRW
Chloride	17	mg/L		1		E300.0	09/25/22 08:41 / SRW
Sulfate	25	mg/L		1		E300.0	09/25/22 08:41 / SRW
NUTRIENTS							
Nitrogen, Nitrate+Nitrite as N	0.66	mg/L		0.01		E353.2	09/30/22 14:34 / JAR
METALS, DISSOLVED							
Calcium	39	mg/L		1		E200.7	09/26/22 17:58 / cfg
Magnesium	14	mg/L		1		E200.7	09/26/22 17:58 / cfg
Potassium	5	mg/L		1		E200.7	09/26/22 17:58 / cfg
Sodium	18	mg/L		1		E200.7	09/26/22 17:58 / cfg

Report Definitions:
RL - Analyte Reporting Limit
QCL - Quality Control Limit
D - Reporting Limit (RL) increased due to sample matrix
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)
H - Analysis performed past the method holding time

ANALYTICAL SUMMARY REPORT

October 10, 2022

Great West Engineering
PO Box 4817
Helena, MT 59604-4817

Work Order: H22090500 Quote ID: H15563

Project Name: Ennis Exploration

Energy Laboratories Inc Helena MT received the following 1 sample for Great West Engineering on 9/19/2022 for analysis.

Lab ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
H22090500-001	EWS-2011	09/19/22 9:50	09/19/22	Aqueous	Metals by ICP/ICPMS, Dissolved Alkalinity to pH 4.5 Conductivity Anions by Ion Chromatography Nitrogen, Nitrate + Nitrite pH Preparation, Dissolved Filtration MCAWW Solids, Total Dissolved

The analyses presented in this report were performed by Energy Laboratories, Inc., 3161 E. Lyndale Ave., Helena, MT 59604, unless otherwise noted. Any exceptions or problems with the analyses are noted in the report package. Any issues encountered during sample receipt are documented in the Work Order Receipt Checklist.

The results as reported relate only to the item(s) submitted for testing. This report shall be used or copied only in its entirety. Energy Laboratories, Inc. is not responsible for the consequences arising from the use of a partial report.

If you have any questions regarding these test results, please contact your Project Manager.

Report Approved By:

LABORATORY ANALYTICAL REPORT

Prepared by Helena, MT Branch

Client: Great West Engineering
Project: Ennis Exploration
Lab ID: H22090500-001
Client Sample ID: EWS-2011

Report Date: 10/10/22
Collection Date: 09/19/22 09:50
DateReceived: 09/19/22
Matrix: Aqueous

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
PHYSICAL PROPERTIES							
pH	8.1	s.u.	H	0.1		A4500-H B	09/20/22 09:50 / ljs
pH Measurement Temp	11.3	°C				A4500-H B	09/20/22 09:50 / ljs
Conductivity @ 25 C	259	umhos/cm		5		A2510 B	09/20/22 09:50 / ljs
Solids, Total Dissolved TDS @ 180 C	147	mg/L	D	20		A2540 C	09/19/22 16:05 / ljs
INORGANICS							
Alkalinity, Total as CaCO3	120	mg/L		4		A2320 B	09/23/22 15:06 / ljs
Bicarbonate as HCO3	140	mg/L		4		A2320 B	09/23/22 15:06 / ljs
Carbonate as CO3	ND	mg/L		4		A2320 B	09/23/22 15:06 / ljs
Sulfate	8	mg/L		1		E300.0	09/24/22 02:40 / SRW
NUTRIENTS							
Nitrogen, Nitrate+Nitrite as N	0.35	mg/L		0.01		E353.2	09/22/22 15:50 / JAR
METALS, DISSOLVED							
Calcium	30	mg/L		1		E200.7	09/28/22 18:47 / sld
Magnesium	6	mg/L		1		E200.7	09/28/22 18:47 / sld
Potassium	5	mg/L		1		E200.7	09/28/22 18:47 / sld
Sodium	14	mg/L		1		E200.7	09/28/22 18:47 / sld

Report Definitions:
RL - Analyte Reporting Limit
QCL - Quality Control Limit
D - Reporting Limit (RL) increased due to sample matrix
MCL - Maximum Contaminant Level
ND - Not detected at the Reporting Limit (RL)
H - Analysis performed past the method holding time

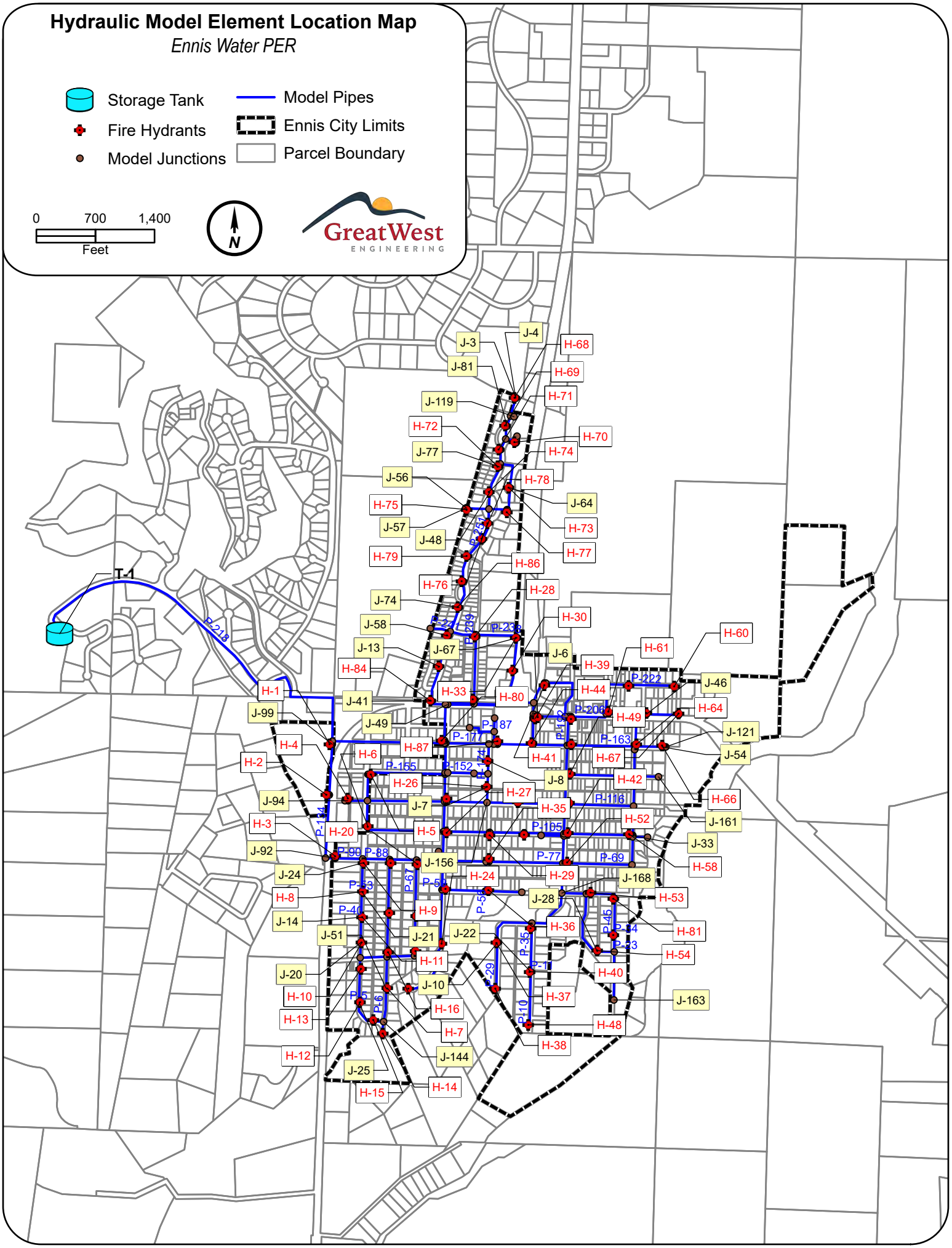
APPENDIX L

Distribution System Model

Ennis Hydrant Test (May 27, 2022 Field Results)								Hydraulic Model Results						
Test #	Time	Hydrant #	Flow / Residual Hydrant	Static Pressure (psi)	Pressure Drop	Residual Pressure (psi)	Flow (gpm)	Elevation (ft.)	Static HGL based on Pressure Reading (ft.)	Static HGL based on Modeling & Tank @ 5157' (ft.)	Static HGL Difference (ft.) (Model - Field)[1]	HGL (flow test model) (ft.)	Pressure Drop based on Modeling (psi)	HGL Diff.[1]
1	10:45 AM	H-11	Flow	75			1000	4,987.57	5,160.65	5,156.79				
		H-9	Residual	77	14	63		4,982.05	5,159.74	5,156.79	-3	5,137.82	8	-13
2[2]	11:00 AM	H-15	Flow	74			840	4,988.57	5,159.34	5,156.78				
		H-13	Residual	73	9	64		4,990.08	5,158.54	5,156.78	-2	5,138.00	8	-2
3	11:45 AM	H-48	Flow	75			840	4,976.28	5,149.36	5,156.76				
		H-46	Residual	79	23	56		4,966.28	5,148.59	5,156.76	8	5,093.72	27	10
4	12:15 PM	H-45	Flow	82			1080	4,963.98	5,153.21	5,156.79				
		H-27	Residual	79	27	52		4,971.58	5,153.89	5,156.79	3	5,139.75	7	-45
5	12:30 PM	H-64	Flow	95			1170	4,941.09	5,160.32	5,156.83				
		H-51	Residual	91	10	81		4,944.39	5,154.39	5,156.83	2	5,138.02	8	-4
6	1:00 PM	H-33	Flow	88			1080	4,963.62	5,166.70	5,156.90				
		H-34	Residual	91	30	61		4,964.67	5,174.67	5,156.90	-18	5,138.67	8	-51
7[2]	1:30 PM	H-85	Flow	86			1115	4,953.95	5,152.41	5,156.90				
		H-86	Residual	84	4	80		4,956.54	5,150.39	5,156.90	7	5,137.27	9	10

[1]Per "Water Distribution Modeling, First Edition" by Haestad, Walski, Chase, and Savic: The model should accurately predict HGL to within 5-10 feet for master planning of smaller systems.

[2]Model output report included in Appendix.


Hydraulic Model Element Location Map
Ennis Water PER
Storage Tank
Fire Hydrants
Model Junctions
Model Pipes
Ennis City Limits
Parcel Boundary
0
700
1,400
Feet
N
GreatWest
ENGINEERING
T-1
J-4
J-3
H-68
J-81
H-69
H-71
J-119
H-72
H-70
J-77
H-74
J-56
H-78
H-75
J-64
J-57
H-73
J-48
H-77
H-79
H-86
H-76
H-28
J-74
H-30
J-58
H-60
J-13
J-67
J-6
H-61
H-84
H-39
H-1
H-33
H-80
H-44
J-46
J-41
J-99
J-49
H-49
H-64
J-121
H-4
H-87
H-41
H-67
J-54
H-2
H-6
J-8
H-42
H-26
H-27
H-66
J-94
J-7
H-35
H-52
J-161
H-3
H-20
H-5
J-33
J-92
J-156
H-58
J-24
H-24
H-29
J-168
H-8
J-28
H-53
J-14
H-9
H-36
H-81
J-51
J-21
J-22
H-54
H-11
H-40
J-20
J-10
H-37
J-163
H-10
H-16
H-13
H-48
H-7
H-38
H-12
J-144
J-25
H-15
H-14
P-218
P-222
P-206
P-187
P-177
P-163
P-165
P-152
P-116
P-105
P-77
P-69
P-67
P-53
P-40
P-35
P-29
P-10
P-5
P-6

Calibration Test 2

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Status (Initial)	Headloss (ft)
P-1	153	H-14	J-144	6.0	AC	125.0	0	0.00	Open	0.00
P-2	121	J-52	J-144	8.0	PVC	145.0	267	1.71	Open	0.16
P-3	14	H-15	J-52	6.0	PVC	145.0	840	9.53	Open	0.62
P-4	331	J-25	J-52	8.0	PVC	145.0	575	3.67	Open	1.77
P-5	13	H-12	J-25	6.0	PVC	145.0	0	0.00	Open	0.00
P-6	397	J-144	J-51	6.0	AC	125.0	268	3.05	Open	2.77
P-7	14	H-7	J-51	6.0	AC	125.0	0	0.00	Open	0.00
P-8	315	J-29	J-163	6.0	AC	125.0	1	0.02	Open	0.00
P-9	13	H-56	J-29	6.0	AC	125.0	0	0.00	Open	0.00
P-10	645	H-48	J-22	6.0	PVC	145.0	0	0.00	Open	0.00
P-11	13	H-40	J-22	6.0	PVC	145.0	0	0.00	Open	0.00
P-12	396	J-35	J-25	8.0	PVC	145.0	578	3.69	Open	2.14
P-13	14	H-13	J-35	6.0	PVC	145.0	0	0.00	Open	0.00
P-14	132	J-146	J-35	8.0	PVC	145.0	581	3.71	Open	0.72
P-15	318	J-146	J-134	6.0	AC	125.0	170	1.93	Open	0.95
P-16	374	J-51	J-134	6.0	AC	125.0	271	3.08	Open	2.66
P-17	326	J-134	J-135	6.0	AC	125.0	272	3.08	Open	2.32
P-18	242	J-135	J-150	6.0	AC	125.0	152	1.72	Open	0.59
P-19	609	H-23	J-150	6.0	PVC	145.0	0	0.00	Open	0.00
P-20	55	J-134	J-19	6.0	AC	125.0	171	1.94	Open	0.17
P-21	13	H-16	J-19	6.0	AC	125.0	0	0.00	Open	0.00
P-22	255	J-157	J-29	6.0	AC	125.0	2	0.02	Open	0.00
P-23	201	J-28	J-157	6.0	PVC	145.0	2	0.02	Open	0.00
P-24	57	J-32	J-135	6.0	AC	125.0	121	1.37	Open	0.09
P-25	13	H-22	J-32	6.0	AC	125.0	0	0.00	Open	0.00
P-26	13	H-54	J-28	6.0	PVC	145.0	0	0.00	Open	0.00
P-27	160	J-150	J-45	6.0	AC	125.0	154	1.74	Open	0.40
P-28	14	H-24	J-45	6.0	AC	125.0	0	0.00	Open	0.00
P-29	557	H-38	J-10	6.0	PVC	145.0	0	0.00	Open	0.00
P-30	11	H-37	J-10	6.0	PVC	145.0	0	0.00	Open	0.00
P-31	178	J-20	J-146	8.0	AC	125.0	411	2.62	Open	0.67
P-32	13	H-10	J-20	6.0	AC	125.0	0	0.00	Open	0.00
P-33	198	J-15	J-157	6.0	AC	125.0	0	0.00	Open	0.00
P-34	12	H-55	J-15	6.0	AC	125.0	0	0.00	Open	0.00
P-35	517	J-12	J-22	6.0	PVC	145.0	3	0.03	Open	0.00
P-36	12	H-46	J-12	6.0	PVC	145.0	0	0.00	Open	0.00
P-37	61	J-138	J-12	6.0	PVC	145.0	3	0.04	Open	0.00

Calibration Test 2

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Status (Initial)	Headloss (ft)
P-38	610	J-138	J-10	6.0	PVC	145.0	1	0.02	Open	0.00
P-39	301	J-14	J-20	8.0	AC	125.0	413	2.64	Open	1.15
P-40	12	H-11	J-14	6.0	AC	125.0	0	0.00	Open	0.00
P-41	413	J-17	J-32	6.0	AC	125.0	122	1.38	Open	0.67
P-42	12	H-21	J-17	6.0	AC	125.0	0	0.00	Open	0.00
P-43	464	J-19	J-40	6.0	AC	125.0	173	1.97	Open	1.44
P-44	14	H-17	J-40	6.0	AC	125.0	0	0.00	Open	0.00
P-45	433	J-50	J-15	6.0	AC	125.0	2	0.02	Open	0.00
P-46	14	H-81	J-50	6.0	AC	125.0	0	0.00	Open	0.00
P-47	782	J-169	J-28	6.0	PVC	145.0	4	0.04	Open	0.00
P-48	291	J-168	J-169	6.0	AC	125.0	13	0.14	Open	0.01
P-49	50	J-169	J-26	6.0	AC	125.0	7	0.08	Open	0.00
P-50	336	J-26	J-50	6.0	AC	125.0	4	0.04	Open	0.00
P-51	13	H-53	J-26	6.0	AC	125.0	0	0.00	Open	0.00
P-52	303	J-21	J-14	8.0	AC	125.0	414	2.64	Open	1.17
P-53	13	H-8	J-21	6.0	AC	125.0	0	0.00	Open	0.00
P-54	396	J-42	J-166	6.0	AC	125.0	1	0.01	Open	0.00
P-55	35	J-110	J-42	6.0	AC	125.0	1	0.02	Open	0.00
P-56	14	H-36	J-42	6.0	AC	125.0	0	0.00	Open	0.00
P-57	474	J-30	J-110	6.0	AC	125.0	71	0.81	Open	0.28
P-58	639	J-45	J-116	6.0	AC	125.0	155	1.76	Open	1.61
P-59	41	J-116	J-30	6.0	AC	125.0	70	0.79	Open	0.02
P-60	13	H-25	J-30	6.0	AC	125.0	0	0.00	Open	0.00
P-61	36	J-113	J-114	6.0	AC	125.0	1	0.01	Open	0.00
P-62	156	J-114	J-168	6.0	PVC	145.0	18	0.21	Open	0.01
P-63	609	J-168	J-138	6.0	PVC	145.0	5	0.06	Open	0.00
P-64	88	J-76	J-139	6.0	CI	100.0	1	0.01	Open	0.00
P-65	21	H-57	J-76	6.0	CI	100.0	0	0.00	Open	0.00
P-66	91	J-140	J-76	6.0	CI	100.0	3	0.03	Open	0.00
P-67	615	J-16	J-17	6.0	AC	125.0	125	1.41	Open	1.04
P-68	12	H-20	J-16	6.0	AC	125.0	0	0.00	Open	0.00
P-69	769	J-140	J-23	6.0	CI	100.0	47	0.54	Open	0.33
P-70	197	J-114	J-130	6.0	AC	125.0	19	0.22	Open	0.01
P-71	51	J-23	J-130	6.0	CI	100.0	45	0.52	Open	0.02
P-72	592	J-40	J-39	6.0	AC	125.0	177	2.01	Open	1.91
P-73	14	H-18	J-39	6.0	AC	125.0	0	0.00	Open	0.00
P-74	341	J-24	J-21	8.0	AC	125.0	416	2.66	Open	1.32

Calibration Test 2

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Status (Initial)	Headloss (ft)
P-75	13	H-9	J-24	6.0	AC	125.0	0	0.00	Open	0.00
P-76	13	H-52	J-23	6.0	CI	100.0	0	0.00	Open	0.00
P-77	876	J-130	J-100	8.0	AC	125.0	208	1.33	Open	0.94
P-78	349	J-110	J-101	6.0	AC	125.0	74	0.84	Open	0.22
P-79	33	J-100	J-101	8.0	AC	125.0	207	1.32	Open	0.04
P-80	344	J-116	J-132	6.0	AC	125.0	86	0.98	Open	0.29
P-81	513	J-101	J-132	8.0	AC	125.0	131	0.84	Open	0.23
P-82	54	J-132	J-133	8.0	PVC	145.0	440	2.81	Open	0.18
P-83	50	J-129	J-16	6.0	AC	125.0	125	1.42	Open	0.08
P-84	258	J-133	J-129	8.0	PVC	145.0	438	2.80	Open	0.83
P-85	42	J-39	J-117	6.0	AC	125.0	179	2.03	Open	0.14
P-86	48	J-127	J-24	8.0	AC	125.0	417	2.66	Open	0.19
P-87	319	J-129	J-117	8.0	PVC	145.0	312	1.99	Open	0.55
P-88	319	J-117	J-127	8.0	PVC	145.0	132	0.85	Open	0.11
P-89	34	H-35	J-100	6.0	AC	125.0	0	0.00	Open	0.00
P-90	327	J-127	J-92	8.0	PVC	145.0	285	1.82	Open	0.48
P-91	113	J-92	J-142	8.0	PVC	145.0	285	1.82	Open	0.17
P-92	27	H-3	J-92	6.0	PVC	145.0	0	0.00	Open	0.00
P-93	106	J-141	J-133	8.0	PVC	145.0	1	0.01	Open	0.00
P-94	331	J-73	J-140	6.0	CI	100.0	52	0.59	Open	0.17
P-95	176	J-73	J-154	4.0	AC	125.0	2	0.06	Open	0.00
P-96	325	J-130	J-86	8.0	CI	100.0	183	1.17	Open	0.42
P-97	270	J-86	J-160	6.0	CI	100.0	2	0.02	Open	0.00
P-98	19	J-72	J-73	6.0	CI	100.0	55	0.62	Open	0.01
P-99	44	J-72	J-33	6.0	CI	100.0	25	0.28	Open	0.01
P-100	13	H-58	J-33	6.0	CI	100.0	0	0.00	Open	0.00
P-101	726	J-33	J-38	6.0	CI	100.0	21	0.24	Open	0.07
P-102	25	J-86	J-87	8.0	CI	100.0	185	1.18	Open	0.03
P-103	46	J-38	J-87	6.0	CI	100.0	18	0.21	Open	0.00
P-104	19	J-69	H-45	6.0	AC	125.0	0	0.00	Open	0.00
P-105	472	J-69	J-87	6.0	AC	125.0	52	0.59	Open	0.16
P-106	14	H-42	J-38	6.0	CI	100.0	0	0.00	Open	0.00
P-107	34	H-29	J-103	6.0	AC	125.0	0	0.00	Open	0.00
P-108	409	J-103	J-69	6.0	AC	125.0	50	0.57	Open	0.13
P-109	13	H-27	J-27	6.0	AC	125.0	0	0.00	Open	0.00
P-110	509	J-27	J-103	6.0	AC	125.0	46	0.53	Open	0.14
P-111	346	J-132	J-111	8.0	AC	125.0	397	2.53	Open	1.23

Calibration Test 2

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Status (Initial)	Headloss (ft)
P-112	36	J-111	J-27	6.0	AC	125.0	44	0.50	Open	0.01
P-113	954	J-18	J-111	6.0	AC	125.0	68	0.77	Open	0.52
P-114	12	H-6	J-18	6.0	AC	125.0	0	0.00	Open	0.00
P-115	346	J-165	J-72	6.0	CI	100.0	79	0.90	Open	0.38
P-116	763	J-68	J-165	6.0	CI	100.0	31	0.36	Open	0.15
P-117	350	J-87	J-128	8.0	CI	100.0	219	1.40	Open	0.63
P-118	49	J-128	J-68	6.0	CI	100.0	34	0.39	Open	0.01
P-119	559	J-53	J-128	6.0	CI	100.0	47	0.53	Open	0.23
P-120	17	H-50	J-68	6.0	CI	100.0	0	0.00	Open	0.00
P-121	367	J-156	J-53	6.0	CI	100.0	49	0.56	Open	0.17
P-122	14	H-43	J-53	6.0	CI	100.0	0	0.00	Open	0.00
P-123	479	J-83	J-156	6.0	CI	100.0	95	1.08	Open	0.74
P-124	354	J-111	J-82	8.0	AC	125.0	286	1.82	Open	0.68
P-125	23	J-82	J-83	6.0	CI	100.0	93	1.06	Open	0.04
P-126	34	H-19	J-104	6.0	AC	125.0	0	0.00	Open	0.00
P-127	264	J-104	J-82	6.0	AC	125.0	8	0.09	Open	0.00
P-128	306	J-158	J-18	6.0	AC	125.0	70	0.80	Open	0.18
P-129	651	J-158	J-104	6.0	AC	125.0	12	0.14	Open	0.02
P-130	231	J-158	J-94	6.0	PVC	145.0	1	0.01	Open	0.00
P-131	34	J-94	J-107	6.0	PVC	145.0	1	0.01	Open	0.00
P-132	34	H-31	J-83	6.0	CI	100.0	0	0.00	Open	0.00
P-133	28	J-94	H-4	6.0	PVC	145.0	0	0.00	Open	0.00
P-134	750	J-102	J-142	6.0	PVC	145.0	285	3.24	Open	4.45
P-135	34	J-102	H-2	6.0	PVC	145.0	0	0.00	Open	0.00
P-136	185	J-156	J-7	6.0	PVC	145.0	146	1.66	Open	0.32
P-137	9	H-26	J-7	6.0	PVC	145.0	0	0.00	Open	0.00
P-138	354	J-125	J-165	6.0	CI	100.0	52	0.60	Open	0.18
P-139	287	J-125	J-161	4.0	PVC	145.0	2	0.06	Open	0.00
P-140	47	J-63	J-125	6.0	CI	100.0	58	0.65	Open	0.03
P-141	715	J-47	J-63	6.0	CI	100.0	61	0.70	Open	0.49
P-142	16	H-59	J-63	6.0	CI	100.0	0	0.00	Open	0.00
P-143	350	J-128	J-123	8.0	CI	100.0	209	1.33	Open	0.57
P-144	45	J-123	J-47	6.0	CI	100.0	65	0.74	Open	0.04
P-145	179	J-155	J-123	4.0	CI	100.0	1	0.03	Open	0.00
P-146	312	J-106	J-158	6.0	AC	125.0	85	0.97	Open	0.26
P-147	34	H-5	J-106	6.0	AC	125.0	0	0.00	Open	0.00
P-148	325	J-82	J-70	6.0	AC	125.0	185	2.10	Open	1.14

Calibration Test 2

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Status (Initial)	Headloss (ft)
P-149	156	J-149	J-7	6.0	PVC	145.0	146	1.66	Open	0.27
P-150	14	H-49	J-47	6.0	CI	100.0	0	0.00	Open	0.00
P-151	166	J-152	J-149	6.0	PVC	145.0	15	0.17	Open	0.00
P-152	311	J-95	J-152	4.0	AC	125.0	15	0.38	Open	0.07
P-153	19	J-70	J-71	6.0	AC	125.0	276	3.13	Open	0.14
P-154	30	J-71	J-95	4.0	AC	125.0	14	0.36	Open	0.01
P-155	937	J-70	J-106	6.0	AC	125.0	90	1.02	Open	0.86
P-156	151	J-8	J-149	6.0	PVC	145.0	161	1.83	Open	0.31
P-157	9	H-32	J-8	6.0	PVC	145.0	0	0.00	Open	0.00
P-158	316	J-164	J-125	6.0	CI	100.0	2	0.02	Open	0.00
P-159	44	J-121	J-54	6.0	CI	100.0	0	0.00	Open	0.00
P-160	37	J-109	J-88	6.0	CI	100.0	0	0.00	Open	0.00
P-161	315	J-54	J-88	6.0	CI	100.0	1	0.02	Open	0.00
P-162	14	J-54	H-66	6.0	CI	100.0	0	0.00	Open	0.00
P-163	761	J-88	J-55	6.0	CI	100.0	42	0.48	Open	0.26
P-164	348	J-123	J-126	8.0	CI	100.0	276	1.76	Open	0.95
P-165	47	J-55	J-126	6.0	CI	100.0	38	0.43	Open	0.01
P-166	409	J-126	J-75	6.0	CI	100.0	62	0.70	Open	0.29
P-167	25	J-88	J-9	6.0	PVC	145.0	43	0.49	Open	0.00
P-168	10	J-9	H-64	6.0	PVC	145.0	0	0.00	Open	0.00
P-169	602	J-99	J-102	6.0	PVC	145.0	285	3.24	Open	3.57
P-170	15	H-51	J-55	6.0	CI	100.0	0	0.00	Open	0.00
P-171	32	H-1	J-99	6.0	PVC	145.0	0	0.00	Open	0.00
P-172	419	J-75	J-105	6.0	CI	100.0	30	0.34	Open	0.08
P-173	42	J-105	J-120	6.0	CI	100.0	30	0.34	Open	0.01
P-174	202	J-137	J-8	6.0	PVC	145.0	162	1.84	Open	0.42
P-175	59	J-120	J-137	6.0	CI	100.0	27	0.31	Open	0.01
P-176	348	J-71	J-61	6.0	AC	125.0	262	2.98	Open	2.33
P-177	511	J-137	J-61	6.0	CI	100.0	135	1.54	Open	1.52
P-178	16	J-61	J-62	12.0	PVC	145.0	398	1.13	Open	0.01
P-179	19	J-75	J-37	6.0	PVC	145.0	92	1.05	Open	0.01
P-180	14	H-44	J-37	6.0	PVC	145.0	0	0.00	Open	0.00
P-181	34	H-87	J-105	6.0	CI	100.0	0	0.00	Open	0.00
P-182	36	J-99	J-112	6.0	PVC	145.0	286	3.24	Open	0.21
P-183	1,329	J-62	J-112	12.0	PVC	145.0	766	2.17	Open	1.68
P-184	31	J-62	J-97	10.0	PVC	145.0	366	1.50	Open	0.02
P-185	34	H-80	J-97	6.0	PVC	145.0	0	0.00	Open	0.00

Calibration Test 2

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Status (Initial)	Headloss (ft)
P-186	148	J-120	J-148	4.0	AC	125.0	3	0.08	Open	0.00
P-187	337	J-148	J-162	4.0	PVC	145.0	2	0.04	Open	0.00
P-188	292	J-37	J-78	6.0	PVC	145.0	93	1.06	Open	0.22
P-189	22	H-39	J-78	6.0	PVC	145.0	0	0.00	Open	0.00
P-190	161	J-148	J-151	4.0	AC	125.0	1	0.03	Open	0.00
P-191	28	H-47	J-93	6.0	PVC	145.0	0	0.00	Open	0.00
P-192	341	J-126	J-98	8.0	CI	100.0	178	1.13	Open	0.41
P-193	32	J-98	J-93	8.0	PVC	145.0	66	0.42	Open	0.00
P-194	9	H-88	J-6	6.0	PVC	145.0	0	0.00	Open	0.00
P-195	324	J-6	J-167	10.0	PVC	145.0	212	0.87	Open	0.09
P-196	39	J-167	J-98	10.0	PVC	145.0	244	1.00	Open	0.01
P-197	24	J-85	J-78	6.0	PVC	145.0	93	1.06	Open	0.02
P-198	53	J-85	J-6	10.0	PVC	145.0	213	0.87	Open	0.02
P-199	382	J-46	J-34	8.0	PVC	145.0	3	0.02	Open	0.00
P-200	27	J-91	J-85	10.0	PVC	145.0	307	1.25	Open	0.02
P-201	358	J-9	J-143	6.0	PVC	145.0	45	0.52	Open	0.07
P-202	119	J-143	J-46	8.0	PVC	145.0	5	0.03	Open	0.00
P-203	14	J-34	H-67	6.0	PVC	145.0	0	0.00	Open	0.00
P-204	332	J-79	J-143	8.0	PVC	145.0	52	0.33	Open	0.02
P-205	26	J-89	J-79	8.0	PVC	145.0	54	0.34	Open	0.00
P-206	455	J-93	J-89	8.0	PVC	145.0	62	0.40	Open	0.04
P-207	14	H-65	J-46	6.0	PVC	145.0	0	0.00	Open	0.00
P-208	23	H-61	J-79	6.0	PVC	145.0	0	0.00	Open	0.00
P-209	428	J-97	J-90	10.0	PVC	145.0	365	1.49	Open	0.33
P-210	26	J-90	J-49	10.0	PVC	145.0	336	1.37	Open	0.02
P-211	327	J-49	J-131	6.0	CI	100.0	7	0.08	Open	0.00
P-212	136	J-91	J-147	10.0	PVC	145.0	307	1.25	Open	0.08
P-213	1,026	J-147	J-49	10.0	PVC	145.0	343	1.40	Open	0.71
P-214	203	J-41	J-90	10.0	PVC	145.0	28	0.12	Open	0.00
P-215	14	H-84	J-41	6.0	PVC	145.0	0	0.00	Open	0.00
P-216	53	J-36	J-131	6.0	CI	100.0	4	0.05	Open	0.00
P-217	14	H-34	J-36	6.0	CI	100.0	0	0.00	Open	0.00
P-218	4,852	J-112	T-1	14.0	PVC	145.0	1,052	2.19	Open	5.21
P-219	295	J-89	J-122	6.0	CI	100.0	5	0.06	Open	0.00
P-220	45	J-122	H-62	6.0	CI	100.0	0	0.00	Open	0.00
P-221	13	H-63	J-31	6.0	CI	100.0	0	0.00	Open	0.00
P-222	550	J-31	H-60	6.0	CI	100.0	0	0.00	Open	0.00

Calibration Test 2

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Status (Initial)	Headloss (ft)
P-223	308	J-122	J-31	6.0	CI	100.0	3	0.03	Open	0.00
P-224	23	H-41	J-59	6.0	PVC	145.0	0	0.00	Open	0.00
P-225	16	J-59	J-60	6.0	PVC	145.0	36	0.41	Open	0.00
P-226	283	J-147	J-59	6.0	PVC	145.0	36	0.41	Open	0.04
P-227	745	J-167	J-60	6.0	CI	100.0	33	0.37	Open	0.16
P-228	755	J-131	J-43	6.0	CI	100.0	3	0.04	Open	0.00
P-229	14	J-43	H-30	6.0	CI	100.0	0	0.00	Open	0.00
P-230	421	J-13	J-41	10.0	PVC	145.0	26	0.11	Open	0.00
P-231	12	H-83	J-13	6.0	PVC	145.0	0	0.00	Open	0.00
P-232	394	J-43	J-67	6.0	CI	100.0	5	0.06	Open	0.00
P-233	17	H-33	J-67	6.0	PVC	145.0	0	0.00	Open	0.00
P-234	741	J-44	J-36	6.0	CI	100.0	6	0.06	Open	0.01
P-235	14	H-28	J-44	6.0	CI	100.0	0	0.00	Open	0.00
P-236	381	J-58	J-13	10.0	PVC	145.0	20	0.08	Open	0.00
P-237	15	H-82	J-58	6.0	PVC	145.0	0	0.00	Open	0.00
P-238	515	J-67	J-84	6.0	PVC	145.0	6	0.06	Open	0.00
P-239	24	J-84	J-44	6.0	CI	100.0	7	0.08	Open	0.00
P-240	58	J-136	J-58	10.0	PVC	145.0	18	0.07	Open	0.00
P-241	311	J-84	J-136	8.0	PVC	145.0	12	0.08	Open	0.00
P-242	240	J-136	J-159	8.0	PVC	145.0	1	0.00	Open	0.00
P-243	303	J-74	J-136	10.0	PVC	145.0	4	0.02	Open	0.00
P-244	19	H-86	J-74	6.0	PVC	145.0	0	0.00	Open	0.00
P-245	17	H-85	J-66	6.0	PVC	145.0	0	0.00	Open	0.00
P-246	326	J-66	J-74	10.0	PVC	145.0	4	0.02	Open	0.00
P-247	298	J-11	J-66	10.0	PVC	145.0	2	0.01	Open	0.00
P-248	11	H-79	J-11	6.0	PVC	145.0	0	0.00	Open	0.00
P-249	275	J-65	J-11	10.0	PVC	145.0	2	0.01	Open	0.00
P-250	17	H-78	J-65	6.0	PVC	145.0	0	0.00	Open	0.00
P-251	208	J-5	J-65	10.0	PVC	145.0	1	0.00	Open	0.00
P-252	9	H-76	J-5	6.0	PVC	145.0	0	0.00	Open	0.00
P-253	34	H-77	J-108	6.0	PVC	145.0	0	0.00	Open	0.00
P-254	168	J-153	J-5	10.0	PVC	145.0	1	0.00	Open	0.00
P-255	215	J-108	J-153	8.0	PVC	145.0	0	0.00	Open	0.00
P-256	16	H-75	J-56	6.0	PVC	145.0	0	0.00	Open	0.00
P-257	262	J-153	J-56	10.0	PVC	145.0	0	0.00	Open	0.00
P-258	15	J-56	J-57	10.0	PVC	145.0	0	0.00	Open	0.00
P-259	201	J-48	J-153	10.0	PVC	145.0	1	0.00	Open	0.00

Calibration Test 2

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Status (Initial)	Headloss (ft)
P-260	14	H-74	J-48	6.0	PVC	145.0	0	0.00	Open	0.00
P-261	278	J-64	J-108	8.0	PVC	145.0	0	0.00	Open	0.00
P-262	16	H-73	J-64	6.0	PVC	145.0	0	0.00	Open	0.00
P-263	320	J-77	J-48	10.0	PVC	145.0	1	0.00	Open	0.00
P-264	21	H-72	J-77	6.0	PVC	145.0	0	0.00	Open	0.00
P-265	38	J-115	J-77	10.0	PVC	145.0	1	0.00	Open	0.00
P-266	416	J-115	J-64	8.0	PVC	145.0	1	0.00	Open	0.00
P-267	169	J-80	J-115	10.0	PVC	145.0	0	0.00	Open	0.00
P-268	23	H-71	J-80	6.0	PVC	145.0	0	0.00	Open	0.00
P-269	5	J-1	J-2	8.0	PVC	145.0	0	0.00	Open	0.00
P-270	19	H-70	J-1	6.0	PVC	145.0	0	0.00	Open	0.00
P-271	30	J-96	J-1	8.0	PVC	145.0	0	0.00	Open	0.00
P-272	140	J-145	J-80	10.0	PVC	145.0	0	0.00	Open	0.00
P-273	128	J-145	J-96	8.0	PVC	145.0	0	0.00	Open	0.00
P-274	46	J-124	J-96	8.0	PVC	145.0	0	0.00	Open	0.00
P-275	154	J-81	J-145	10.0	PVC	145.0	0	0.00	Open	0.00
P-276	23	H-69	J-81	6.0	PVC	145.0	0	0.00	Open	0.00
P-277	129	J-118	J-81	10.0	PVC	145.0	0	0.00	Open	0.00
P-278	42	J-118	J-119	8.0	PVC	145.0	0	0.00	Open	0.00
P-279	219	J-4	J-118	10.0	PVC	145.0	0	0.00	Open	0.00
P-280	14	H-68	J-4	6.0	PVC	145.0	0	0.00	Open	0.00
P-281	5	J-3	J-4	10.0	PVC	145.0	0	0.00	Open	0.00

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	4,946.77	<None>	<Collection: 0 items>	0	5,150.05	88
J-2	4,946.79	<None>	<Collection: 0 items>	0	5,150.05	88
J-3	4,942.68	<None>	<Collection: 0 items>	0	5,150.05	90
J-4	4,942.70	<None>	<Collection: 1 item>	0	5,150.05	90
J-5	4,949.16	<None>	<Collection: 0 items>	0	5,150.05	87
J-6	4,945.62	<None>	<Collection: 1 item>	1	5,149.22	88
J-7	4,967.68	<None>	<Collection: 0 items>	0	5,147.89	78
J-8	4,967.04	<None>	<Collection: 1 item>	1	5,148.47	78
J-9	4,941.09	<None>	<Collection: 1 item>	2	5,148.98	90

Calibration Test 2

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-10	4,967.33	<None>	<Collection: 1 item>	1	5,146.08	77
J-11	4,952.34	<None>	<Collection: 1 item>	1	5,150.05	86
J-12	4,966.10	<None>	<Collection: 1 item>	0	5,146.08	78
J-13	4,963.42	<None>	<Collection: 1 item>	6	5,150.05	81
J-14	4,987.70	<None>	<Collection: 1 item>	1	5,140.54	66
J-15	4,951.10	<None>	<Collection: 1 item>	2	5,146.08	84
J-16	4,976.26	<None>	<Collection: 1 item>	0	5,143.79	72
J-17	4,978.27	<None>	<Collection: 1 item>	3	5,142.75	71
J-18	4,978.93	<None>	<Collection: 1 item>	2	5,146.64	73
J-19	4,985.83	<None>	<Collection: 1 item>	2	5,139.84	67
J-20	4,989.01	<None>	<Collection: 1 item>	2	5,139.39	65
J-21	4,985.94	<None>	<Collection: 1 item>	2	5,141.71	67
J-22	4,970.88	<None>	<Collection: 1 item>	3	5,146.08	76
J-23	4,957.44	<None>	<Collection: 1 item>	2	5,146.12	82
J-24	4,982.04	<None>	<Collection: 1 item>	1	5,143.03	70
J-25	4,990.57	<None>	<Collection: 1 item>	3	5,135.86	63
J-26	4,956.35	<None>	<Collection: 1 item>	3	5,146.08	82
J-27	4,971.54	<None>	<Collection: 1 item>	2	5,146.12	76
J-28	4,960.63	<None>	<Collection: 1 item>	2	5,146.08	80
J-29	4,961.21	<None>	<Collection: 1 item>	1	5,146.08	80
J-30	4,971.22	<None>	<Collection: 1 item>	1	5,144.62	75
J-31	4,937.30	<None>	<Collection: 1 item>	3	5,149.07	92
J-32	4,980.67	<None>	<Collection: 1 item>	1	5,142.09	70
J-33	4,947.26	<None>	<Collection: 1 item>	3	5,146.62	86
J-34	4,934.12	<None>	<Collection: 1 item>	3	5,149.05	93
J-35	4,990.23	<None>	<Collection: 1 item>	2	5,138.00	64
J-36	4,964.68	<None>	<Collection: 1 item>	2	5,150.04	80
J-37	4,955.99	<None>	<Collection: 1 item>	1	5,149.00	84
J-38	4,950.48	<None>	<Collection: 1 item>	3	5,146.55	85
J-39	4,980.38	<None>	<Collection: 1 item>	2	5,143.19	70
J-40	4,982.74	<None>	<Collection: 1 item>	4	5,141.28	69
J-41	4,966.65	<None>	<Collection: 1 item>	2	5,150.05	79
J-42	4,965.11	<None>	<Collection: 1 item>	0	5,144.90	78
J-43	4,964.42	<None>	<Collection: 1 item>	2	5,150.04	80
J-44	4,958.73	<None>	<Collection: 1 item>	1	5,150.05	83
J-45	4,971.04	<None>	<Collection: 1 item>	1	5,142.98	74
J-46	4,937.71	<None>	<Collection: 1 item>	3	5,149.05	91

Calibration Test 2

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-47	4,946.44	<None>	<Collection: 1 item>	4	5,147.71	87
J-48	4,949.12	<None>	<Collection: 0 items>	0	5,150.05	87
J-49	4,965.98	<None>	<Collection: 1 item>	0	5,150.04	80
J-50	4,949.20	<None>	<Collection: 1 item>	2	5,146.08	85
J-51	4,986.79	<None>	<Collection: 1 item>	3	5,137.01	65
J-52	4,988.58	<None>	<Collection: 1 item>	3	5,134.08	63
J-53	4,964.72	<None>	<Collection: 1 item>	2	5,147.40	79
J-54	4,938.98	<None>	<Collection: 1 item>	1	5,148.97	91
J-55	4,944.47	<None>	<Collection: 1 item>	4	5,148.71	88
J-56	4,951.02	<None>	<Collection: 0 items>	0	5,150.05	86
J-57	4,951.10	<None>	<Collection: 0 items>	0	5,150.05	86
J-58	4,959.85	<None>	<Collection: 1 item>	2	5,150.05	82
J-59	4,943.81	<None>	<Collection: 0 items>	0	5,149.29	89
J-60	4,943.65	<None>	<Collection: 1 item>	3	5,149.29	89
J-61	4,969.60	<None>	<Collection: 1 item>	1	5,150.41	78
J-62	4,969.72	<None>	<Collection: 1 item>	1	5,150.41	78
J-63	4,944.43	<None>	<Collection: 1 item>	4	5,147.22	88
J-64	4,947.08	<None>	<Collection: 1 item>	1	5,150.05	88
J-65	4,950.27	<None>	<Collection: 1 item>	1	5,150.05	86
J-66	4,953.86	<None>	<Collection: 1 item>	2	5,150.05	85
J-67	4,963.80	<None>	<Collection: 1 item>	1	5,150.05	81
J-68	4,948.69	<None>	<Collection: 1 item>	3	5,147.16	86
J-69	4,964.06	<None>	<Collection: 1 item>	2	5,146.39	79
J-70	4,971.06	<None>	<Collection: 1 item>	1	5,147.94	77
J-71	4,971.00	<None>	<Collection: 1 item>	1	5,148.07	77
J-72	4,946.84	<None>	<Collection: 1 item>	0	5,146.63	86
J-73	4,946.84	<None>	<Collection: 0 items>	0	5,146.62	86
J-74	4,956.35	<None>	<Collection: 0 items>	0	5,150.05	84
J-75	4,956.02	<None>	<Collection: 0 items>	0	5,148.98	83
J-76	4,946.57	<None>	<Collection: 1 item>	2	5,146.45	86
J-77	4,947.98	<None>	<Collection: 0 items>	0	5,150.05	87
J-78	4,952.58	<None>	<Collection: 1 item>	0	5,149.22	85
J-79	4,939.94	<None>	<Collection: 1 item>	2	5,149.07	90
J-80	4,947.37	<None>	<Collection: 0 items>	0	5,150.05	88
J-81	4,944.97	<None>	<Collection: 0 items>	0	5,150.05	89
J-82	4,972.06	<None>	<Collection: 1 item>	0	5,146.80	76
J-83	4,971.83	<None>	<Collection: 1 item>	2	5,146.83	76

Calibration Test 2

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-84	4,958.52	<None>	<Collection: 0 items>	0	5,150.05	83
J-85	4,952.11	<None>	<Collection: 0 items>	0	5,149.23	85
J-86	4,950.96	<None>	<Collection: 1 item>	1	5,146.52	85
J-87	4,950.89	<None>	<Collection: 1 item>	0	5,146.55	85
J-88	4,941.26	<None>	<Collection: 0 items>	0	5,148.97	90
J-89	4,939.99	<None>	<Collection: 1 item>	3	5,149.07	90
J-90	4,966.12	<None>	<Collection: 1 item>	1	5,150.05	80
J-91	4,951.95	<None>	<Collection: 0 items>	0	5,149.25	85
J-92	4,982.92	<None>	<Collection: 1 item>	1	5,143.69	70
J-93	4,942.35	<None>	<Collection: 1 item>	3	5,149.11	89
J-94	4,979.40	<None>	<Collection: 0 items>	0	5,146.81	72
J-95	4,970.77	<None>	<Collection: 1 item>	1	5,148.08	77
J-96	4,946.59	<None>	<Collection: 0 items>	0	5,150.05	88
J-97	4,969.57	<None>	<Collection: 1 item>	1	5,150.39	78
J-98	4,942.49	<None>	<Collection: 1 item>	0	5,149.11	89
J-99	4,977.43	<None>	<Collection: 1 item>	1	5,151.88	75
J-100	4,967.28	<None>	<Collection: 1 item>	1	5,145.16	77
J-101	4,967.02	<None>	<Collection: 1 item>	2	5,145.12	77
J-102	4,981.17	<None>	<Collection: 0 items>	0	5,148.31	72
J-103	4,968.24	<None>	<Collection: 1 item>	4	5,146.26	77
J-104	4,973.70	<None>	<Collection: 1 item>	4	5,146.80	75
J-105	4,966.50	<None>	<Collection: 0 items>	0	5,148.91	79
J-106	4,976.28	<None>	<Collection: 1 item>	4	5,147.08	74
J-107	4,979.62	<None>	<Collection: 1 item>	1	5,146.81	72
J-108	4,947.27	<None>	<Collection: 0 items>	0	5,150.05	88
J-109	4,941.50	<None>	<Collection: 0 items>	0	5,148.97	90
J-110	4,965.50	<None>	<Collection: 1 item>	1	5,144.90	78
J-111	4,971.83	<None>	<Collection: 1 item>	1	5,146.11	75
J-112	4,977.12	<None>	<Collection: 1 item>	0	5,152.09	76
J-113	4,963.32	<None>	<Collection: 1 item>	1	5,146.09	79
J-114	4,962.61	<None>	<Collection: 1 item>	0	5,146.09	79
J-115	4,947.76	<None>	<Collection: 0 items>	0	5,150.05	88
J-116	4,971.71	<None>	<Collection: 1 item>	1	5,144.59	75
J-117	4,980.00	<None>	<Collection: 1 item>	1	5,143.32	71
J-118	4,944.33	<None>	<Collection: 0 items>	0	5,150.05	89
J-119	4,944.43	<None>	<Collection: 0 items>	0	5,150.05	89
J-120	4,967.01	<None>	<Collection: 0 items>	0	5,148.90	79

Calibration Test 2

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-121	4,938.29	<None>	<Collection: 0 items>	0	5,148.97	91
J-122	4,938.83	<None>	<Collection: 1 item>	2	5,149.07	91
J-123	4,946.83	<None>	<Collection: 1 item>	0	5,147.75	87
J-124	4,946.32	<None>	<Collection: 0 items>	0	5,150.05	88
J-125	4,944.45	<None>	<Collection: 1 item>	1	5,147.19	88
J-126	4,944.54	<None>	<Collection: 1 item>	1	5,148.70	88
J-127	4,981.50	<None>	<Collection: 1 item>	0	5,143.21	70
J-128	4,949.00	<None>	<Collection: 1 item>	2	5,147.17	86
J-129	4,976.11	<None>	<Collection: 1 item>	1	5,143.88	73
J-130	4,958.12	<None>	<Collection: 1 item>	0	5,146.10	81
J-131	4,965.26	<None>	<Collection: 0 items>	0	5,150.04	80
J-132	4,971.98	<None>	<Collection: 1 item>	2	5,144.89	75
J-133	4,972.75	<None>	<Collection: 1 item>	0	5,144.71	74
J-134	4,986.04	<None>	<Collection: 1 item>	1	5,139.67	66
J-135	4,981.35	<None>	<Collection: 1 item>	1	5,141.99	70
J-136	4,959.31	<None>	<Collection: 1 item>	1	5,150.05	83
J-137	4,967.53	<None>	<Collection: 1 item>	1	5,148.89	78
J-138	4,966.15	<None>	<Collection: 1 item>	1	5,146.08	78
J-139	4,946.65	<None>	<Collection: 1 item>	1	5,146.45	86
J-140	4,946.74	<None>	<Collection: 1 item>	2	5,146.45	86
J-141	4,972.72	<None>	<Collection: 1 item>	1	5,144.71	74
J-142	4,983.83	<None>	<Collection: 0 items>	0	5,143.85	69
J-143	4,938.48	<None>	<Collection: 1 item>	1	5,149.05	91
J-144	4,987.29	<None>	<Collection: 1 item>	1	5,134.24	64
J-145	4,946.60	<None>	<Collection: 0 items>	0	5,150.05	88
J-146	4,989.71	<None>	<Collection: 1 item>	1	5,138.72	64
J-147	4,954.04	<None>	<Collection: 0 items>	0	5,149.33	84
J-148	4,967.18	<None>	<Collection: 0 items>	0	5,148.90	79
J-149	4,967.31	<None>	<Collection: 0 items>	0	5,148.16	78
J-150	4,974.81	<None>	<Collection: 1 item>	2	5,142.58	73
J-151	4,966.92	<None>	<Collection: 1 item>	1	5,148.90	79
J-152	4,968.60	<None>	<Collection: 1 item>	0	5,148.15	78
J-153	4,948.86	<None>	<Collection: 0 items>	0	5,150.05	87
J-154	4,945.51	<None>	<Collection: 1 item>	2	5,146.62	87
J-155	4,949.59	<None>	<Collection: 1 item>	1	5,147.75	86
J-156	4,967.97	<None>	<Collection: 1 item>	2	5,147.57	78
J-157	4,955.32	<None>	<Collection: 0 items>	0	5,146.08	83

Calibration Test 2

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-158	4,977.81	<None>	<Collection: 1 item>	2	5,146.81	73
J-159	4,960.05	<None>	<Collection: 1 item>	1	5,150.05	82
J-160	4,956.20	<None>	<Collection: 1 item>	2	5,146.51	82
J-161	4,944.19	<None>	<Collection: 1 item>	2	5,147.19	88
J-162	4,968.66	<None>	<Collection: 1 item>	2	5,148.90	78
J-163	4,966.83	<None>	<Collection: 1 item>	1	5,146.08	78
J-164	4,941.53	<None>	<Collection: 1 item>	2	5,147.19	89
J-165	4,946.78	<None>	<Collection: 1 item>	4	5,147.01	87
J-166	4,959.64	<None>	<Collection: 1 item>	1	5,144.90	80
J-167	4,942.78	<None>	<Collection: 1 item>	1	5,149.13	89
J-168	4,963.18	<None>	<Collection: 1 item>	0	5,146.08	79
J-169	4,957.37	<None>	<Collection: 1 item>	2	5,146.08	82

Hydrant Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Notes
H-1	4,977.69	<None>	<Collection: 0 items>	0	5,151.88	75	
H-2	4,981.41	<None>	<Collection: 0 items>	0	5,148.31	72	
H-3	4,982.68	<None>	<Collection: 0 items>	0	5,143.69	70	
H-4	4,979.33	<None>	<Collection: 0 items>	0	5,146.81	72	
H-5	4,976.07	<None>	<Collection: 0 items>	0	5,147.08	74	
H-6	4,978.87	<None>	<Collection: 0 items>	0	5,146.64	73	
H-7	4,986.68	<None>	<Collection: 0 items>	0	5,137.01	65	
H-8	4,985.89	<None>	<Collection: 0 items>	0	5,141.71	67	
H-9	4,982.05	<None>	<Collection: 0 items>	0	5,143.03	70	Test 1R
H-10	4,988.84	<None>	<Collection: 0 items>	0	5,139.39	65	
H-11	4,987.57	<None>	<Collection: 0 items>	0	5,140.54	66	Test 1F
H-12	4,990.46	<None>	<Collection: 0 items>	0	5,135.86	63	
H-13	4,990.08	<None>	<Collection: 0 items>	0	5,138.00	64	Test 2R
H-14	4,987.40	<None>	<Collection: 0 items>	0	5,134.24	64	
H-15	4,988.57	<None>	<Collection: 1 item>	840	5,133.46	63	Test 2F
H-16	4,985.68	<None>	<Collection: 0 items>	0	5,139.84	67	
H-17	4,982.47	<None>	<Collection: 0 items>	0	5,141.28	69	
H-18	4,980.24	<None>	<Collection: 0 items>	0	5,143.19	70	
H-19	4,973.78	<None>	<Collection: 0 items>	0	5,146.80	75	

Calibration Test 2

Hydrant Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Notes
H-20	4,976.07	<None>	<Collection: 0 items>	0	5,143.79	73	
H-21	4,978.08	<None>	<Collection: 0 items>	0	5,142.75	71	
H-22	4,980.35	<None>	<Collection: 0 items>	0	5,142.09	70	
H-23	4,985.15	<None>	<Collection: 0 items>	0	5,142.58	68	
H-24	4,970.28	<None>	<Collection: 0 items>	0	5,142.98	75	
H-25	4,971.26	<None>	<Collection: 0 items>	0	5,144.62	75	
H-26	4,967.82	<None>	<Collection: 0 items>	0	5,147.89	78	
H-27	4,971.58	<None>	<Collection: 0 items>	0	5,146.12	76	Test 4R
H-28	4,958.67	<None>	<Collection: 0 items>	0	5,150.05	83	
H-29	4,968.09	<None>	<Collection: 0 items>	0	5,146.26	77	
H-30	4,964.52	<None>	<Collection: 0 items>	0	5,150.04	80	
H-31	4,971.82	<None>	<Collection: 0 items>	0	5,146.83	76	
H-32	4,967.13	<None>	<Collection: 0 items>	0	5,148.47	78	
H-33	4,963.62	<None>	<Collection: 0 items>	0	5,150.05	81	Test 6F
H-34	4,964.67	<None>	<Collection: 0 items>	0	5,150.04	80	Test 6R
H-35	4,967.43	<None>	<Collection: 0 items>	0	5,145.16	77	
H-36	4,965.18	<None>	<Collection: 0 items>	0	5,144.90	78	
H-37	4,967.25	<None>	<Collection: 0 items>	0	5,146.08	77	
H-38	4,974.00	<None>	<Collection: 0 items>	0	5,146.08	74	
H-39	4,949.39	<None>	<Collection: 0 items>	0	5,149.22	86	
H-40	4,970.88	<None>	<Collection: 0 items>	0	5,146.08	76	
H-41	4,944.04	<None>	<Collection: 0 items>	0	5,149.29	89	
H-42	4,950.42	<None>	<Collection: 0 items>	0	5,146.55	85	
H-43	4,964.62	<None>	<Collection: 0 items>	0	5,147.40	79	
H-44	4,956.57	<None>	<Collection: 0 items>	0	5,149.00	83	
H-45	4,963.98	<None>	<Collection: 0 items>	0	5,146.39	79	Test 4F
H-46	4,966.28	<None>	<Collection: 0 items>	0	5,146.08	78	Test 3R
H-47	4,942.56	<None>	<Collection: 0 items>	0	5,149.11	89	
H-48	4,976.28	<None>	<Collection: 0 items>	0	5,146.08	73	Test 3F
H-49	4,946.39	<None>	<Collection: 0 items>	0	5,147.71	87	
H-50	4,948.60	<None>	<Collection: 0 items>	0	5,147.16	86	
H-51	4,944.39	<None>	<Collection: 0 items>	0	5,148.71	88	Test 5R
H-52	4,956.99	<None>	<Collection: 0 items>	0	5,146.12	82	
H-53	4,956.26	<None>	<Collection: 0 items>	0	5,146.08	82	
H-54	4,960.60	<None>	<Collection: 0 items>	0	5,146.08	80	
H-55	4,951.48	<None>	<Collection: 0 items>	0	5,146.08	84	
H-56	4,961.40	<None>	<Collection: 0 items>	0	5,146.08	80	

Calibration Test 2

Hydrant Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Notes
H-57	4,946.88	<None>	<Collection: 0 items>	0	5,146.45	86	
H-58	4,947.18	<None>	<Collection: 0 items>	0	5,146.62	86	
H-59	4,944.30	<None>	<Collection: 0 items>	0	5,147.22	88	
H-60	4,933.95	<None>	<Collection: 0 items>	0	5,149.07	93	
H-61	4,939.73	<None>	<Collection: 0 items>	0	5,149.07	91	
H-62	4,938.94	<None>	<Collection: 0 items>	0	5,149.07	91	
H-63	4,937.41	<None>	<Collection: 0 items>	0	5,149.07	92	
H-64	4,941.09	<None>	<Collection: 0 items>	0	5,148.98	90	Test 5F
H-65	4,937.70	<None>	<Collection: 0 items>	0	5,149.05	91	
H-66	4,938.87	<None>	<Collection: 0 items>	0	5,148.97	91	
H-67	4,933.99	<None>	<Collection: 0 items>	0	5,149.05	93	
H-68	4,942.76	<None>	<Collection: 0 items>	0	5,150.05	90	
H-69	4,944.87	<None>	<Collection: 0 items>	0	5,150.05	89	
H-70	4,946.74	<None>	<Collection: 0 items>	0	5,150.05	88	
H-71	4,947.35	<None>	<Collection: 0 items>	0	5,150.05	88	
H-72	4,948.10	<None>	<Collection: 0 items>	0	5,150.05	87	
H-73	4,947.24	<None>	<Collection: 0 items>	0	5,150.05	88	
H-74	4,949.19	<None>	<Collection: 0 items>	0	5,150.05	87	
H-75	4,951.02	<None>	<Collection: 0 items>	0	5,150.05	86	
H-76	4,949.25	<None>	<Collection: 0 items>	0	5,150.05	87	
H-77	4,947.22	<None>	<Collection: 0 items>	0	5,150.05	88	
H-78	4,950.38	<None>	<Collection: 0 items>	0	5,150.05	86	
H-79	4,952.45	<None>	<Collection: 0 items>	0	5,150.05	85	
H-80	4,969.76	<None>	<Collection: 0 items>	0	5,150.39	78	
H-81	4,949.59	<None>	<Collection: 0 items>	0	5,146.08	85	
H-82	4,959.85	<None>	<Collection: 0 items>	0	5,150.05	82	
H-83	4,963.42	<None>	<Collection: 0 items>	0	5,150.05	81	
H-84	4,966.80	<None>	<Collection: 0 items>	0	5,150.05	79	
H-85	4,953.95	<None>	<Collection: 0 items>	0	5,150.05	85	Test 7F
H-86	4,956.54	<None>	<Collection: 0 items>	0	5,150.05	84	Test 7R
H-87	4,966.58	<None>	<Collection: 0 items>	0	5,148.91	79	
H-88	4,945.68	<None>	<Collection: 0 items>	0	5,149.22	88	

Tank Table - Time: 0.00 hours

Calibration Test 2

Tank Table - Time: 0.00 hours

Label	Elevation (Base) (ft)	Elevation (Minimum) (ft)	Elevation (Initial) (ft)	Elevation (Maximum) (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)	Elevation (ft)	Diameter (ft)	Volume Full (Calculated) (MG)	Percent Full (%)
T-1	5,122.00	5,122.00	5,157.30	5,162.00	1,052	5,157.30	5,123.45	10.00	0.02	88.2

Calibration Test 7

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Status (Initial)	Headloss (ft)
P-1	153	H-14	J-144	6.0	AC	125.0	0	0.00	Open	0.00
P-2	121	J-52	J-144	8.0	PVC	145.0	14	0.09	Open	0.00
P-3	14	H-15	J-52	6.0	PVC	145.0	0	0.00	Open	0.00
P-4	331	J-25	J-52	8.0	PVC	145.0	17	0.11	Open	0.00
P-5	13	H-12	J-25	6.0	PVC	145.0	0	0.00	Open	0.00
P-6	397	J-144	J-51	6.0	AC	125.0	13	0.15	Open	0.01
P-7	14	H-7	J-51	6.0	AC	125.0	0	0.00	Open	0.00
P-8	315	J-29	J-163	6.0	AC	125.0	1	0.02	Open	0.00
P-9	13	H-56	J-29	6.0	AC	125.0	0	0.00	Open	0.00
P-10	645	H-48	J-22	6.0	PVC	145.0	0	0.00	Open	0.00
P-11	13	H-40	J-22	6.0	PVC	145.0	0	0.00	Open	0.00
P-12	396	J-35	J-25	8.0	PVC	145.0	20	0.13	Open	0.00
P-13	14	H-13	J-35	6.0	PVC	145.0	0	0.00	Open	0.00
P-14	132	J-146	J-35	8.0	PVC	145.0	23	0.14	Open	0.00
P-15	318	J-146	J-134	6.0	AC	125.0	25	0.28	Open	0.03
P-16	374	J-51	J-134	6.0	AC	125.0	11	0.12	Open	0.01
P-17	326	J-134	J-135	6.0	AC	125.0	39	0.44	Open	0.06
P-18	242	J-135	J-150	6.0	AC	125.0	28	0.32	Open	0.03
P-19	609	H-23	J-150	6.0	PVC	145.0	0	0.00	Open	0.00
P-20	55	J-134	J-19	6.0	AC	125.0	4	0.05	Open	0.00
P-21	13	H-16	J-19	6.0	AC	125.0	0	0.00	Open	0.00
P-22	255	J-157	J-29	6.0	AC	125.0	2	0.02	Open	0.00
P-23	201	J-28	J-157	6.0	PVC	145.0	2	0.02	Open	0.00
P-24	57	J-32	J-135	6.0	AC	125.0	9	0.10	Open	0.00
P-25	13	H-22	J-32	6.0	AC	125.0	0	0.00	Open	0.00
P-26	13	H-54	J-28	6.0	PVC	145.0	0	0.00	Open	0.00
P-27	160	J-150	J-45	6.0	AC	125.0	27	0.30	Open	0.02
P-28	14	H-24	J-45	6.0	AC	125.0	0	0.00	Open	0.00
P-29	557	H-38	J-10	6.0	PVC	145.0	0	0.00	Open	0.00
P-30	11	H-37	J-10	6.0	PVC	145.0	0	0.00	Open	0.00
P-31	178	J-20	J-146	8.0	AC	125.0	48	0.31	Open	0.01
P-32	13	H-10	J-20	6.0	AC	125.0	0	0.00	Open	0.00
P-33	198	J-15	J-157	6.0	AC	125.0	0	0.00	Open	0.00
P-34	12	H-55	J-15	6.0	AC	125.0	0	0.00	Open	0.00
P-35	517	J-12	J-22	6.0	PVC	145.0	3	0.03	Open	0.00
P-36	12	H-46	J-12	6.0	PVC	145.0	0	0.00	Open	0.00
P-37	61	J-138	J-12	6.0	PVC	145.0	3	0.04	Open	0.00

Calibration Test 7

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Status (Initial)	Headloss (ft)
P-38	610	J-138	J-10	6.0	PVC	145.0	1	0.02	Open	0.00
P-39	301	J-14	J-20	8.0	AC	125.0	50	0.32	Open	0.02
P-40	12	H-11	J-14	6.0	AC	125.0	0	0.00	Open	0.00
P-41	413	J-17	J-32	6.0	AC	125.0	8	0.09	Open	0.00
P-42	12	H-21	J-17	6.0	AC	125.0	0	0.00	Open	0.00
P-43	464	J-19	J-40	6.0	AC	125.0	7	0.08	Open	0.00
P-44	14	H-17	J-40	6.0	AC	125.0	0	0.00	Open	0.00
P-45	433	J-50	J-15	6.0	AC	125.0	2	0.02	Open	0.00
P-46	14	H-81	J-50	6.0	AC	125.0	0	0.00	Open	0.00
P-47	782	J-169	J-28	6.0	PVC	145.0	4	0.04	Open	0.00
P-48	291	J-168	J-169	6.0	AC	125.0	13	0.14	Open	0.01
P-49	50	J-169	J-26	6.0	AC	125.0	7	0.08	Open	0.00
P-50	336	J-26	J-50	6.0	AC	125.0	4	0.04	Open	0.00
P-51	13	H-53	J-26	6.0	AC	125.0	0	0.00	Open	0.00
P-52	303	J-21	J-14	8.0	AC	125.0	51	0.33	Open	0.02
P-53	13	H-8	J-21	6.0	AC	125.0	0	0.00	Open	0.00
P-54	396	J-42	J-166	6.0	AC	125.0	1	0.01	Open	0.00
P-55	35	J-110	J-42	6.0	AC	125.0	1	0.02	Open	0.00
P-56	14	H-36	J-42	6.0	AC	125.0	0	0.00	Open	0.00
P-57	474	J-30	J-110	6.0	AC	125.0	29	0.33	Open	0.06
P-58	639	J-45	J-116	6.0	AC	125.0	25	0.29	Open	0.06
P-59	41	J-116	J-30	6.0	AC	125.0	30	0.35	Open	0.01
P-60	13	H-25	J-30	6.0	AC	125.0	0	0.00	Open	0.00
P-61	36	J-113	J-114	6.0	AC	125.0	1	0.01	Open	0.00
P-62	156	J-114	J-168	6.0	PVC	145.0	18	0.21	Open	0.01
P-63	609	J-168	J-138	6.0	PVC	145.0	5	0.06	Open	0.00
P-64	88	J-76	J-139	6.0	CI	100.0	1	0.01	Open	0.00
P-65	21	H-57	J-76	6.0	CI	100.0	0	0.00	Open	0.00
P-66	91	J-140	J-76	6.0	CI	100.0	3	0.03	Open	0.00
P-67	615	J-16	J-17	6.0	AC	125.0	5	0.06	Open	0.00
P-68	12	H-20	J-16	6.0	AC	125.0	0	0.00	Open	0.00
P-69	769	J-140	J-23	6.0	CI	100.0	23	0.26	Open	0.08
P-70	197	J-114	J-130	6.0	AC	125.0	19	0.22	Open	0.01
P-71	51	J-23	J-130	6.0	CI	100.0	25	0.28	Open	0.01
P-72	592	J-40	J-39	6.0	AC	125.0	10	0.12	Open	0.01
P-73	14	H-18	J-39	6.0	AC	125.0	0	0.00	Open	0.00
P-74	341	J-24	J-21	8.0	AC	125.0	53	0.34	Open	0.03

Calibration Test 7

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Status (Initial)	Headloss (ft)
P-75	13	H-9	J-24	6.0	AC	125.0	0	0.00	Open	0.00
P-76	13	H-52	J-23	6.0	CI	100.0	0	0.00	Open	0.00
P-77	876	J-130	J-100	8.0	AC	125.0	105	0.67	Open	0.26
P-78	349	J-110	J-101	6.0	AC	125.0	27	0.30	Open	0.03
P-79	33	J-100	J-101	8.0	AC	125.0	106	0.68	Open	0.01
P-80	344	J-116	J-132	6.0	AC	125.0	6	0.07	Open	0.00
P-81	513	J-101	J-132	8.0	AC	125.0	81	0.52	Open	0.10
P-82	54	J-132	J-133	8.0	PVC	145.0	116	0.74	Open	0.01
P-83	50	J-129	J-16	6.0	AC	125.0	5	0.05	Open	0.00
P-84	258	J-133	J-129	8.0	PVC	145.0	118	0.75	Open	0.07
P-85	42	J-39	J-117	6.0	AC	125.0	12	0.14	Open	0.00
P-86	48	J-127	J-24	8.0	AC	125.0	53	0.34	Open	0.00
P-87	319	J-129	J-117	8.0	PVC	145.0	114	0.73	Open	0.08
P-88	319	J-117	J-127	8.0	PVC	145.0	127	0.81	Open	0.10
P-89	34	H-35	J-100	6.0	AC	125.0	0	0.00	Open	0.00
P-90	327	J-127	J-92	8.0	PVC	145.0	181	1.16	Open	0.21
P-91	113	J-92	J-142	8.0	PVC	145.0	182	1.16	Open	0.07
P-92	27	H-3	J-92	6.0	PVC	145.0	0	0.00	Open	0.00
P-93	106	J-141	J-133	8.0	PVC	145.0	1	0.01	Open	0.00
P-94	331	J-73	J-140	6.0	CI	100.0	18	0.20	Open	0.02
P-95	176	J-73	J-154	4.0	AC	125.0	2	0.06	Open	0.00
P-96	325	J-130	J-86	8.0	CI	100.0	61	0.39	Open	0.05
P-97	270	J-86	J-160	6.0	CI	100.0	2	0.02	Open	0.00
P-98	19	J-72	J-73	6.0	CI	100.0	15	0.17	Open	0.00
P-99	44	J-72	J-33	6.0	CI	100.0	15	0.16	Open	0.00
P-100	13	H-58	J-33	6.0	CI	100.0	0	0.00	Open	0.00
P-101	726	J-33	J-38	6.0	CI	100.0	18	0.20	Open	0.05
P-102	25	J-86	J-87	8.0	CI	100.0	58	0.37	Open	0.00
P-103	46	J-38	J-87	6.0	CI	100.0	21	0.23	Open	0.00
P-104	19	J-69	H-45	6.0	AC	125.0	0	0.00	Open	0.00
P-105	472	J-69	J-87	6.0	AC	125.0	45	0.52	Open	0.12
P-106	14	H-42	J-38	6.0	CI	100.0	0	0.00	Open	0.00
P-107	34	H-29	J-103	6.0	AC	125.0	0	0.00	Open	0.00
P-108	409	J-103	J-69	6.0	AC	125.0	48	0.54	Open	0.12
P-109	13	H-27	J-27	6.0	AC	125.0	0	0.00	Open	0.00
P-110	509	J-27	J-103	6.0	AC	125.0	52	0.59	Open	0.17
P-111	346	J-132	J-111	8.0	AC	125.0	27	0.17	Open	0.01

Calibration Test 7

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Status (Initial)	Headloss (ft)
P-112	36	J-111	J-27	6.0	AC	125.0	54	0.61	Open	0.01
P-113	954	J-18	J-111	6.0	AC	125.0	8	0.09	Open	0.01
P-114	12	H-6	J-18	6.0	AC	125.0	0	0.00	Open	0.00
P-115	346	J-165	J-72	6.0	CI	100.0	30	0.34	Open	0.06
P-116	763	J-68	J-165	6.0	CI	100.0	8	0.09	Open	0.01
P-117	350	J-87	J-128	8.0	CI	100.0	83	0.53	Open	0.10
P-118	49	J-128	J-68	6.0	CI	100.0	11	0.12	Open	0.00
P-119	559	J-53	J-128	6.0	CI	100.0	47	0.53	Open	0.23
P-120	17	H-50	J-68	6.0	CI	100.0	0	0.00	Open	0.00
P-121	367	J-156	J-53	6.0	CI	100.0	49	0.56	Open	0.17
P-122	14	H-43	J-53	6.0	CI	100.0	0	0.00	Open	0.00
P-123	479	J-83	J-156	6.0	CI	100.0	36	0.41	Open	0.12
P-124	354	J-111	J-82	8.0	AC	125.0	20	0.13	Open	0.00
P-125	23	J-82	J-83	6.0	CI	100.0	38	0.43	Open	0.01
P-126	34	H-19	J-104	6.0	AC	125.0	0	0.00	Open	0.00
P-127	264	J-104	J-82	6.0	AC	125.0	4	0.05	Open	0.00
P-128	306	J-158	J-18	6.0	AC	125.0	10	0.11	Open	0.00
P-129	651	J-158	J-104	6.0	AC	125.0	9	0.10	Open	0.01
P-130	231	J-158	J-94	6.0	PVC	145.0	1	0.01	Open	0.00
P-131	34	J-94	J-107	6.0	PVC	145.0	1	0.01	Open	0.00
P-132	34	H-31	J-83	6.0	CI	100.0	0	0.00	Open	0.00
P-133	28	J-94	H-4	6.0	PVC	145.0	0	0.00	Open	0.00
P-134	750	J-102	J-142	6.0	PVC	145.0	182	2.06	Open	1.93
P-135	34	J-102	H-2	6.0	PVC	145.0	0	0.00	Open	0.00
P-136	185	J-156	J-7	6.0	PVC	145.0	15	0.17	Open	0.00
P-137	9	H-26	J-7	6.0	PVC	145.0	0	0.00	Open	0.00
P-138	354	J-125	J-165	6.0	CI	100.0	33	0.38	Open	0.08
P-139	287	J-125	J-161	4.0	PVC	145.0	2	0.06	Open	0.00
P-140	47	J-63	J-125	6.0	CI	100.0	28	0.32	Open	0.01
P-141	715	J-47	J-63	6.0	CI	100.0	25	0.28	Open	0.09
P-142	16	H-59	J-63	6.0	CI	100.0	0	0.00	Open	0.00
P-143	350	J-128	J-123	8.0	CI	100.0	117	0.74	Open	0.19
P-144	45	J-123	J-47	6.0	CI	100.0	20	0.23	Open	0.00
P-145	179	J-155	J-123	4.0	CI	100.0	1	0.03	Open	0.00
P-146	312	J-106	J-158	6.0	AC	125.0	22	0.25	Open	0.02
P-147	34	H-5	J-106	6.0	AC	125.0	0	0.00	Open	0.00
P-148	325	J-82	J-70	6.0	AC	125.0	54	0.62	Open	0.12

Calibration Test 7

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Status (Initial)	Headloss (ft)
P-149	156	J-149	J-7	6.0	PVC	145.0	15	0.17	Open	0.00
P-150	14	H-49	J-47	6.0	CI	100.0	0	0.00	Open	0.00
P-151	166	J-152	J-149	6.0	PVC	145.0	26	0.30	Open	0.01
P-152	311	J-95	J-152	4.0	AC	125.0	27	0.68	Open	0.22
P-153	19	J-70	J-71	6.0	AC	125.0	81	0.92	Open	0.01
P-154	30	J-71	J-95	4.0	AC	125.0	27	0.70	Open	0.02
P-155	937	J-70	J-106	6.0	AC	125.0	26	0.30	Open	0.09
P-156	151	J-8	J-149	6.0	PVC	145.0	11	0.12	Open	0.00
P-157	9	H-32	J-8	6.0	PVC	145.0	0	0.00	Open	0.00
P-158	316	J-164	J-125	6.0	CI	100.0	2	0.02	Open	0.00
P-159	44	J-121	J-54	6.0	CI	100.0	0	0.00	Open	0.00
P-160	37	J-109	J-88	6.0	CI	100.0	0	0.00	Open	0.00
P-161	315	J-54	J-88	6.0	CI	100.0	1	0.02	Open	0.00
P-162	14	J-54	H-66	6.0	CI	100.0	0	0.00	Open	0.00
P-163	761	J-88	J-55	6.0	CI	100.0	29	0.33	Open	0.13
P-164	348	J-123	J-126	8.0	CI	100.0	135	0.86	Open	0.25
P-165	47	J-55	J-126	6.0	CI	100.0	34	0.38	Open	0.01
P-166	409	J-126	J-75	6.0	CI	100.0	11	0.12	Open	0.01
P-167	25	J-88	J-9	6.0	PVC	145.0	28	0.32	Open	0.00
P-168	10	J-9	H-64	6.0	PVC	145.0	0	0.00	Open	0.00
P-169	602	J-99	J-102	6.0	PVC	145.0	182	2.06	Open	1.55
P-170	15	H-51	J-55	6.0	CI	100.0	0	0.00	Open	0.00
P-171	32	H-1	J-99	6.0	PVC	145.0	0	0.00	Open	0.00
P-172	419	J-75	J-105	6.0	CI	100.0	97	1.10	Open	0.67
P-173	42	J-105	J-120	6.0	CI	100.0	97	1.10	Open	0.07
P-174	202	J-137	J-8	6.0	PVC	145.0	10	0.12	Open	0.00
P-175	59	J-120	J-137	6.0	CI	100.0	100	1.14	Open	0.10
P-176	348	J-71	J-61	6.0	AC	125.0	110	1.25	Open	0.46
P-177	511	J-137	J-61	6.0	CI	100.0	91	1.03	Open	0.72
P-178	16	J-61	J-62	12.0	PVC	145.0	201	0.57	Open	0.00
P-179	19	J-75	J-37	6.0	PVC	145.0	86	0.98	Open	0.01
P-180	14	H-44	J-37	6.0	PVC	145.0	0	0.00	Open	0.00
P-181	34	H-87	J-105	6.0	CI	100.0	0	0.00	Open	0.00
P-182	36	J-99	J-112	6.0	PVC	145.0	182	2.07	Open	0.09
P-183	1,329	J-62	J-112	12.0	PVC	145.0	1,144	3.25	Open	3.53
P-184	31	J-62	J-97	10.0	PVC	145.0	942	3.85	Open	0.14
P-185	34	H-80	J-97	6.0	PVC	145.0	0	0.00	Open	0.00

Calibration Test 7

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Status (Initial)	Headloss (ft)
P-186	148	J-120	J-148	4.0	AC	125.0	3	0.08	Open	0.00
P-187	337	J-148	J-162	4.0	PVC	145.0	2	0.04	Open	0.00
P-188	292	J-37	J-78	6.0	PVC	145.0	86	0.97	Open	0.19
P-189	22	H-39	J-78	6.0	PVC	145.0	0	0.00	Open	0.00
P-190	161	J-148	J-151	4.0	AC	125.0	1	0.03	Open	0.00
P-191	28	H-47	J-93	6.0	PVC	145.0	0	0.00	Open	0.00
P-192	341	J-126	J-98	8.0	CI	100.0	111	0.71	Open	0.17
P-193	32	J-98	J-93	8.0	PVC	145.0	5	0.03	Open	0.00
P-194	9	H-88	J-6	6.0	PVC	145.0	0	0.00	Open	0.00
P-195	324	J-6	J-167	10.0	PVC	145.0	97	0.40	Open	0.02
P-196	39	J-167	J-98	10.0	PVC	145.0	116	0.48	Open	0.00
P-197	24	J-85	J-78	6.0	PVC	145.0	85	0.97	Open	0.02
P-198	53	J-85	J-6	10.0	PVC	145.0	96	0.39	Open	0.00
P-199	382	J-46	J-34	8.0	PVC	145.0	3	0.02	Open	0.00
P-200	27	J-91	J-85	10.0	PVC	145.0	182	0.74	Open	0.01
P-201	358	J-9	J-143	6.0	PVC	145.0	26	0.29	Open	0.02
P-202	119	J-143	J-46	8.0	PVC	145.0	5	0.03	Open	0.00
P-203	14	J-34	H-67	6.0	PVC	145.0	0	0.00	Open	0.00
P-204	332	J-79	J-143	8.0	PVC	145.0	19	0.12	Open	0.00
P-205	26	J-89	J-79	8.0	PVC	145.0	17	0.11	Open	0.00
P-206	455	J-93	J-89	8.0	PVC	145.0	9	0.06	Open	0.00
P-207	14	H-65	J-46	6.0	PVC	145.0	0	0.00	Open	0.00
P-208	23	H-61	J-79	6.0	PVC	145.0	0	0.00	Open	0.00
P-209	428	J-97	J-90	10.0	PVC	145.0	941	3.84	Open	1.93
P-210	26	J-90	J-49	10.0	PVC	145.0	19	0.08	Open	0.00
P-211	327	J-49	J-131	6.0	CI	100.0	215	2.44	Open	2.29
P-212	136	J-91	J-147	10.0	PVC	145.0	182	0.74	Open	0.03
P-213	1,026	J-147	J-49	10.0	PVC	145.0	196	0.80	Open	0.25
P-214	203	J-41	J-90	10.0	PVC	145.0	921	3.76	Open	0.88
P-215	14	H-84	J-41	6.0	PVC	145.0	0	0.00	Open	0.00
P-216	53	J-36	J-131	6.0	CI	100.0	123	1.40	Open	0.13
P-217	14	H-34	J-36	6.0	CI	100.0	0	0.00	Open	0.00
P-218	4,852	J-112	T-1	14.0	PVC	145.0	1,327	2.77	Open	8.01
P-219	295	J-89	J-122	6.0	CI	100.0	5	0.06	Open	0.00
P-220	45	J-122	H-62	6.0	CI	100.0	0	0.00	Open	0.00
P-221	13	H-63	J-31	6.0	CI	100.0	0	0.00	Open	0.00
P-222	550	J-31	H-60	6.0	CI	100.0	0	0.00	Open	0.00

Calibration Test 7

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Status (Initial)	Headloss (ft)
P-223	308	J-122	J-31	6.0	CI	100.0	3	0.03	Open	0.00
P-224	23	H-41	J-59	6.0	PVC	145.0	0	0.00	Open	0.00
P-225	16	J-59	J-60	6.0	PVC	145.0	15	0.17	Open	0.00
P-226	283	J-147	J-59	6.0	PVC	145.0	15	0.17	Open	0.01
P-227	745	J-167	J-60	6.0	CI	100.0	18	0.20	Open	0.05
P-228	755	J-131	J-43	6.0	CI	100.0	92	1.04	Open	1.09
P-229	14	J-43	H-30	6.0	CI	100.0	0	0.00	Open	0.00
P-230	421	J-13	J-41	10.0	PVC	145.0	919	3.75	Open	1.81
P-231	12	H-83	J-13	6.0	PVC	145.0	0	0.00	Open	0.00
P-232	394	J-43	J-67	6.0	CI	100.0	90	1.02	Open	0.55
P-233	17	H-33	J-67	6.0	PVC	145.0	0	0.00	Open	0.00
P-234	741	J-44	J-36	6.0	CI	100.0	122	1.38	Open	1.81
P-235	14	H-28	J-44	6.0	CI	100.0	0	0.00	Open	0.00
P-236	381	J-58	J-13	10.0	PVC	145.0	913	3.73	Open	1.62
P-237	15	H-82	J-58	6.0	PVC	145.0	0	0.00	Open	0.00
P-238	515	J-67	J-84	6.0	PVC	145.0	89	1.01	Open	0.36
P-239	24	J-84	J-44	6.0	CI	100.0	121	1.37	Open	0.06
P-240	58	J-136	J-58	10.0	PVC	145.0	911	3.72	Open	0.24
P-241	311	J-84	J-136	8.0	PVC	145.0	210	1.34	Open	0.26
P-242	240	J-136	J-159	8.0	PVC	145.0	1	0.00	Open	0.00
P-243	303	J-74	J-136	10.0	PVC	145.0	1,119	4.57	Open	1.88
P-244	19	H-86	J-74	6.0	PVC	145.0	0	0.00	Open	0.00
P-245	17	H-85	J-66	6.0	PVC	145.0	1,115	12.65	Open	1.25
P-246	326	J-66	J-74	10.0	PVC	145.0	1,119	4.57	Open	2.02
P-247	298	J-11	J-66	10.0	PVC	145.0	2	0.01	Open	0.00
P-248	11	H-79	J-11	6.0	PVC	145.0	0	0.00	Open	0.00
P-249	275	J-65	J-11	10.0	PVC	145.0	2	0.01	Open	0.00
P-250	17	H-78	J-65	6.0	PVC	145.0	0	0.00	Open	0.00
P-251	208	J-5	J-65	10.0	PVC	145.0	1	0.00	Open	0.00
P-252	9	H-76	J-5	6.0	PVC	145.0	0	0.00	Open	0.00
P-253	34	H-77	J-108	6.0	PVC	145.0	0	0.00	Open	0.00
P-254	168	J-153	J-5	10.0	PVC	145.0	1	0.00	Open	0.00
P-255	215	J-108	J-153	8.0	PVC	145.0	0	0.00	Open	0.00
P-256	16	H-75	J-56	6.0	PVC	145.0	0	0.00	Open	0.00
P-257	262	J-153	J-56	10.0	PVC	145.0	0	0.00	Open	0.00
P-258	15	J-56	J-57	10.0	PVC	145.0	0	0.00	Open	0.00
P-259	201	J-48	J-153	10.0	PVC	145.0	1	0.00	Open	0.00

Calibration Test 7

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Status (Initial)	Headloss (ft)
P-260	14	H-74	J-48	6.0	PVC	145.0	0	0.00	Open	0.00
P-261	278	J-64	J-108	8.0	PVC	145.0	0	0.00	Open	0.00
P-262	16	H-73	J-64	6.0	PVC	145.0	0	0.00	Open	0.00
P-263	320	J-77	J-48	10.0	PVC	145.0	1	0.00	Open	0.00
P-264	21	H-72	J-77	6.0	PVC	145.0	0	0.00	Open	0.00
P-265	38	J-115	J-77	10.0	PVC	145.0	1	0.00	Open	0.00
P-266	416	J-115	J-64	8.0	PVC	145.0	1	0.00	Open	0.00
P-267	169	J-80	J-115	10.0	PVC	145.0	0	0.00	Open	0.00
P-268	23	H-71	J-80	6.0	PVC	145.0	0	0.00	Open	0.00
P-269	5	J-1	J-2	8.0	PVC	145.0	0	0.00	Open	0.00
P-270	19	H-70	J-1	6.0	PVC	145.0	0	0.00	Open	0.00
P-271	30	J-96	J-1	8.0	PVC	145.0	0	0.00	Open	0.00
P-272	140	J-145	J-80	10.0	PVC	145.0	0	0.00	Open	0.00
P-273	128	J-145	J-96	8.0	PVC	145.0	0	0.00	Open	0.00
P-274	46	J-124	J-96	8.0	PVC	145.0	0	0.00	Open	0.00
P-275	154	J-81	J-145	10.0	PVC	145.0	0	0.00	Open	0.00
P-276	23	H-69	J-81	6.0	PVC	145.0	0	0.00	Open	0.00
P-277	129	J-118	J-81	10.0	PVC	145.0	0	0.00	Open	0.00
P-278	42	J-118	J-119	8.0	PVC	145.0	0	0.00	Open	0.00
P-279	219	J-4	J-118	10.0	PVC	145.0	0	0.00	Open	0.00
P-280	14	H-68	J-4	6.0	PVC	145.0	0	0.00	Open	0.00
P-281	5	J-3	J-4	10.0	PVC	145.0	0	0.00	Open	0.00

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	4,946.77	<None>	<Collection: 0 items>	0	5,135.24	82
J-2	4,946.79	<None>	<Collection: 0 items>	0	5,135.24	82
J-3	4,942.68	<None>	<Collection: 0 items>	0	5,135.24	83
J-4	4,942.70	<None>	<Collection: 1 item>	0	5,135.24	83
J-5	4,949.16	<None>	<Collection: 0 items>	0	5,135.24	81
J-6	4,945.62	<None>	<Collection: 1 item>	1	5,143.99	86
J-7	4,967.68	<None>	<Collection: 0 items>	0	5,145.04	77
J-8	4,967.04	<None>	<Collection: 1 item>	1	5,145.04	77
J-9	4,941.09	<None>	<Collection: 1 item>	2	5,144.04	88

Calibration Test 7

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-10	4,967.33	<None>	<Collection: 1 item>	1	5,144.77	77
J-11	4,952.34	<None>	<Collection: 1 item>	1	5,135.24	79
J-12	4,966.10	<None>	<Collection: 1 item>	0	5,144.77	77
J-13	4,963.42	<None>	<Collection: 1 item>	6	5,141.01	77
J-14	4,987.70	<None>	<Collection: 1 item>	1	5,145.38	68
J-15	4,951.10	<None>	<Collection: 1 item>	2	5,144.77	84
J-16	4,976.26	<None>	<Collection: 1 item>	0	5,145.25	73
J-17	4,978.27	<None>	<Collection: 1 item>	3	5,145.25	72
J-18	4,978.93	<None>	<Collection: 1 item>	2	5,145.17	72
J-19	4,985.83	<None>	<Collection: 1 item>	2	5,145.32	69
J-20	4,989.01	<None>	<Collection: 1 item>	2	5,145.36	68
J-21	4,985.94	<None>	<Collection: 1 item>	2	5,145.41	69
J-22	4,970.88	<None>	<Collection: 1 item>	3	5,144.77	75
J-23	4,957.44	<None>	<Collection: 1 item>	2	5,144.79	81
J-24	4,982.04	<None>	<Collection: 1 item>	1	5,145.44	71
J-25	4,990.57	<None>	<Collection: 1 item>	3	5,145.34	67
J-26	4,956.35	<None>	<Collection: 1 item>	3	5,144.77	82
J-27	4,971.54	<None>	<Collection: 1 item>	2	5,145.14	75
J-28	4,960.63	<None>	<Collection: 1 item>	2	5,144.77	80
J-29	4,961.21	<None>	<Collection: 1 item>	1	5,144.77	79
J-30	4,971.22	<None>	<Collection: 1 item>	1	5,145.16	75
J-31	4,937.30	<None>	<Collection: 1 item>	3	5,144.01	89
J-32	4,980.67	<None>	<Collection: 1 item>	1	5,145.26	71
J-33	4,947.26	<None>	<Collection: 1 item>	3	5,144.68	85
J-34	4,934.12	<None>	<Collection: 1 item>	3	5,144.02	91
J-35	4,990.23	<None>	<Collection: 1 item>	2	5,145.35	67
J-36	4,964.68	<None>	<Collection: 1 item>	2	5,141.27	76
J-37	4,955.99	<None>	<Collection: 1 item>	1	5,144.18	81
J-38	4,950.48	<None>	<Collection: 1 item>	3	5,144.73	84
J-39	4,980.38	<None>	<Collection: 1 item>	2	5,145.34	71
J-40	4,982.74	<None>	<Collection: 1 item>	4	5,145.33	70
J-41	4,966.65	<None>	<Collection: 1 item>	2	5,142.82	76
J-42	4,965.11	<None>	<Collection: 1 item>	0	5,145.10	78
J-43	4,964.42	<None>	<Collection: 1 item>	2	5,140.31	76
J-44	4,958.73	<None>	<Collection: 1 item>	1	5,139.46	78
J-45	4,971.04	<None>	<Collection: 1 item>	1	5,145.22	75
J-46	4,937.71	<None>	<Collection: 1 item>	3	5,144.02	89

Calibration Test 7

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-47	4,946.44	<None>	<Collection: 1 item>	4	5,144.44	86
J-48	4,949.12	<None>	<Collection: 0 items>	0	5,135.24	81
J-49	4,965.98	<None>	<Collection: 1 item>	0	5,143.69	77
J-50	4,949.20	<None>	<Collection: 1 item>	2	5,144.77	85
J-51	4,986.79	<None>	<Collection: 1 item>	3	5,145.33	69
J-52	4,988.58	<None>	<Collection: 1 item>	3	5,145.34	68
J-53	4,964.72	<None>	<Collection: 1 item>	2	5,144.87	78
J-54	4,938.98	<None>	<Collection: 1 item>	1	5,144.04	89
J-55	4,944.47	<None>	<Collection: 1 item>	4	5,144.17	86
J-56	4,951.02	<None>	<Collection: 0 items>	0	5,135.24	80
J-57	4,951.10	<None>	<Collection: 0 items>	0	5,135.24	80
J-58	4,959.85	<None>	<Collection: 1 item>	2	5,139.39	78
J-59	4,943.81	<None>	<Collection: 0 items>	0	5,143.95	87
J-60	4,943.65	<None>	<Collection: 1 item>	3	5,143.95	87
J-61	4,969.60	<None>	<Collection: 1 item>	1	5,145.76	76
J-62	4,969.72	<None>	<Collection: 1 item>	1	5,145.76	76
J-63	4,944.43	<None>	<Collection: 1 item>	4	5,144.53	87
J-64	4,947.08	<None>	<Collection: 1 item>	1	5,135.24	81
J-65	4,950.27	<None>	<Collection: 1 item>	1	5,135.24	80
J-66	4,953.86	<None>	<Collection: 1 item>	2	5,135.24	78
J-67	4,963.80	<None>	<Collection: 1 item>	1	5,139.76	76
J-68	4,948.69	<None>	<Collection: 1 item>	3	5,144.63	85
J-69	4,964.06	<None>	<Collection: 1 item>	2	5,144.86	78
J-70	4,971.06	<None>	<Collection: 1 item>	1	5,145.28	75
J-71	4,971.00	<None>	<Collection: 1 item>	1	5,145.29	75
J-72	4,946.84	<None>	<Collection: 1 item>	0	5,144.68	86
J-73	4,946.84	<None>	<Collection: 0 items>	0	5,144.68	86
J-74	4,956.35	<None>	<Collection: 0 items>	0	5,137.27	78
J-75	4,956.02	<None>	<Collection: 0 items>	0	5,144.20	81
J-76	4,946.57	<None>	<Collection: 1 item>	2	5,144.70	86
J-77	4,947.98	<None>	<Collection: 0 items>	0	5,135.24	81
J-78	4,952.58	<None>	<Collection: 1 item>	0	5,144.00	83
J-79	4,939.94	<None>	<Collection: 1 item>	2	5,144.01	88
J-80	4,947.37	<None>	<Collection: 0 items>	0	5,135.24	81
J-81	4,944.97	<None>	<Collection: 0 items>	0	5,135.24	82
J-82	4,972.06	<None>	<Collection: 1 item>	0	5,145.16	75
J-83	4,971.83	<None>	<Collection: 1 item>	2	5,145.15	75

Calibration Test 7

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-84	4,958.52	<None>	<Collection: 0 items>	0	5,139.40	78
J-85	4,952.11	<None>	<Collection: 0 items>	0	5,143.98	83
J-86	4,950.96	<None>	<Collection: 1 item>	1	5,144.74	84
J-87	4,950.89	<None>	<Collection: 1 item>	0	5,144.74	84
J-88	4,941.26	<None>	<Collection: 0 items>	0	5,144.04	88
J-89	4,939.99	<None>	<Collection: 1 item>	3	5,144.01	88
J-90	4,966.12	<None>	<Collection: 1 item>	1	5,143.69	77
J-91	4,951.95	<None>	<Collection: 0 items>	0	5,143.98	83
J-92	4,982.92	<None>	<Collection: 1 item>	1	5,145.65	70
J-93	4,942.35	<None>	<Collection: 1 item>	3	5,144.01	87
J-94	4,979.40	<None>	<Collection: 0 items>	0	5,145.17	72
J-95	4,970.77	<None>	<Collection: 1 item>	1	5,145.27	75
J-96	4,946.59	<None>	<Collection: 0 items>	0	5,135.24	82
J-97	4,969.57	<None>	<Collection: 1 item>	1	5,145.62	76
J-98	4,942.49	<None>	<Collection: 1 item>	0	5,144.01	87
J-99	4,977.43	<None>	<Collection: 1 item>	1	5,149.20	74
J-100	4,967.28	<None>	<Collection: 1 item>	1	5,145.06	77
J-101	4,967.02	<None>	<Collection: 1 item>	2	5,145.07	77
J-102	4,981.17	<None>	<Collection: 0 items>	0	5,147.65	72
J-103	4,968.24	<None>	<Collection: 1 item>	4	5,144.98	76
J-104	4,973.70	<None>	<Collection: 1 item>	4	5,145.16	74
J-105	4,966.50	<None>	<Collection: 0 items>	0	5,144.87	77
J-106	4,976.28	<None>	<Collection: 1 item>	4	5,145.19	73
J-107	4,979.62	<None>	<Collection: 1 item>	1	5,145.17	72
J-108	4,947.27	<None>	<Collection: 0 items>	0	5,135.24	81
J-109	4,941.50	<None>	<Collection: 0 items>	0	5,144.04	88
J-110	4,965.50	<None>	<Collection: 1 item>	1	5,145.10	78
J-111	4,971.83	<None>	<Collection: 1 item>	1	5,145.16	75
J-112	4,977.12	<None>	<Collection: 1 item>	0	5,149.29	74
J-113	4,963.32	<None>	<Collection: 1 item>	1	5,144.78	79
J-114	4,962.61	<None>	<Collection: 1 item>	0	5,144.78	79
J-115	4,947.76	<None>	<Collection: 0 items>	0	5,135.24	81
J-116	4,971.71	<None>	<Collection: 1 item>	1	5,145.16	75
J-117	4,980.00	<None>	<Collection: 1 item>	1	5,145.34	72
J-118	4,944.33	<None>	<Collection: 0 items>	0	5,135.24	83
J-119	4,944.43	<None>	<Collection: 0 items>	0	5,135.24	83
J-120	4,967.01	<None>	<Collection: 0 items>	0	5,144.94	77

Calibration Test 7

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-121	4,938.29	<None>	<Collection: 0 items>	0	5,144.04	89
J-122	4,938.83	<None>	<Collection: 1 item>	2	5,144.01	89
J-123	4,946.83	<None>	<Collection: 1 item>	0	5,144.44	85
J-124	4,946.32	<None>	<Collection: 0 items>	0	5,135.24	82
J-125	4,944.45	<None>	<Collection: 1 item>	1	5,144.54	87
J-126	4,944.54	<None>	<Collection: 1 item>	1	5,144.18	86
J-127	4,981.50	<None>	<Collection: 1 item>	0	5,145.44	71
J-128	4,949.00	<None>	<Collection: 1 item>	2	5,144.63	85
J-129	4,976.11	<None>	<Collection: 1 item>	1	5,145.25	73
J-130	4,958.12	<None>	<Collection: 1 item>	0	5,144.79	81
J-131	4,965.26	<None>	<Collection: 0 items>	0	5,141.40	76
J-132	4,971.98	<None>	<Collection: 1 item>	2	5,145.16	75
J-133	4,972.75	<None>	<Collection: 1 item>	0	5,145.18	75
J-134	4,986.04	<None>	<Collection: 1 item>	1	5,145.32	69
J-135	4,981.35	<None>	<Collection: 1 item>	1	5,145.26	71
J-136	4,959.31	<None>	<Collection: 1 item>	1	5,139.14	78
J-137	4,967.53	<None>	<Collection: 1 item>	1	5,145.04	77
J-138	4,966.15	<None>	<Collection: 1 item>	1	5,144.77	77
J-139	4,946.65	<None>	<Collection: 1 item>	1	5,144.70	86
J-140	4,946.74	<None>	<Collection: 1 item>	2	5,144.70	86
J-141	4,972.72	<None>	<Collection: 1 item>	1	5,145.18	75
J-142	4,983.83	<None>	<Collection: 0 items>	0	5,145.72	70
J-143	4,938.48	<None>	<Collection: 1 item>	1	5,144.02	89
J-144	4,987.29	<None>	<Collection: 1 item>	1	5,145.34	68
J-145	4,946.60	<None>	<Collection: 0 items>	0	5,135.24	82
J-146	4,989.71	<None>	<Collection: 1 item>	1	5,145.35	67
J-147	4,954.04	<None>	<Collection: 0 items>	0	5,143.95	82
J-148	4,967.18	<None>	<Collection: 0 items>	0	5,144.94	77
J-149	4,967.31	<None>	<Collection: 0 items>	0	5,145.04	77
J-150	4,974.81	<None>	<Collection: 1 item>	2	5,145.23	74
J-151	4,966.92	<None>	<Collection: 1 item>	1	5,144.93	77
J-152	4,968.60	<None>	<Collection: 1 item>	0	5,145.05	76
J-153	4,948.86	<None>	<Collection: 0 items>	0	5,135.24	81
J-154	4,945.51	<None>	<Collection: 1 item>	2	5,144.68	86
J-155	4,949.59	<None>	<Collection: 1 item>	1	5,144.44	84
J-156	4,967.97	<None>	<Collection: 1 item>	2	5,145.03	77
J-157	4,955.32	<None>	<Collection: 0 items>	0	5,144.77	82

Calibration Test 7

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-158	4,977.81	<None>	<Collection: 1 item>	2	5,145.17	72
J-159	4,960.05	<None>	<Collection: 1 item>	1	5,139.14	77
J-160	4,956.20	<None>	<Collection: 1 item>	2	5,144.74	82
J-161	4,944.19	<None>	<Collection: 1 item>	2	5,144.54	87
J-162	4,968.66	<None>	<Collection: 1 item>	2	5,144.93	76
J-163	4,966.83	<None>	<Collection: 1 item>	1	5,144.77	77
J-164	4,941.53	<None>	<Collection: 1 item>	2	5,144.54	88
J-165	4,946.78	<None>	<Collection: 1 item>	4	5,144.62	86
J-166	4,959.64	<None>	<Collection: 1 item>	1	5,145.10	80
J-167	4,942.78	<None>	<Collection: 1 item>	1	5,144.01	87
J-168	4,963.18	<None>	<Collection: 1 item>	0	5,144.78	79
J-169	4,957.37	<None>	<Collection: 1 item>	2	5,144.77	81

Hydrant Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Notes
H-1	4,977.69	<None>	<Collection: 0 items>	0	5,149.20	74	
H-2	4,981.41	<None>	<Collection: 0 items>	0	5,147.65	72	
H-3	4,982.68	<None>	<Collection: 0 items>	0	5,145.65	71	
H-4	4,979.33	<None>	<Collection: 0 items>	0	5,145.17	72	
H-5	4,976.07	<None>	<Collection: 0 items>	0	5,145.19	73	
H-6	4,978.87	<None>	<Collection: 0 items>	0	5,145.17	72	
H-7	4,986.68	<None>	<Collection: 0 items>	0	5,145.33	69	
H-8	4,985.89	<None>	<Collection: 0 items>	0	5,145.41	69	
H-9	4,982.05	<None>	<Collection: 0 items>	0	5,145.44	71	Test 1R
H-10	4,988.84	<None>	<Collection: 0 items>	0	5,145.36	68	
H-11	4,987.57	<None>	<Collection: 0 items>	0	5,145.38	68	Test 1F
H-12	4,990.46	<None>	<Collection: 0 items>	0	5,145.34	67	
H-13	4,990.08	<None>	<Collection: 0 items>	0	5,145.35	67	Test 2R
H-14	4,987.40	<None>	<Collection: 0 items>	0	5,145.34	68	
H-15	4,988.57	<None>	<Collection: 0 items>	0	5,145.34	68	Test 2F
H-16	4,985.68	<None>	<Collection: 0 items>	0	5,145.32	69	
H-17	4,982.47	<None>	<Collection: 0 items>	0	5,145.33	70	
H-18	4,980.24	<None>	<Collection: 0 items>	0	5,145.34	71	
H-19	4,973.78	<None>	<Collection: 0 items>	0	5,145.16	74	

Calibration Test 7

Hydrant Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Notes
H-20	4,976.07	<None>	<Collection: 0 items>	0	5,145.25	73	
H-21	4,978.08	<None>	<Collection: 0 items>	0	5,145.25	72	
H-22	4,980.35	<None>	<Collection: 0 items>	0	5,145.26	71	
H-23	4,985.15	<None>	<Collection: 0 items>	0	5,145.23	69	
H-24	4,970.28	<None>	<Collection: 0 items>	0	5,145.22	76	
H-25	4,971.26	<None>	<Collection: 0 items>	0	5,145.16	75	
H-26	4,967.82	<None>	<Collection: 0 items>	0	5,145.04	77	
H-27	4,971.58	<None>	<Collection: 0 items>	0	5,145.14	75	Test 4R
H-28	4,958.67	<None>	<Collection: 0 items>	0	5,139.46	78	
H-29	4,968.09	<None>	<Collection: 0 items>	0	5,144.98	77	
H-30	4,964.52	<None>	<Collection: 0 items>	0	5,140.31	76	
H-31	4,971.82	<None>	<Collection: 0 items>	0	5,145.15	75	
H-32	4,967.13	<None>	<Collection: 0 items>	0	5,145.04	77	
H-33	4,963.62	<None>	<Collection: 0 items>	0	5,139.76	76	Test 6F
H-34	4,964.67	<None>	<Collection: 0 items>	0	5,141.27	76	Test 6R
H-35	4,967.43	<None>	<Collection: 0 items>	0	5,145.06	77	
H-36	4,965.18	<None>	<Collection: 0 items>	0	5,145.10	78	
H-37	4,967.25	<None>	<Collection: 0 items>	0	5,144.77	77	
H-38	4,974.00	<None>	<Collection: 0 items>	0	5,144.77	74	
H-39	4,949.39	<None>	<Collection: 0 items>	0	5,144.00	84	
H-40	4,970.88	<None>	<Collection: 0 items>	0	5,144.77	75	
H-41	4,944.04	<None>	<Collection: 0 items>	0	5,143.95	86	
H-42	4,950.42	<None>	<Collection: 0 items>	0	5,144.73	84	
H-43	4,964.62	<None>	<Collection: 0 items>	0	5,144.87	78	
H-44	4,956.57	<None>	<Collection: 0 items>	0	5,144.18	81	
H-45	4,963.98	<None>	<Collection: 0 items>	0	5,144.86	78	Test 4F
H-46	4,966.28	<None>	<Collection: 0 items>	0	5,144.77	77	Test 3R
H-47	4,942.56	<None>	<Collection: 0 items>	0	5,144.01	87	
H-48	4,976.28	<None>	<Collection: 0 items>	0	5,144.77	73	Test 3F
H-49	4,946.39	<None>	<Collection: 0 items>	0	5,144.44	86	
H-50	4,948.60	<None>	<Collection: 0 items>	0	5,144.63	85	
H-51	4,944.39	<None>	<Collection: 0 items>	0	5,144.17	86	Test 5R
H-52	4,956.99	<None>	<Collection: 0 items>	0	5,144.79	81	
H-53	4,956.26	<None>	<Collection: 0 items>	0	5,144.77	82	
H-54	4,960.60	<None>	<Collection: 0 items>	0	5,144.77	80	
H-55	4,951.48	<None>	<Collection: 0 items>	0	5,144.77	84	
H-56	4,961.40	<None>	<Collection: 0 items>	0	5,144.77	79	

Calibration Test 7

Hydrant Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Notes
H-57	4,946.88	<None>	<Collection: 0 items>	0	5,144.70	86	
H-58	4,947.18	<None>	<Collection: 0 items>	0	5,144.68	85	
H-59	4,944.30	<None>	<Collection: 0 items>	0	5,144.53	87	
H-60	4,933.95	<None>	<Collection: 0 items>	0	5,144.01	91	
H-61	4,939.73	<None>	<Collection: 0 items>	0	5,144.01	88	
H-62	4,938.94	<None>	<Collection: 0 items>	0	5,144.01	89	
H-63	4,937.41	<None>	<Collection: 0 items>	0	5,144.01	89	
H-64	4,941.09	<None>	<Collection: 0 items>	0	5,144.04	88	Test 5F
H-65	4,937.70	<None>	<Collection: 0 items>	0	5,144.02	89	
H-66	4,938.87	<None>	<Collection: 0 items>	0	5,144.04	89	
H-67	4,933.99	<None>	<Collection: 0 items>	0	5,144.02	91	
H-68	4,942.76	<None>	<Collection: 0 items>	0	5,135.24	83	
H-69	4,944.87	<None>	<Collection: 0 items>	0	5,135.24	82	
H-70	4,946.74	<None>	<Collection: 0 items>	0	5,135.24	82	
H-71	4,947.35	<None>	<Collection: 0 items>	0	5,135.24	81	
H-72	4,948.10	<None>	<Collection: 0 items>	0	5,135.24	81	
H-73	4,947.24	<None>	<Collection: 0 items>	0	5,135.24	81	
H-74	4,949.19	<None>	<Collection: 0 items>	0	5,135.24	80	
H-75	4,951.02	<None>	<Collection: 0 items>	0	5,135.24	80	
H-76	4,949.25	<None>	<Collection: 0 items>	0	5,135.24	80	
H-77	4,947.22	<None>	<Collection: 0 items>	0	5,135.24	81	
H-78	4,950.38	<None>	<Collection: 0 items>	0	5,135.24	80	
H-79	4,952.45	<None>	<Collection: 0 items>	0	5,135.24	79	
H-80	4,969.76	<None>	<Collection: 0 items>	0	5,145.62	76	
H-81	4,949.59	<None>	<Collection: 0 items>	0	5,144.77	84	
H-82	4,959.85	<None>	<Collection: 0 items>	0	5,139.39	78	
H-83	4,963.42	<None>	<Collection: 0 items>	0	5,141.01	77	
H-84	4,966.80	<None>	<Collection: 0 items>	0	5,142.82	76	
H-85	4,953.95	<None>	<Collection: 1 item>	1,115	5,133.99	78	Test 7F
H-86	4,956.54	<None>	<Collection: 0 items>	0	5,137.27	78	Test 7R
H-87	4,966.58	<None>	<Collection: 0 items>	0	5,144.87	77	
H-88	4,945.68	<None>	<Collection: 0 items>	0	5,143.99	86	

Tank Table - Time: 0.00 hours

Calibration Test 7

Tank Table - Time: 0.00 hours

Label	Elevation (Base) (ft)	Elevation (Minimum) (ft)	Elevation (Initial) (ft)	Elevation (Maximum) (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)	Elevation (ft)	Diameter (ft)	Volume Full (Calculated) (MG)	Percent Full (%)
T-1	5,122.00	5,122.00	5,157.30	5,162.00	1,327	5,157.30	5,123.45	10.00	0.02	88.2

Maximum Day

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Status (Initial)	Headloss (ft)
P-1	153	H-14	J-144	6.0	AC	125.0	0	0.00	Open	0.00
P-2	121	J-52	J-144	8.0	PVC	145.0	2	0.01	Open	0.00
P-3	14	H-15	J-52	6.0	PVC	145.0	0	0.00	Open	0.00
P-4	331	J-25	J-52	8.0	PVC	145.0	7	0.05	Open	0.00
P-5	13	H-12	J-25	6.0	PVC	145.0	0	0.00	Open	0.00
P-6	397	J-144	J-51	6.0	AC	125.0	0	0.01	Open	0.00
P-7	14	H-7	J-51	6.0	AC	125.0	0	0.00	Open	0.00
P-8	315	J-29	J-163	6.0	AC	125.0	3	0.03	Open	0.00
P-9	13	H-56	J-29	6.0	AC	125.0	0	0.00	Open	0.00
P-10	645	H-48	J-22	6.0	PVC	145.0	0	0.00	Open	0.00
P-11	13	H-40	J-22	6.0	PVC	145.0	0	0.00	Open	0.00
P-12	396	J-35	J-25	8.0	PVC	145.0	14	0.09	Open	0.00
P-13	14	H-13	J-35	6.0	PVC	145.0	0	0.00	Open	0.00
P-14	132	J-146	J-35	8.0	PVC	145.0	19	0.12	Open	0.00
P-15	318	J-146	J-134	6.0	AC	125.0	5	0.06	Open	0.00
P-16	374	J-51	J-134	6.0	AC	125.0	6	0.07	Open	0.00
P-17	326	J-134	J-135	6.0	AC	125.0	1	0.02	Open	0.00
P-18	242	J-135	J-150	6.0	AC	125.0	0	0.00	Open	0.00
P-19	609	H-23	J-150	6.0	PVC	145.0	0	0.00	Open	0.00
P-20	55	J-134	J-19	6.0	AC	125.0	2	0.02	Open	0.00
P-21	13	H-16	J-19	6.0	AC	125.0	0	0.00	Open	0.00
P-22	255	J-157	J-29	6.0	AC	125.0	4	0.05	Open	0.00
P-23	201	J-28	J-157	6.0	PVC	145.0	4	0.05	Open	0.00
P-24	57	J-32	J-135	6.0	AC	125.0	4	0.05	Open	0.00
P-25	13	H-22	J-32	6.0	AC	125.0	0	0.00	Open	0.00
P-26	13	H-54	J-28	6.0	PVC	145.0	0	0.00	Open	0.00
P-27	160	J-150	J-45	6.0	AC	125.0	3	0.04	Open	0.00
P-28	14	H-24	J-45	6.0	AC	125.0	0	0.00	Open	0.00
P-29	557	H-38	J-10	6.0	PVC	145.0	0	0.00	Open	0.00
P-30	11	H-37	J-10	6.0	PVC	145.0	0	0.00	Open	0.00
P-31	178	J-20	J-146	8.0	AC	125.0	25	0.16	Open	0.00
P-32	13	H-10	J-20	6.0	AC	125.0	0	0.00	Open	0.00
P-33	198	J-15	J-157	6.0	AC	125.0	0	0.00	Open	0.00
P-34	12	H-55	J-15	6.0	AC	125.0	0	0.00	Open	0.00
P-35	517	J-12	J-22	6.0	PVC	145.0	6	0.07	Open	0.00
P-36	12	H-46	J-12	6.0	PVC	145.0	0	0.00	Open	0.00
P-37	61	J-138	J-12	6.0	PVC	145.0	7	0.08	Open	0.00

Maximum Day

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Status (Initial)	Headloss (ft)
P-38	610	J-138	J-10	6.0	PVC	145.0	3	0.03	Open	0.00
P-39	301	J-14	J-20	8.0	AC	125.0	29	0.18	Open	0.01
P-40	12	H-11	J-14	6.0	AC	125.0	0	0.00	Open	0.00
P-41	413	J-17	J-32	6.0	AC	125.0	7	0.07	Open	0.00
P-42	12	H-21	J-17	6.0	AC	125.0	0	0.00	Open	0.00
P-43	464	J-19	J-40	6.0	AC	125.0	7	0.08	Open	0.00
P-44	14	H-17	J-40	6.0	AC	125.0	0	0.00	Open	0.00
P-45	433	J-50	J-15	6.0	AC	125.0	4	0.04	Open	0.00
P-46	14	H-81	J-50	6.0	AC	125.0	0	0.00	Open	0.00
P-47	782	J-169	J-28	6.0	PVC	145.0	8	0.09	Open	0.01
P-48	291	J-168	J-169	6.0	AC	125.0	26	0.30	Open	0.03
P-49	50	J-169	J-26	6.0	AC	125.0	15	0.17	Open	0.00
P-50	336	J-26	J-50	6.0	AC	125.0	8	0.09	Open	0.00
P-51	13	H-53	J-26	6.0	AC	125.0	0	0.00	Open	0.00
P-52	303	J-21	J-14	8.0	AC	125.0	32	0.20	Open	0.01
P-53	13	H-8	J-21	6.0	AC	125.0	0	0.00	Open	0.00
P-54	396	J-42	J-166	6.0	AC	125.0	2	0.02	Open	0.00
P-55	35	J-110	J-42	6.0	AC	125.0	3	0.03	Open	0.00
P-56	14	H-36	J-42	6.0	AC	125.0	0	0.00	Open	0.00
P-57	474	J-30	J-110	6.0	AC	125.0	5	0.06	Open	0.00
P-58	639	J-45	J-116	6.0	AC	125.0	6	0.07	Open	0.00
P-59	41	J-116	J-30	6.0	AC	125.0	7	0.08	Open	0.00
P-60	13	H-25	J-30	6.0	AC	125.0	0	0.00	Open	0.00
P-61	36	J-113	J-114	6.0	AC	125.0	1	0.02	Open	0.00
P-62	156	J-114	J-168	6.0	PVC	145.0	38	0.44	Open	0.02
P-63	609	J-168	J-138	6.0	PVC	145.0	11	0.13	Open	0.01
P-64	88	J-76	J-139	6.0	CI	100.0	1	0.02	Open	0.00
P-65	21	H-57	J-76	6.0	CI	100.0	0	0.00	Open	0.00
P-66	91	J-140	J-76	6.0	CI	100.0	6	0.06	Open	0.00
P-67	615	J-16	J-17	6.0	AC	125.0	12	0.14	Open	0.01
P-68	12	H-20	J-16	6.0	AC	125.0	0	0.00	Open	0.00
P-69	769	J-140	J-23	6.0	CI	100.0	5	0.05	Open	0.00
P-70	197	J-114	J-130	6.0	AC	125.0	41	0.46	Open	0.04
P-71	51	J-23	J-130	6.0	CI	100.0	9	0.10	Open	0.00
P-72	592	J-40	J-39	6.0	AC	125.0	14	0.16	Open	0.02
P-73	14	H-18	J-39	6.0	AC	125.0	0	0.00	Open	0.00
P-74	341	J-24	J-21	8.0	AC	125.0	35	0.23	Open	0.01

Maximum Day

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Status (Initial)	Headloss (ft)
P-75	13	H-9	J-24	6.0	AC	125.0	0	0.00	Open	0.00
P-76	13	H-52	J-23	6.0	CI	100.0	0	0.00	Open	0.00
P-77	876	J-130	J-100	8.0	AC	125.0	22	0.14	Open	0.02
P-78	349	J-110	J-101	6.0	AC	125.0	1	0.01	Open	0.00
P-79	33	J-100	J-101	8.0	AC	125.0	25	0.16	Open	0.00
P-80	344	J-116	J-132	6.0	AC	125.0	16	0.18	Open	0.01
P-81	513	J-101	J-132	8.0	AC	125.0	30	0.19	Open	0.02
P-82	54	J-132	J-133	8.0	PVC	145.0	7	0.04	Open	0.00
P-83	50	J-129	J-16	6.0	AC	125.0	13	0.15	Open	0.00
P-84	258	J-133	J-129	8.0	PVC	145.0	10	0.06	Open	0.00
P-85	42	J-39	J-117	6.0	AC	125.0	18	0.20	Open	0.00
P-86	48	J-127	J-24	8.0	AC	125.0	37	0.23	Open	0.00
P-87	319	J-129	J-117	8.0	PVC	145.0	25	0.16	Open	0.00
P-88	319	J-117	J-127	8.0	PVC	145.0	46	0.29	Open	0.02
P-89	34	H-35	J-100	6.0	AC	125.0	0	0.00	Open	0.00
P-90	327	J-127	J-92	8.0	PVC	145.0	83	0.53	Open	0.05
P-91	113	J-92	J-142	8.0	PVC	145.0	84	0.54	Open	0.02
P-92	27	H-3	J-92	6.0	PVC	145.0	0	0.00	Open	0.00
P-93	106	J-141	J-133	8.0	PVC	145.0	2	0.01	Open	0.00
P-94	331	J-73	J-140	6.0	CI	100.0	5	0.06	Open	0.00
P-95	176	J-73	J-154	4.0	AC	125.0	5	0.13	Open	0.01
P-96	325	J-130	J-86	8.0	CI	100.0	28	0.18	Open	0.01
P-97	270	J-86	J-160	6.0	CI	100.0	4	0.04	Open	0.00
P-98	19	J-72	J-73	6.0	CI	100.0	10	0.12	Open	0.00
P-99	44	J-72	J-33	6.0	CI	100.0	3	0.03	Open	0.00
P-100	13	H-58	J-33	6.0	CI	100.0	0	0.00	Open	0.00
P-101	726	J-33	J-38	6.0	CI	100.0	9	0.10	Open	0.01
P-102	25	J-86	J-87	8.0	CI	100.0	33	0.21	Open	0.00
P-103	46	J-38	J-87	6.0	CI	100.0	15	0.17	Open	0.00
P-104	19	J-69	H-45	6.0	AC	125.0	0	0.00	Open	0.00
P-105	472	J-69	J-87	6.0	AC	125.0	6	0.06	Open	0.00
P-106	14	H-42	J-38	6.0	CI	100.0	0	0.00	Open	0.00
P-107	34	H-29	J-103	6.0	AC	125.0	0	0.00	Open	0.00
P-108	409	J-103	J-69	6.0	AC	125.0	11	0.12	Open	0.01
P-109	13	H-27	J-27	6.0	AC	125.0	0	0.00	Open	0.00
P-110	509	J-27	J-103	6.0	AC	125.0	19	0.21	Open	0.03
P-111	346	J-132	J-111	8.0	AC	125.0	43	0.28	Open	0.02

Maximum Day

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Status (Initial)	Headloss (ft)
P-112	36	J-111	J-27	6.0	AC	125.0	23	0.26	Open	0.00
P-113	954	J-18	J-111	6.0	AC	125.0	11	0.12	Open	0.02
P-114	12	H-6	J-18	6.0	AC	125.0	0	0.00	Open	0.00
P-115	346	J-165	J-72	6.0	CI	100.0	8	0.10	Open	0.01
P-116	763	J-68	J-165	6.0	CI	100.0	15	0.17	Open	0.04
P-117	350	J-87	J-128	8.0	CI	100.0	43	0.28	Open	0.03
P-118	49	J-128	J-68	6.0	CI	100.0	20	0.23	Open	0.00
P-119	559	J-53	J-128	6.0	CI	100.0	18	0.21	Open	0.04
P-120	17	H-50	J-68	6.0	CI	100.0	0	0.00	Open	0.00
P-121	367	J-156	J-53	6.0	CI	100.0	23	0.26	Open	0.04
P-122	14	H-43	J-53	6.0	CI	100.0	0	0.00	Open	0.00
P-123	479	J-83	J-156	6.0	CI	100.0	20	0.22	Open	0.04
P-124	354	J-111	J-82	8.0	AC	125.0	57	0.37	Open	0.04
P-125	23	J-82	J-83	6.0	CI	100.0	16	0.18	Open	0.00
P-126	34	H-19	J-104	6.0	AC	125.0	0	0.00	Open	0.00
P-127	264	J-104	J-82	6.0	AC	125.0	12	0.13	Open	0.01
P-128	306	J-158	J-18	6.0	AC	125.0	16	0.18	Open	0.01
P-129	651	J-158	J-104	6.0	AC	125.0	2	0.03	Open	0.00
P-130	231	J-158	J-94	6.0	PVC	145.0	1	0.02	Open	0.00
P-131	34	J-94	J-107	6.0	PVC	145.0	1	0.02	Open	0.00
P-132	34	H-31	J-83	6.0	CI	100.0	0	0.00	Open	0.00
P-133	28	J-94	H-4	6.0	PVC	145.0	0	0.00	Open	0.00
P-134	750	J-102	J-142	6.0	PVC	145.0	84	0.96	Open	0.47
P-135	34	J-102	H-2	6.0	PVC	145.0	0	0.00	Open	0.00
P-136	185	J-156	J-7	6.0	PVC	145.0	47	0.54	Open	0.04
P-137	9	H-26	J-7	6.0	PVC	145.0	0	0.00	Open	0.00
P-138	354	J-125	J-165	6.0	CI	100.0	3	0.03	Open	0.00
P-139	287	J-125	J-161	4.0	PVC	145.0	5	0.13	Open	0.01
P-140	47	J-63	J-125	6.0	CI	100.0	14	0.15	Open	0.00
P-141	715	J-47	J-63	6.0	CI	100.0	21	0.24	Open	0.07
P-142	16	H-59	J-63	6.0	CI	100.0	0	0.00	Open	0.00
P-143	350	J-128	J-123	8.0	CI	100.0	50	0.32	Open	0.04
P-144	45	J-123	J-47	6.0	CI	100.0	30	0.34	Open	0.01
P-145	179	J-155	J-123	4.0	CI	100.0	3	0.07	Open	0.00
P-146	312	J-106	J-158	6.0	AC	125.0	20	0.22	Open	0.02
P-147	34	H-5	J-106	6.0	AC	125.0	0	0.00	Open	0.00
P-148	325	J-82	J-70	6.0	AC	125.0	54	0.62	Open	0.12

Maximum Day

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Status (Initial)	Headloss (ft)
P-149	156	J-149	J-7	6.0	PVC	145.0	47	0.54	Open	0.03
P-150	14	H-49	J-47	6.0	CI	100.0	0	0.00	Open	0.00
P-151	166	J-152	J-149	6.0	PVC	145.0	6	0.06	Open	0.00
P-152	311	J-95	J-152	4.0	AC	125.0	6	0.16	Open	0.02
P-153	19	J-70	J-71	6.0	AC	125.0	85	0.96	Open	0.02
P-154	30	J-71	J-95	4.0	AC	125.0	8	0.20	Open	0.00
P-155	937	J-70	J-106	6.0	AC	125.0	29	0.33	Open	0.11
P-156	151	J-8	J-149	6.0	PVC	145.0	42	0.47	Open	0.03
P-157	9	H-32	J-8	6.0	PVC	145.0	0	0.00	Open	0.00
P-158	316	J-164	J-125	6.0	CI	100.0	4	0.04	Open	0.00
P-159	44	J-121	J-54	6.0	CI	100.0	0	0.00	Open	0.00
P-160	37	J-109	J-88	6.0	CI	100.0	0	0.00	Open	0.00
P-161	315	J-54	J-88	6.0	CI	100.0	3	0.03	Open	0.00
P-162	14	J-54	H-66	6.0	CI	100.0	0	0.00	Open	0.00
P-163	761	J-88	J-55	6.0	CI	100.0	7	0.08	Open	0.01
P-164	348	J-123	J-126	8.0	CI	100.0	83	0.53	Open	0.10
P-165	47	J-55	J-126	6.0	CI	100.0	2	0.02	Open	0.00
P-166	409	J-126	J-75	6.0	CI	100.0	29	0.32	Open	0.07
P-167	25	J-88	J-9	6.0	PVC	145.0	10	0.11	Open	0.00
P-168	10	J-9	H-64	6.0	PVC	145.0	0	0.00	Open	0.00
P-169	602	J-99	J-102	6.0	PVC	145.0	84	0.96	Open	0.37
P-170	15	H-51	J-55	6.0	CI	100.0	0	0.00	Open	0.00
P-171	32	H-1	J-99	6.0	PVC	145.0	0	0.00	Open	0.00
P-172	419	J-75	J-105	6.0	CI	100.0	6	0.07	Open	0.00
P-173	42	J-105	J-120	6.0	CI	100.0	6	0.07	Open	0.00
P-174	202	J-137	J-8	6.0	PVC	145.0	43	0.49	Open	0.04
P-175	59	J-120	J-137	6.0	CI	100.0	13	0.15	Open	0.00
P-176	348	J-71	J-61	6.0	AC	125.0	95	1.07	Open	0.35
P-177	511	J-137	J-61	6.0	CI	100.0	57	0.65	Open	0.31
P-178	16	J-61	J-62	12.0	PVC	145.0	153	0.44	Open	0.00
P-179	19	J-75	J-37	6.0	PVC	145.0	22	0.25	Open	0.00
P-180	14	H-44	J-37	6.0	PVC	145.0	0	0.00	Open	0.00
P-181	34	H-87	J-105	6.0	CI	100.0	0	0.00	Open	0.00
P-182	36	J-99	J-112	6.0	PVC	145.0	86	0.97	Open	0.02
P-183	1,329	J-62	J-112	12.0	PVC	145.0	358	1.01	Open	0.41
P-184	31	J-62	J-97	10.0	PVC	145.0	201	0.82	Open	0.01
P-185	34	H-80	J-97	6.0	PVC	145.0	0	0.00	Open	0.00

Maximum Day

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Status (Initial)	Headloss (ft)
P-186	148	J-120	J-148	4.0	AC	125.0	6	0.16	Open	0.01
P-187	337	J-148	J-162	4.0	PVC	145.0	4	0.09	Open	0.00
P-188	292	J-37	J-78	6.0	PVC	145.0	24	0.27	Open	0.02
P-189	22	H-39	J-78	6.0	PVC	145.0	0	0.00	Open	0.00
P-190	161	J-148	J-151	4.0	AC	125.0	3	0.07	Open	0.00
P-191	28	H-47	J-93	6.0	PVC	145.0	0	0.00	Open	0.00
P-192	341	J-126	J-98	8.0	CI	100.0	59	0.38	Open	0.05
P-193	32	J-98	J-93	8.0	PVC	145.0	57	0.36	Open	0.00
P-194	9	H-88	J-6	6.0	PVC	145.0	0	0.00	Open	0.00
P-195	324	J-6	J-167	10.0	PVC	145.0	106	0.43	Open	0.03
P-196	39	J-167	J-98	10.0	PVC	145.0	117	0.48	Open	0.00
P-197	24	J-85	J-78	6.0	PVC	145.0	24	0.28	Open	0.00
P-198	53	J-85	J-6	10.0	PVC	145.0	107	0.44	Open	0.00
P-199	382	J-46	J-34	8.0	PVC	145.0	6	0.04	Open	0.00
P-200	27	J-91	J-85	10.0	PVC	145.0	131	0.54	Open	0.00
P-201	358	J-9	J-143	6.0	PVC	145.0	14	0.16	Open	0.01
P-202	119	J-143	J-46	8.0	PVC	145.0	11	0.07	Open	0.00
P-203	14	J-34	H-67	6.0	PVC	145.0	0	0.00	Open	0.00
P-204	332	J-79	J-143	8.0	PVC	145.0	28	0.18	Open	0.01
P-205	26	J-89	J-79	8.0	PVC	145.0	32	0.20	Open	0.00
P-206	455	J-93	J-89	8.0	PVC	145.0	50	0.32	Open	0.03
P-207	14	H-65	J-46	6.0	PVC	145.0	0	0.00	Open	0.00
P-208	23	H-61	J-79	6.0	PVC	145.0	0	0.00	Open	0.00
P-209	428	J-97	J-90	10.0	PVC	145.0	199	0.81	Open	0.11
P-210	26	J-90	J-49	10.0	PVC	145.0	159	0.65	Open	0.00
P-211	327	J-49	J-131	6.0	CI	100.0	6	0.07	Open	0.00
P-212	136	J-91	J-147	10.0	PVC	145.0	131	0.54	Open	0.02
P-213	1,026	J-147	J-49	10.0	PVC	145.0	152	0.62	Open	0.16
P-214	203	J-41	J-90	10.0	PVC	145.0	38	0.15	Open	0.00
P-215	14	H-84	J-41	6.0	PVC	145.0	0	0.00	Open	0.00
P-216	53	J-36	J-131	6.0	CI	100.0	4	0.05	Open	0.00
P-217	14	H-34	J-36	6.0	CI	100.0	0	0.00	Open	0.00
P-218	4,852	J-112	T-1	14.0	PVC	145.0	444	0.93	Open	1.05
P-219	295	J-89	J-122	6.0	CI	100.0	11	0.12	Open	0.01
P-220	45	J-122	H-62	6.0	CI	100.0	0	0.00	Open	0.00
P-221	13	H-63	J-31	6.0	CI	100.0	0	0.00	Open	0.00
P-222	550	J-31	H-60	6.0	CI	100.0	0	0.00	Open	0.00

Maximum Day

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Status (Initial)	Headloss (ft)
P-223	308	J-122	J-31	6.0	CI	100.0	6	0.07	Open	0.00
P-224	23	H-41	J-59	6.0	PVC	145.0	0	0.00	Open	0.00
P-225	16	J-59	J-60	6.0	PVC	145.0	21	0.24	Open	0.00
P-226	283	J-147	J-59	6.0	PVC	145.0	21	0.24	Open	0.01
P-227	745	J-167	J-60	6.0	CI	100.0	14	0.16	Open	0.03
P-228	755	J-131	J-43	6.0	CI	100.0	2	0.03	Open	0.00
P-229	14	J-43	H-30	6.0	CI	100.0	0	0.00	Open	0.00
P-230	421	J-13	J-41	10.0	PVC	145.0	33	0.14	Open	0.00
P-231	12	H-83	J-13	6.0	PVC	145.0	0	0.00	Open	0.00
P-232	394	J-43	J-67	6.0	CI	100.0	1	0.02	Open	0.00
P-233	17	H-33	J-67	6.0	PVC	145.0	0	0.00	Open	0.00
P-234	741	J-44	J-36	6.0	CI	100.0	1	0.01	Open	0.00
P-235	14	H-28	J-44	6.0	CI	100.0	0	0.00	Open	0.00
P-236	381	J-58	J-13	10.0	PVC	145.0	21	0.09	Open	0.00
P-237	15	H-82	J-58	6.0	PVC	145.0	0	0.00	Open	0.00
P-238	515	J-67	J-84	6.0	PVC	145.0	3	0.03	Open	0.00
P-239	24	J-84	J-44	6.0	CI	100.0	2	0.02	Open	0.00
P-240	58	J-136	J-58	10.0	PVC	145.0	16	0.07	Open	0.00
P-241	311	J-84	J-136	8.0	PVC	145.0	4	0.03	Open	0.00
P-242	240	J-136	J-159	8.0	PVC	145.0	1	0.01	Open	0.00
P-243	303	J-74	J-136	10.0	PVC	145.0	9	0.04	Open	0.00
P-244	19	H-86	J-74	6.0	PVC	145.0	0	0.00	Open	0.00
P-245	17	H-85	J-66	6.0	PVC	145.0	0	0.00	Open	0.00
P-246	326	J-66	J-74	10.0	PVC	145.0	9	0.04	Open	0.00
P-247	298	J-11	J-66	10.0	PVC	145.0	5	0.02	Open	0.00
P-248	11	H-79	J-11	6.0	PVC	145.0	0	0.00	Open	0.00
P-249	275	J-65	J-11	10.0	PVC	145.0	4	0.01	Open	0.00
P-250	17	H-78	J-65	6.0	PVC	145.0	0	0.00	Open	0.00
P-251	208	J-5	J-65	10.0	PVC	145.0	2	0.01	Open	0.00
P-252	9	H-76	J-5	6.0	PVC	145.0	0	0.00	Open	0.00
P-253	34	H-77	J-108	6.0	PVC	145.0	0	0.00	Open	0.00
P-254	168	J-153	J-5	10.0	PVC	145.0	2	0.01	Open	0.00
P-255	215	J-108	J-153	8.0	PVC	145.0	1	0.01	Open	0.00
P-256	16	H-75	J-56	6.0	PVC	145.0	0	0.00	Open	0.00
P-257	262	J-153	J-56	10.0	PVC	145.0	0	0.00	Open	0.00
P-258	15	J-56	J-57	10.0	PVC	145.0	0	0.00	Open	0.00
P-259	201	J-48	J-153	10.0	PVC	145.0	1	0.01	Open	0.00

Maximum Day

Pipe Table - Time: 0.00 hours

Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (Absolute) (gpm)	Velocity (ft/s)	Status (Initial)	Headloss (ft)
P-260	14	H-74	J-48	6.0	PVC	145.0	0	0.00	Open	0.00
P-261	278	J-64	J-108	8.0	PVC	145.0	1	0.01	Open	0.00
P-262	16	H-73	J-64	6.0	PVC	145.0	0	0.00	Open	0.00
P-263	320	J-77	J-48	10.0	PVC	145.0	1	0.01	Open	0.00
P-264	21	H-72	J-77	6.0	PVC	145.0	0	0.00	Open	0.00
P-265	38	J-115	J-77	10.0	PVC	145.0	1	0.01	Open	0.00
P-266	416	J-115	J-64	8.0	PVC	145.0	1	0.00	Open	0.00
P-267	169	J-80	J-115	10.0	PVC	145.0	1	0.00	Open	0.00
P-268	23	H-71	J-80	6.0	PVC	145.0	0	0.00	Open	0.00
P-269	5	J-1	J-2	8.0	PVC	145.0	0	0.00	Open	0.00
P-270	19	H-70	J-1	6.0	PVC	145.0	0	0.00	Open	0.00
P-271	30	J-96	J-1	8.0	PVC	145.0	0	0.00	Open	0.00
P-272	140	J-145	J-80	10.0	PVC	145.0	1	0.00	Open	0.00
P-273	128	J-145	J-96	8.0	PVC	145.0	0	0.00	Open	0.00
P-274	46	J-124	J-96	8.0	PVC	145.0	0	0.00	Open	0.00
P-275	154	J-81	J-145	10.0	PVC	145.0	1	0.00	Open	0.00
P-276	23	H-69	J-81	6.0	PVC	145.0	0	0.00	Open	0.00
P-277	129	J-118	J-81	10.0	PVC	145.0	1	0.00	Open	0.00
P-278	42	J-118	J-119	8.0	PVC	145.0	0	0.00	Open	0.00
P-279	219	J-4	J-118	10.0	PVC	145.0	1	0.00	Open	0.00
P-280	14	H-68	J-4	6.0	PVC	145.0	0	0.00	Open	0.00
P-281	5	J-3	J-4	10.0	PVC	145.0	0	0.00	Open	0.00

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	4,946.77	<None>	<Collection: 0 items>	0	5,155.71	90
J-2	4,946.79	<None>	<Collection: 0 items>	0	5,155.71	90
J-3	4,942.68	<None>	<Collection: 0 items>	0	5,155.71	92
J-4	4,942.70	<None>	<Collection: 1 item>	1	5,155.71	92
J-5	4,949.16	<None>	<Collection: 0 items>	0	5,155.71	89
J-6	4,945.62	<None>	<Collection: 1 item>	1	5,155.53	91
J-7	4,967.68	<None>	<Collection: 0 items>	0	5,155.43	81
J-8	4,967.04	<None>	<Collection: 1 item>	1	5,155.49	82
J-9	4,941.09	<None>	<Collection: 1 item>	4	5,155.46	93

Maximum Day

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-10	4,967.33	<None>	<Collection: 1 item>	3	5,155.19	81
J-11	4,952.34	<None>	<Collection: 1 item>	1	5,155.71	88
J-12	4,966.10	<None>	<Collection: 1 item>	1	5,155.19	82
J-13	4,963.42	<None>	<Collection: 1 item>	12	5,155.71	83
J-14	4,987.70	<None>	<Collection: 1 item>	3	5,155.29	73
J-15	4,951.10	<None>	<Collection: 1 item>	4	5,155.17	88
J-16	4,976.26	<None>	<Collection: 1 item>	1	5,155.29	77
J-17	4,978.27	<None>	<Collection: 1 item>	6	5,155.28	77
J-18	4,978.93	<None>	<Collection: 1 item>	5	5,155.33	76
J-19	4,985.83	<None>	<Collection: 1 item>	5	5,155.28	73
J-20	4,989.01	<None>	<Collection: 1 item>	4	5,155.28	72
J-21	4,985.94	<None>	<Collection: 1 item>	4	5,155.30	73
J-22	4,970.88	<None>	<Collection: 1 item>	6	5,155.19	80
J-23	4,957.44	<None>	<Collection: 1 item>	4	5,155.26	86
J-24	4,982.04	<None>	<Collection: 1 item>	1	5,155.31	75
J-25	4,990.57	<None>	<Collection: 1 item>	6	5,155.27	71
J-26	4,956.35	<None>	<Collection: 1 item>	7	5,155.17	86
J-27	4,971.54	<None>	<Collection: 1 item>	4	5,155.31	80
J-28	4,960.63	<None>	<Collection: 1 item>	4	5,155.17	84
J-29	4,961.21	<None>	<Collection: 1 item>	1	5,155.16	84
J-30	4,971.22	<None>	<Collection: 1 item>	2	5,155.28	80
J-31	4,937.30	<None>	<Collection: 1 item>	6	5,155.47	94
J-32	4,980.67	<None>	<Collection: 1 item>	2	5,155.28	76
J-33	4,947.26	<None>	<Collection: 1 item>	6	5,155.26	90
J-34	4,934.12	<None>	<Collection: 1 item>	6	5,155.47	96
J-35	4,990.23	<None>	<Collection: 1 item>	5	5,155.28	71
J-36	4,964.68	<None>	<Collection: 1 item>	4	5,155.71	83
J-37	4,955.99	<None>	<Collection: 1 item>	1	5,155.52	86
J-38	4,950.48	<None>	<Collection: 1 item>	6	5,155.27	89
J-39	4,980.38	<None>	<Collection: 1 item>	4	5,155.30	76
J-40	4,982.74	<None>	<Collection: 1 item>	8	5,155.28	75
J-41	4,966.65	<None>	<Collection: 1 item>	4	5,155.72	82
J-42	4,965.11	<None>	<Collection: 1 item>	1	5,155.28	82
J-43	4,964.42	<None>	<Collection: 1 item>	4	5,155.71	83
J-44	4,958.73	<None>	<Collection: 1 item>	2	5,155.71	85
J-45	4,971.04	<None>	<Collection: 1 item>	3	5,155.28	80
J-46	4,937.71	<None>	<Collection: 1 item>	6	5,155.47	94

Maximum Day

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-47	4,946.44	<None>	<Collection: 1 item>	9	5,155.34	90
J-48	4,949.12	<None>	<Collection: 0 items>	0	5,155.71	89
J-49	4,965.98	<None>	<Collection: 1 item>	1	5,155.72	82
J-50	4,949.20	<None>	<Collection: 1 item>	4	5,155.17	89
J-51	4,986.79	<None>	<Collection: 1 item>	6	5,155.27	73
J-52	4,988.58	<None>	<Collection: 1 item>	6	5,155.27	72
J-53	4,964.72	<None>	<Collection: 1 item>	5	5,155.35	82
J-54	4,938.98	<None>	<Collection: 1 item>	3	5,155.46	94
J-55	4,944.47	<None>	<Collection: 1 item>	9	5,155.45	91
J-56	4,951.02	<None>	<Collection: 0 items>	0	5,155.71	89
J-57	4,951.10	<None>	<Collection: 0 items>	0	5,155.71	89
J-58	4,959.85	<None>	<Collection: 1 item>	5	5,155.71	85
J-59	4,943.81	<None>	<Collection: 0 items>	0	5,155.54	92
J-60	4,943.65	<None>	<Collection: 1 item>	6	5,155.54	92
J-61	4,969.60	<None>	<Collection: 1 item>	1	5,155.83	81
J-62	4,969.72	<None>	<Collection: 1 item>	3	5,155.84	81
J-63	4,944.43	<None>	<Collection: 1 item>	8	5,155.27	91
J-64	4,947.08	<None>	<Collection: 1 item>	1	5,155.71	90
J-65	4,950.27	<None>	<Collection: 1 item>	1	5,155.71	89
J-66	4,953.86	<None>	<Collection: 1 item>	4	5,155.71	87
J-67	4,963.80	<None>	<Collection: 1 item>	1	5,155.71	83
J-68	4,948.69	<None>	<Collection: 1 item>	6	5,155.30	89
J-69	4,964.06	<None>	<Collection: 1 item>	5	5,155.28	83
J-70	4,971.06	<None>	<Collection: 1 item>	1	5,155.47	80
J-71	4,971.00	<None>	<Collection: 1 item>	2	5,155.48	80
J-72	4,946.84	<None>	<Collection: 1 item>	1	5,155.26	90
J-73	4,946.84	<None>	<Collection: 0 items>	0	5,155.26	90
J-74	4,956.35	<None>	<Collection: 0 items>	0	5,155.71	86
J-75	4,956.02	<None>	<Collection: 0 items>	0	5,155.52	86
J-76	4,946.57	<None>	<Collection: 1 item>	4	5,155.26	90
J-77	4,947.98	<None>	<Collection: 0 items>	0	5,155.71	90
J-78	4,952.58	<None>	<Collection: 1 item>	1	5,155.54	88
J-79	4,939.94	<None>	<Collection: 1 item>	4	5,155.48	93
J-80	4,947.37	<None>	<Collection: 0 items>	0	5,155.71	90
J-81	4,944.97	<None>	<Collection: 0 items>	0	5,155.71	91
J-82	4,972.06	<None>	<Collection: 1 item>	1	5,155.35	79
J-83	4,971.83	<None>	<Collection: 1 item>	4	5,155.35	79

Maximum Day

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-84	4,958.52	<None>	<Collection: 0 items>	0	5,155.71	85
J-85	4,952.11	<None>	<Collection: 0 items>	0	5,155.54	88
J-86	4,950.96	<None>	<Collection: 1 item>	1	5,155.28	88
J-87	4,950.89	<None>	<Collection: 1 item>	1	5,155.28	88
J-88	4,941.26	<None>	<Collection: 0 items>	0	5,155.46	93
J-89	4,939.99	<None>	<Collection: 1 item>	7	5,155.48	93
J-90	4,966.12	<None>	<Collection: 1 item>	2	5,155.72	82
J-91	4,951.95	<None>	<Collection: 0 items>	0	5,155.54	88
J-92	4,982.92	<None>	<Collection: 1 item>	1	5,155.36	75
J-93	4,942.35	<None>	<Collection: 1 item>	7	5,155.50	92
J-94	4,979.40	<None>	<Collection: 0 items>	0	5,155.34	76
J-95	4,970.77	<None>	<Collection: 1 item>	1	5,155.48	80
J-96	4,946.59	<None>	<Collection: 0 items>	0	5,155.71	90
J-97	4,969.57	<None>	<Collection: 1 item>	2	5,155.83	81
J-98	4,942.49	<None>	<Collection: 1 item>	1	5,155.50	92
J-99	4,977.43	<None>	<Collection: 1 item>	1	5,156.22	77
J-100	4,967.28	<None>	<Collection: 1 item>	3	5,155.28	81
J-101	4,967.02	<None>	<Collection: 1 item>	4	5,155.28	81
J-102	4,981.17	<None>	<Collection: 0 items>	0	5,155.85	76
J-103	4,968.24	<None>	<Collection: 1 item>	8	5,155.29	81
J-104	4,973.70	<None>	<Collection: 1 item>	9	5,155.34	79
J-105	4,966.50	<None>	<Collection: 0 items>	0	5,155.52	82
J-106	4,976.28	<None>	<Collection: 1 item>	9	5,155.36	77
J-107	4,979.62	<None>	<Collection: 1 item>	1	5,155.34	76
J-108	4,947.27	<None>	<Collection: 0 items>	0	5,155.71	90
J-109	4,941.50	<None>	<Collection: 0 items>	0	5,155.46	93
J-110	4,965.50	<None>	<Collection: 1 item>	3	5,155.28	82
J-111	4,971.83	<None>	<Collection: 1 item>	2	5,155.31	79
J-112	4,977.12	<None>	<Collection: 1 item>	1	5,156.25	77
J-113	4,963.32	<None>	<Collection: 1 item>	1	5,155.22	83
J-114	4,962.61	<None>	<Collection: 1 item>	1	5,155.22	83
J-115	4,947.76	<None>	<Collection: 0 items>	0	5,155.71	90
J-116	4,971.71	<None>	<Collection: 1 item>	3	5,155.28	79
J-117	4,980.00	<None>	<Collection: 1 item>	3	5,155.30	76
J-118	4,944.33	<None>	<Collection: 0 items>	0	5,155.71	91
J-119	4,944.43	<None>	<Collection: 0 items>	0	5,155.71	91
J-120	4,967.01	<None>	<Collection: 0 items>	0	5,155.52	82

Maximum Day

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-121	4,938.29	<None>	<Collection: 0 items>	0	5,155.46	94
J-122	4,938.83	<None>	<Collection: 1 item>	4	5,155.47	94
J-123	4,946.83	<None>	<Collection: 1 item>	1	5,155.35	90
J-124	4,946.32	<None>	<Collection: 0 items>	0	5,155.71	91
J-125	4,944.45	<None>	<Collection: 1 item>	2	5,155.27	91
J-126	4,944.54	<None>	<Collection: 1 item>	3	5,155.45	91
J-127	4,981.50	<None>	<Collection: 1 item>	1	5,155.32	75
J-128	4,949.00	<None>	<Collection: 1 item>	4	5,155.31	89
J-129	4,976.11	<None>	<Collection: 1 item>	2	5,155.29	78
J-130	4,958.12	<None>	<Collection: 1 item>	1	5,155.26	85
J-131	4,965.26	<None>	<Collection: 0 items>	0	5,155.71	82
J-132	4,971.98	<None>	<Collection: 1 item>	4	5,155.29	79
J-133	4,972.75	<None>	<Collection: 1 item>	1	5,155.29	79
J-134	4,986.04	<None>	<Collection: 1 item>	2	5,155.28	73
J-135	4,981.35	<None>	<Collection: 1 item>	3	5,155.28	75
J-136	4,959.31	<None>	<Collection: 1 item>	1	5,155.71	85
J-137	4,967.53	<None>	<Collection: 1 item>	1	5,155.53	81
J-138	4,966.15	<None>	<Collection: 1 item>	1	5,155.19	82
J-139	4,946.65	<None>	<Collection: 1 item>	1	5,155.26	90
J-140	4,946.74	<None>	<Collection: 1 item>	4	5,155.26	90
J-141	4,972.72	<None>	<Collection: 1 item>	2	5,155.29	79
J-142	4,983.83	<None>	<Collection: 0 items>	0	5,155.38	74
J-143	4,938.48	<None>	<Collection: 1 item>	2	5,155.47	94
J-144	4,987.29	<None>	<Collection: 1 item>	2	5,155.27	73
J-145	4,946.60	<None>	<Collection: 0 items>	0	5,155.71	90
J-146	4,989.71	<None>	<Collection: 1 item>	1	5,155.28	72
J-147	4,954.04	<None>	<Collection: 0 items>	0	5,155.56	87
J-148	4,967.18	<None>	<Collection: 0 items>	0	5,155.52	81
J-149	4,967.31	<None>	<Collection: 0 items>	0	5,155.46	81
J-150	4,974.81	<None>	<Collection: 1 item>	4	5,155.28	78
J-151	4,966.92	<None>	<Collection: 1 item>	3	5,155.51	82
J-152	4,968.60	<None>	<Collection: 1 item>	1	5,155.46	81
J-153	4,948.86	<None>	<Collection: 0 items>	0	5,155.71	89
J-154	4,945.51	<None>	<Collection: 1 item>	5	5,155.25	91
J-155	4,949.59	<None>	<Collection: 1 item>	3	5,155.34	89
J-156	4,967.97	<None>	<Collection: 1 item>	4	5,155.39	81
J-157	4,955.32	<None>	<Collection: 0 items>	0	5,155.17	86

Maximum Day

Junction Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-158	4,977.81	<None>	<Collection: 1 item>	5	5,155.34	77
J-159	4,960.05	<None>	<Collection: 1 item>	1	5,155.71	85
J-160	4,956.20	<None>	<Collection: 1 item>	4	5,155.27	86
J-161	4,944.19	<None>	<Collection: 1 item>	5	5,155.26	91
J-162	4,968.66	<None>	<Collection: 1 item>	4	5,155.51	81
J-163	4,966.83	<None>	<Collection: 1 item>	3	5,155.16	81
J-164	4,941.53	<None>	<Collection: 1 item>	4	5,155.27	92
J-165	4,946.78	<None>	<Collection: 1 item>	9	5,155.27	90
J-166	4,959.64	<None>	<Collection: 1 item>	2	5,155.28	85
J-167	4,942.78	<None>	<Collection: 1 item>	3	5,155.51	92
J-168	4,963.18	<None>	<Collection: 1 item>	1	5,155.20	83
J-169	4,957.37	<None>	<Collection: 1 item>	4	5,155.17	86

Hydrant Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Notes
H-1	4,977.69	<None>	<Collection: 0 items>	0	5,156.22	77	
H-2	4,981.41	<None>	<Collection: 0 items>	0	5,155.85	75	
H-3	4,982.68	<None>	<Collection: 0 items>	0	5,155.36	75	
H-4	4,979.33	<None>	<Collection: 0 items>	0	5,155.34	76	
H-5	4,976.07	<None>	<Collection: 0 items>	0	5,155.36	78	
H-6	4,978.87	<None>	<Collection: 0 items>	0	5,155.33	76	
H-7	4,986.68	<None>	<Collection: 0 items>	0	5,155.27	73	
H-8	4,985.89	<None>	<Collection: 0 items>	0	5,155.30	73	
H-9	4,982.05	<None>	<Collection: 0 items>	0	5,155.31	75	Test 1R
H-10	4,988.84	<None>	<Collection: 0 items>	0	5,155.28	72	
H-11	4,987.57	<None>	<Collection: 0 items>	0	5,155.29	73	Test 1F
H-12	4,990.46	<None>	<Collection: 0 items>	0	5,155.27	71	
H-13	4,990.08	<None>	<Collection: 0 items>	0	5,155.28	71	Test 2R
H-14	4,987.40	<None>	<Collection: 0 items>	0	5,155.27	73	
H-15	4,988.57	<None>	<Collection: 0 items>	0	5,155.27	72	Test 2F
H-16	4,985.68	<None>	<Collection: 0 items>	0	5,155.28	73	
H-17	4,982.47	<None>	<Collection: 0 items>	0	5,155.28	75	
H-18	4,980.24	<None>	<Collection: 0 items>	0	5,155.30	76	
H-19	4,973.78	<None>	<Collection: 0 items>	0	5,155.34	79	

Maximum Day

Hydrant Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Notes
H-20	4,976.07	<None>	<Collection: 0 items>	0	5,155.29	78	
H-21	4,978.08	<None>	<Collection: 0 items>	0	5,155.28	77	
H-22	4,980.35	<None>	<Collection: 0 items>	0	5,155.28	76	
H-23	4,985.15	<None>	<Collection: 0 items>	0	5,155.28	74	
H-24	4,970.28	<None>	<Collection: 0 items>	0	5,155.28	80	
H-25	4,971.26	<None>	<Collection: 0 items>	0	5,155.28	80	
H-26	4,967.82	<None>	<Collection: 0 items>	0	5,155.43	81	
H-27	4,971.58	<None>	<Collection: 0 items>	0	5,155.31	79	Test 4R
H-28	4,958.67	<None>	<Collection: 0 items>	0	5,155.71	85	
H-29	4,968.09	<None>	<Collection: 0 items>	0	5,155.29	81	
H-30	4,964.52	<None>	<Collection: 0 items>	0	5,155.71	83	
H-31	4,971.82	<None>	<Collection: 0 items>	0	5,155.35	79	
H-32	4,967.13	<None>	<Collection: 0 items>	0	5,155.49	81	
H-33	4,963.62	<None>	<Collection: 0 items>	0	5,155.71	83	Test 6F
H-34	4,964.67	<None>	<Collection: 0 items>	0	5,155.71	83	Test 6R
H-35	4,967.43	<None>	<Collection: 0 items>	0	5,155.28	81	
H-36	4,965.18	<None>	<Collection: 0 items>	0	5,155.28	82	
H-37	4,967.25	<None>	<Collection: 0 items>	0	5,155.19	81	
H-38	4,974.00	<None>	<Collection: 0 items>	0	5,155.19	78	
H-39	4,949.39	<None>	<Collection: 0 items>	0	5,155.54	89	
H-40	4,970.88	<None>	<Collection: 0 items>	0	5,155.19	80	
H-41	4,944.04	<None>	<Collection: 0 items>	0	5,155.54	92	
H-42	4,950.42	<None>	<Collection: 0 items>	0	5,155.27	89	
H-43	4,964.62	<None>	<Collection: 0 items>	0	5,155.35	83	
H-44	4,956.57	<None>	<Collection: 0 items>	0	5,155.52	86	
H-45	4,963.98	<None>	<Collection: 0 items>	0	5,155.28	83	Test 4F
H-46	4,966.28	<None>	<Collection: 0 items>	0	5,155.19	82	Test 3R
H-47	4,942.56	<None>	<Collection: 0 items>	0	5,155.50	92	
H-48	4,976.28	<None>	<Collection: 0 items>	0	5,155.19	77	Test 3F
H-49	4,946.39	<None>	<Collection: 0 items>	0	5,155.34	90	
H-50	4,948.60	<None>	<Collection: 0 items>	0	5,155.30	89	
H-51	4,944.39	<None>	<Collection: 0 items>	0	5,155.45	91	Test 5R
H-52	4,956.99	<None>	<Collection: 0 items>	0	5,155.26	86	
H-53	4,956.26	<None>	<Collection: 0 items>	0	5,155.17	86	
H-54	4,960.60	<None>	<Collection: 0 items>	0	5,155.17	84	
H-55	4,951.48	<None>	<Collection: 0 items>	0	5,155.17	88	
H-56	4,961.40	<None>	<Collection: 0 items>	0	5,155.16	84	

Maximum Day

Hydrant Table - Time: 0.00 hours

Label	Elevation (ft)	Zone	Demand Collection	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)	Notes
H-57	4,946.88	<None>	<Collection: 0 items>	0	5,155.26	90	
H-58	4,947.18	<None>	<Collection: 0 items>	0	5,155.26	90	
H-59	4,944.30	<None>	<Collection: 0 items>	0	5,155.27	91	
H-60	4,933.95	<None>	<Collection: 0 items>	0	5,155.47	96	
H-61	4,939.73	<None>	<Collection: 0 items>	0	5,155.48	93	
H-62	4,938.94	<None>	<Collection: 0 items>	0	5,155.47	94	
H-63	4,937.41	<None>	<Collection: 0 items>	0	5,155.47	94	
H-64	4,941.09	<None>	<Collection: 0 items>	0	5,155.46	93	Test 5F
H-65	4,937.70	<None>	<Collection: 0 items>	0	5,155.47	94	
H-66	4,938.87	<None>	<Collection: 0 items>	0	5,155.46	94	
H-67	4,933.99	<None>	<Collection: 0 items>	0	5,155.47	96	
H-68	4,942.76	<None>	<Collection: 0 items>	0	5,155.71	92	
H-69	4,944.87	<None>	<Collection: 0 items>	0	5,155.71	91	
H-70	4,946.74	<None>	<Collection: 0 items>	0	5,155.71	90	
H-71	4,947.35	<None>	<Collection: 0 items>	0	5,155.71	90	
H-72	4,948.10	<None>	<Collection: 0 items>	0	5,155.71	90	
H-73	4,947.24	<None>	<Collection: 0 items>	0	5,155.71	90	
H-74	4,949.19	<None>	<Collection: 0 items>	0	5,155.71	89	
H-75	4,951.02	<None>	<Collection: 0 items>	0	5,155.71	89	
H-76	4,949.25	<None>	<Collection: 0 items>	0	5,155.71	89	
H-77	4,947.22	<None>	<Collection: 0 items>	0	5,155.71	90	
H-78	4,950.38	<None>	<Collection: 0 items>	0	5,155.71	89	
H-79	4,952.45	<None>	<Collection: 0 items>	0	5,155.71	88	
H-80	4,969.76	<None>	<Collection: 0 items>	0	5,155.83	81	
H-81	4,949.59	<None>	<Collection: 0 items>	0	5,155.17	89	
H-82	4,959.85	<None>	<Collection: 0 items>	0	5,155.71	85	
H-83	4,963.42	<None>	<Collection: 0 items>	0	5,155.71	83	
H-84	4,966.80	<None>	<Collection: 0 items>	0	5,155.72	82	
H-85	4,953.95	<None>	<Collection: 0 items>	0	5,155.71	87	Test 7F
H-86	4,956.54	<None>	<Collection: 0 items>	0	5,155.71	86	Test 7R
H-87	4,966.58	<None>	<Collection: 0 items>	0	5,155.52	82	
H-88	4,945.68	<None>	<Collection: 0 items>	0	5,155.53	91	

Tank Table - Time: 0.00 hours

Maximum Day

Tank Table - Time: 0.00 hours

Label	Elevation (Base) (ft)	Elevation (Minimum) (ft)	Elevation (Initial) (ft)	Elevation (Maximum) (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)	Elevation (ft)	Diameter (ft)	Volume Full (Calculated) (MG)	Percent Full (%)
T-1	5,122.00	5,122.00	5,157.30	5,162.00	444	5,157.30	5,123.45	10.00	0.02	88.2

Fire Flow Availability

Fire Flow Report - Time: 0.00 hours

Label	Fire Flow Iterations	Fire Flow (Available) (gpm)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
H-1	2	3,500	35	43	J-25	43	J-25
H-2	4	2,507	20	25	J-102	25	J-102
H-3	4	2,594	20	24	J-92	24	J-92
H-4	4	1,825	20	22	J-107	22	J-107
H-5	4	2,097	20	25	J-106	25	J-106
H-6	4	2,130	20	22	J-18	22	J-18
H-7	4	1,962	20	22	J-51	22	J-51
H-8	4	2,462	20	22	J-21	22	J-21
H-9	4	2,694	20	22	J-21	22	J-21
H-10	4	2,302	20	22	J-20	22	J-20
H-11	4	2,362	20	22	J-14	22	J-14
H-12	4	2,112	20	21	J-25	21	J-25
H-13	4	2,232	20	22	J-35	22	J-35
H-14	4	1,728	20	35	J-144	35	J-144
H-15	4	2,062	20	21	J-52	21	J-52
H-16	4	2,274	20	22	J-19	22	J-19
H-17	4	2,047	20	22	J-40	22	J-40
H-18	4	2,616	20	23	J-39	23	J-39
H-19	4	2,361	20	26	J-104	26	J-104
H-20	4	2,715	20	23	J-16	23	J-16
H-21	4	2,105	20	22	J-17	22	J-17
H-22	4	2,276	20	22	J-32	22	J-32
H-23	3	1,369	20	53	J-150	53	J-150
H-24	4	2,185	20	22	J-45	22	J-45
H-25	4	2,525	20	23	J-30	23	J-30
H-26	4	2,861	20	22	J-7	22	J-7
H-27	4	3,006	20	23	J-27	23	J-27
H-28	4	3,015	20	26	J-44	26	J-44
H-29	4	2,201	20	25	J-103	25	J-103
H-30	4	1,961	20	23	J-43	23	J-43
H-31	4	2,771	20	32	J-83	32	J-83
H-32	4	2,949	20	22	J-8	22	J-8
H-33	4	2,244	20	22	J-67	22	J-67
H-34	4	2,520	20	24	J-36	24	J-36
H-35	4	2,848	20	28	J-25	28	J-25

Fire Flow Availability

Fire Flow Report - Time: 0.00 hours

Label	Fire Flow Iterations	Fire Flow (Available) (gpm)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
H-36	4	2,300	20	22	J-42	22	J-42
H-37	6	1,045	23	20	H-38	20	H-38
H-38	3	914	20	35	J-10	35	J-10
H-39	3	3,500	27	30	J-25	30	J-25
H-40	5	1,043	22	20	H-48	20	H-48
H-41	4	2,919	20	24	J-59	24	J-59
H-42	4	2,909	20	25	J-38	25	J-38
H-43	4	2,265	20	23	J-53	23	J-53
H-44	4	3,271	20	23	J-37	23	J-37
H-45	4	2,307	20	23	J-69	23	J-69
H-46	5	1,237	24	20	H-48	20	H-48
H-47	3	3,500	27	30	J-25	30	J-25
H-48	3	894	20	36	J-22	36	J-22
H-49	4	3,012	20	26	J-47	26	J-47
H-50	4	2,931	20	26	J-68	26	J-68
H-51	4	3,184	20	27	J-55	27	J-55
H-52	4	2,738	20	24	J-23	24	J-23
H-53	6	1,436	22	20	J-163	20	J-163
H-54	20	1,296	21	20	J-163	20	J-163
H-55	6	1,298	23	20	J-163	20	J-163
H-56	5	1,131	22	20	J-163	20	J-163
H-57	4	1,835	20	24	J-139	24	J-139
H-58	4	2,418	20	24	J-33	24	J-33
H-59	4	2,140	20	23	J-63	23	J-63
H-60	3	1,043	20	49	H-63	49	H-63
H-61	4	3,224	20	25	J-79	25	J-79
H-62	3	1,741	20	27	J-122	27	J-122
H-63	3	1,371	20	21	J-31	21	J-31
H-64	4	2,592	20	22	J-9	22	J-9
H-65	4	2,935	20	23	J-46	23	J-46
H-66	3	1,616	20	22	J-54	22	J-54
H-67	4	2,625	20	22	J-34	22	J-34
H-68	4	2,590	20	22	J-4	22	J-4
H-69	4	2,634	20	24	J-81	24	J-81
H-70	4	2,549	20	23	J-2	23	J-2

Fire Flow Availability

Fire Flow Report - Time: 0.00 hours

Label	Fire Flow Iterations	Fire Flow (Available) (gpm)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Junction w/ Minimum Pressure (Zone)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
H-71	4	2,696	20	24	J-80	24	J-80
H-72	4	2,750	20	24	J-77	24	J-77
H-73	4	2,724	20	23	J-64	23	J-64
H-74	4	2,815	20	23	J-48	23	J-48
H-75	4	2,747	20	23	J-57	23	J-57
H-76	4	2,949	20	21	J-57	21	J-57
H-77	4	2,699	20	26	J-108	26	J-108
H-78	4	2,981	20	23	J-57	23	J-57
H-79	4	3,105	20	22	J-11	22	J-11
H-80	3	3,500	34	35	J-25	35	J-25
H-81	5	1,367	22	20	J-163	20	J-163
H-82	3	3,500	21	25	J-159	25	J-159
H-83	3	3,500	26	29	J-13	29	J-13
H-84	3	3,500	30	34	J-25	34	J-25
H-85	4	3,201	20	24	J-66	24	J-66
H-86	4	3,336	20	25	J-74	25	J-74
H-87	4	2,573	20	30	J-105	30	J-105
H-88	3	3,500	35	30	J-25	30	J-25

APPENDIX M

Water Rights

STATE OF MONTANA

DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

1424 9TH AVENUE P.O. BOX 201601 HELENA, MONTANA 59620-1601

GENERAL ABSTRACT

Water Right Number: 41F 21774-00 PROVISIONAL PERMIT

Version: 1 -- ORIGINAL RIGHT

Version Status: ACTIVE

Owners: ENNIS, TOWN OF
PO BOX 147
ENNIS, MT 59729

Priority Date: FEBRUARY 8, 1979 at 11:45 A.M.

Enforceable Priority Date: FEBRUARY 8, 1979 at 11:45 A.M.

Purpose (Use): MUNICIPAL

Maximum Flow Rate: 350.00 GPM

Maximum Volume: 564.55 AC-FT

Source Name: GROUNDWATER

Source Type: GROUNDWATER

Point of Diversion and Means of Diversion:

ID	Govt Lot	Qtr Sec	Sec	Twp	Rge	County
1		NESWNW	4	6S	1W	MADISON

Period of Diversion: JANUARY 1 TO DECEMBER 31

Diversion Means: WELL

Well Depth: 130.00 FEET

Static Water Level: 25.00 FEET

Casing Diameter: 6.62 INCHES

Pump Size: 25.00 HP

Purpose (Use): MUNICIPAL

Volume: 564.55 AC-FT

Period of Use: JANUARY 1 to DECEMBER 31

Place of Use:

ID	Acres	Govt Lot	Qtr Sec	Sec	Twp	Rge	County
1			N2	4	6S	1W	MADISON
2			S2SE	33	5S	1W	MADISON

Remarks:

GROUNDWATER WASTE & CONTAMINATION

THIS RIGHT IS SUBJECT TO SECTION 85-2-505, MCA, REQUIRING A WELL BE CONSTRUCTED SO IT WILL NOT ALLOW WATER TO BE WASTED OR CONTAMINATE OTHER WATER SUPPLIES OR SOURCES, AND A FLOWING WELL MUST BE CAPPED OR EQUIPPED SO THE FLOW OF THE WATER MAY BE STOPPED WHEN NOT BEING PUT TO BENEFICIAL USE.

GROUNDWATER WELL - ACCESS PORT

THE FINAL COMPLETION OF THE WELL(S) MUST INCLUDE AN ACCESS PORT OF AT LEAST .50 INCH SO THE STATIC LEVEL OF THE WELL MAY BE ACCURATELY MEASURED.

STATE OF MONTANA

DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

1424 9TH AVENUE P.O. BOX 201601 HELENA, MONTANA 59620-1601

GENERAL ABSTRACT

Water Right Number: 41F 31156-00 STATEMENT OF CLAIM

Version: 2 -- REEXAMINED

Version Status: ACTIVE

Owners: ENNIS, TOWN OF
PO BOX 147
ENNIS, MT 59729

Priority Date: SEPTEMBER 16, 1961

Enforceable Priority Date: SEPTEMBER 16, 1961

Type of Historical Right: USE

Purpose (Use): MUNICIPAL

Maximum Flow Rate: 200.00 GPM

Maximum Volume: 270.00 AC-FT

Source Name: GROUNDWATER

Source Type: GROUNDWATER

Point of Diversion and Means of Diversion:

ID	Govt Lot	Qtr Sec	Sec	Twp	Rge	County
1		SWSWNE	4	6S	1W	MADISON

Period of Diversion: JANUARY 1 TO DECEMBER 31

Diversion Means: WELL

Period of Use: JANUARY 1 to DECEMBER 31

Place of Use:

ID	Acres	Govt Lot	Qtr Sec	Sec	Twp	Rge	County
1			N2	4	6S	1W	MADISON
2			N2S2	4	6S	1W	MADISON
3			S2S2	33	5S	1W	MADISON

Remarks:

STARTING IN 2008, PERIOD OF DIVERSION WAS ADDED TO MOST CLAIM ABSTRACTS, INCLUDING THIS ONE.

APPENDIX N

Financials

STATE FINANCIAL SERVICES DIVISION
LOCAL GOVERNMENT SERVICES BUREAU
Mitchell Building Room 255, PO Box 200547, Helena, Montana 59620-0547
Local Government Services Bureau Portal

ENTITY # **022801**

MONTANA
TOWN OF ENNIS
P.O. BOX 147
ENNIS, MT 59729

ANNUAL FINANCIAL REPORT

FISCAL YEAR ENDING JUNE 30, 2021

REVISED JULY 2021/VERSION 21.1

TOWN OF ENNIS
STATEMENT OF NET POSITION
PROPRIETARY FUNDS
FISCAL YEAR ENDING JUNE 30, 2021

Account Number	Description	Fund #5210 Water	Fund #5310 Sewer	Fund #5510 Ambulance	Fund # Name	Nonmajor Enterprise Funds	Totals	Governmental Activities Internal Service
		Business-type Activities						
		Major Enterprise Funds						
	ASSETS							
	Current Assets							
101000	Cash and cash equivalents	769,162.59	988,542.88	31,669.32		0.00	1,789,374.79	0.00
103000	Petty cash	125.00				0.00	125.00	0.00
101100	Investments (at fair value)					0.00	0.00	0.00
110000	Tax/assessment receivable (net of allowance for uncollectibles)					0.00	0.00	0.00
120000	Accounts/other receivables - (net of allowance for uncollectibles)	32,167.78	45,271.17	10,990.62		0.00	88,429.57	0.00
131000	Due from other funds	10,057.17	(0.02)			0.00	10,057.15	0.00
132000	Due from other governments					0.00	0.00	0.00
141000	Prepaid expense					0.00	0.00	0.00
150000	Inventories					0.00	0.00	0.00
	Total Current Assets	811,512.54	1,033,814.03	42,659.94	0.00	0.00	1,887,986.51	0.00
	Noncurrent Assets							
	Restricted Assets:							
102200	Cash and cash equivalents	228,066.79	58,029.26	243,106.63		0.00	529,202.68	0.00
102300	Investments					0.00	0.00	0.00
133000	Advances to other funds					0.00	0.00	0.00
170000	Other debits	15,493.90				0.00	15,493.90	0.00
180000	Capital assets:							
	Land	120,414.28	72,364.79			0.00	192,779.07	0.00
	Construction in progress	0.47				0.00	0.47	0.00
	Buildings					0.00	0.00	0.00
	Improvements other than buildings	2,493.33	2,493.33			0.00	4,986.66	0.00
	Machinery and equipment	74,634.75	66,382.76	387,993.55		0.00	529,011.06	0.00
	Infrastructure (utility systems)	1,172,879.89	2,495,044.00			0.00	3,667,923.89	0.00
	Less: accumulated depreciation	(713,697.00)	(1,155,927.00)	(227,331.00)		0.00	(2,096,955.00)	0.00
	Capital assets - net of accumulated depreciation	656,725.72	1,480,357.88	160,662.55	0.00	0.00	2,297,746.15	0.00
	Total Noncurrent Assets	900,286.41	1,538,387.14	403,769.18	0.00	0.00	2,842,442.73	0.00
	Total Assets	1,711,798.95	2,572,201.17	446,429.12	0.00	0.00	4,730,429.24	0.00
	DEFERRED OUTFLOWS OF RESOURCES							
199000	Deferred Outflows of Resources - Pensions	17,016.00	17,016.00	14,180.00		0.00	48,212.00	0.00
199xxx	Deferred Outflows of Resources - OPEB					0.00	0.00	0.00
199xxx	Deferred Outflow of Resources - Others					0.00	0.00	0.00
	Total Deferred Outflows of Resources	17,016.00	17,016.00	14,180.00	0.00	0.00	48,212.00	0.00
	LIABILITIES							
	Current Liabilities							
202100	Accounts payable					0.00	0.00	0.00
203100	Judgments payable					0.00	0.00	0.00
204000	Contracts/loans/notes payable					0.00	0.00	0.00
205200	Matured interest bonds payable					0.00	0.00	0.00
206100	Other accrued payables					0.00	0.00	0.00
209100	Compensated absences					0.00	0.00	0.00
211000	Due to other funds					0.00	0.00	0.00
212000	Due to other governments					0.00	0.00	0.00
214000	Deposits payable					0.00	0.00	0.00
216000	Revenues collected in advance					0.00	0.00	0.00
	Total Current Liabilities	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Noncurrent Liabilities							
231000	Bonds payable					0.00	0.00	0.00
233000	Advance from other funds					0.00	0.00	0.00
234000	Judgments payable					0.00	0.00	0.00
235000	Contracts/loans/notes payable					0.00	0.00	0.00
236000	Closure/postclosure care costs					0.00	0.00	0.00
237000	Pension Liability	71,031.00	71,031.00	59,192.00		0.00	201,254.00	0.00
238000	OPEB Liability					0.00	0.00	0.00
239000	Compensated absences	6,675.00	6,675.00	0.00		0.00	13,350.00	0.00
	Total Noncurrent Liabilities	77,706.00	77,706.00	59,192.00	0.00	0.00	214,604.00	0.00
	Total Liabilities	77,706.00	77,706.00	59,192.00	0.00	0.00	214,604.00	0.00
	DEFERRED INFLOWS OF RESOURCES							
220000	Deferred Inflows of Resources - Pensions	2,031.00	2,031.00	1,692.00		0.00	5,754.00	0.00
22xxxx	Deferred Inflows of Resources - OPEB					0.00	0.00	0.00
22xxxx	Deferred Inflows of Resources - Other					0.00	0.00	0.00
	Total Deferred Inflows of Resources	2,031.00	2,031.00	1,692.00	0.00	0.00	5,754.00	0.00
	NET POSITION							
	Net Investment in Capital Assets	656,725.72	1,480,357.88	160,662.55	0.00	0.00	2,297,746.15	0.00
	Restricted for:							
						0.00	0.00	0.00
						0.00	0.00	0.00
						0.00	0.00	
						0.00	0.00	
	Unrestricted	992,352.23	1,029,122.29	239,062.57	0.00	0.00	2,260,537.09	0.00
	Total Net Position	1,649,077.95	2,509,480.17	399,725.12	0.00	0.00	4,558,283.24	0.00
	Balance check (Should equal zero):	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*		
			Reconciliation to government-wide statement of net position:					
			Adjustment to reflect the consolidations of internal service funds					
			activities related to enterprise funds					
			Net position of business-type activities				4,558,283.24	

TOWN OF ENNIS
STATEMENT OF REVENUES, EXPENSES AND CHANGES IN FUND NET POSITION
PROPRIETARY FUNDS
FISCAL YEAR ENDING JUNE 30, 2021

Account Number	Description	Fund #5210 Water	Fund #5310 Sewer	Fund #5510 Ambulance	Fund # Name	Nonmajor Enterprise Funds	Totals	Governmental Activities Internal Service
		Business-type Activities						
		Major Enterprise Funds						
	OPERATING REVENUES							
340000	Charges for services	302,957.15	392,919.56	86,737.35		0.00	782,614.06	0.00
360000	Miscellaneous revenues					0.00	0.00	0.00
363000	Special assessments					0.00	0.00	0.00
						0.00	0.00	
	Total Operating Revenues	302,957.15	392,919.56	86,737.35	0.00	0.00	782,614.06	0.00
	OPERATING EXPENSES							
100	Personal services	74,938.77	74,924.84	86,618.91		0.00	236,482.52	0.00
200	Supplies	11,268.88	13,784.12	15,909.98		0.00	40,962.98	0.00
300	Purchased services	68,984.86	62,170.06	20,317.08		0.00	151,472.00	0.00
400	Building materials					0.00	0.00	0.00
500	Fixed charges	5,536.00	8,393.00	3,591.64		0.00	17,520.64	0.00
810	Loss/Bad debt expense					0.00	0.00	0.00
830	Depreciation	33,156.00	68,119.00	34,447.00		0.00	135,722.00	0.00
						0.00	0.00	
	Total Operating Expenses	193,884.51	227,391.02	160,884.61	0.00	0.00	582,160.14	0.00
	Operating Income (Loss)	109,072.64	165,528.54	(74,147.26)	0.00	0.00	200,453.92	0.00
	NONOPERATING REVENUES (EXPENSES)							
310000	Taxes/assessment revenue					0.00	0.00	0.00
320000	Miscellaneous revenue			26,762.50		0.00	26,762.50	0.00
330000	Intergovernmental revenue	3,664.00	3,664.00	5,916.79		0.00	13,244.79	0.00
371000	Interest revenue	2,363.26	2,143.65	702.22		0.00	5,209.13	0.00
382030	Gain/Loss on Sale of Capital Assets (Loss is negative)					0.00	0.00	0.00
490000	Debt service interest expense (Enter as negative)					0.00	0.00	0.00
384000	Special items - revenue					0.00	0.00	0.00
385000	Extraordinary items - revenue					0.00	0.00	0.00
524000	Special items - expense (enter as negative)					0.00	0.00	0.00
525000	Extraordinary items - expense (enter as negative)					0.00	0.00	0.00
	Total Non-Operating Revenues (Expenses)	6,027.26	5,807.65	33,381.51	0.00	0.00	45,216.42	0.00
	Income (Loss) before contributions and transfers	115,099.90	171,336.19	(40,765.75)	0.00	0.00	245,670.34	0.00
	Capital contributions					0.00	0.00	0.00
	Transfers in (out)	(38,704.00)	(38,704.00)	(7,458.00)		0.00	(84,866.00)	0.00
	Change in net position	76,395.90	132,632.19	(48,223.75)	0.00	0.00	160,804.34	0.00
	Total net position - July 1, 2020 as previously reported	1,572,682.05	2,376,847.98	447,948.87		0.00	4,397,478.90	0.00
	Prior period adjustments					0.00	0.00	0.00
	Total net position - July 1, 2020 as restated	1,572,682.05	2,376,847.98	447,948.87	0.00	0.00	4,397,478.90	0.00
	Total net position - June 30, 2021	1,649,077.95	2,509,480.17	399,725.12	0.00	0.00	4,558,283.24	0.00
			Reconciliation to government-wide statement of activities:					
			Adjustment to reflect the consolidation of internal service fund					
			activities related to enterprise funds					
			Change in net position of business-type activities				160,804.34	

TOWN OF ENNIS
STATEMENT OF CASH FLOWS
PROPRIETARY FUNDS
FISCAL YEAR ENDING JUNE 30, 2021

							Governmental
	Business-type Activities						Activities
	Major Enterprise Funds				Nonmajor		
	Fund #5210	Fund #5310	Fund #5510	Fund #	Enterprise		Internal
Description	Water	Sewer	Ambulance	Name	Funds	Totals	Service
CASH FLOWS FROM OPERATING ACTIVITIES							
Cash received from customers	300,550.36	390,525.66	102,351.29	0.00	0.00	793,427.31	0.00
Cash paid to suppliers	(85,789.74)	(84,347.18)	(39,818.70)	0.00	0.00	(209,955.62)	0.00
Cash paid to employees	(66,806.77)	(66,792.84)	(59,976.91)	0.00	0.00	(193,576.52)	0.00
Cash received from interfund services provided					0.00	0.00	0.00
Cash paid for interfund services used					0.00	0.00	0.00
Net cash provided (used) by operating activities	147,953.85	239,385.64	2,555.68	0.00	0.00	389,895.17	0.00
CASH FLOWS FROM NONCAPITAL FINANCING ACTIVITIES							
Transfers from (to) other funds	(38,704.00)	(38,704.00)	(7,458.00)	0.00	0.00	(84,866.00)	0.00
Advances from (to) other funds	5,028.01				0.00	5,028.01	0.00
Subsidies from taxes and other governments			29,625.29	0.00	0.00	29,625.29	0.00
Net cash provided (used) by capital and related financing activities	(33,675.99)	(38,704.00)	22,167.29	0.00	0.00	(50,212.70)	0.00
CASH FLOWS FROM CAPITAL AND RELATED FINANCING ACTIVITIES							
Proceeds from debt					0.00	0.00	0.00
Capital contributions	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Purchases/acquisition/construction of capital assets					0.00	0.00	0.00
Principal on debt (Enter as a negative)			(4,502.40)		0.00	(4,502.40)	0.00
Interest paid on debt (Negative)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Capital lease down payment					0.00	0.00	0.00
Proceeds from sales of capital assets					0.00	0.00	0.00
Net cash provided (used) by capital and related financing activities	0.00	0.00	(4,502.40)	0.00	0.00	(4,502.40)	0.00
CASH FLOWS FROM INVESTING ACTIVITIES							
Proceeds from sales of investments					0.00	0.00	0.00
Purchase of investments (Enter as negative)					0.00	0.00	0.00
Interest earnings	2,363.26	2,143.65	702.22	0.00	0.00	5,209.13	0.00
Net cash provided (used) by investing activities	2,363.26	2,143.65	702.22	0.00	0.00	5,209.13	0.00
Net increase (decrease) in cash and cash equivalents	116,641.12	202,825.29	20,922.79	0.00	0.00	340,389.20	0.00
Cash and cash equivalents - July 1, 2020	880,713.26	843,746.85	253,853.16		0.00	1,978,313.27	0.00
Cash and cash equivalents - June 30, 2021	997,354.38	1,046,572.14	274,775.95	0.00	0.00	2,318,702.47	0.00
Reconciliation of operating income to net cash provided (used by operating activities:							
Operating income	109,072.64	165,528.54	(74,147.26)	0.00	0.00	200,453.92	0.00
Adjustments to reconcile operating income to net cash provided (used) by operating activities							
Depreciation expense	33,156.00	68,119.00	34,447.00	0.00	0.00	135,722.00	0.00
(Increase) Decrease in accounts receivable	(2,406.79)	(2,393.90)	15,613.94		0.00	10,813.25	0.00
(Increase) Decrease in intergovernmental receivables					0.00	0.00	0.00
(Increase) Decrease in due to/from other funds					0.00	0.00	0.00
Increase in allowance for uncollectible accounts					0.00	0.00	0.00
(Increase) decrease in inventories					0.00	0.00	0.00
(Increase) decrease in prepaid items					0.00	0.00	0.00
Increase (decrease) in customer deposits					0.00	0.00	0.00
Increase (decrease) in accounts payable					0.00	0.00	0.00
Increase (decrease) in compensated absences pay.	687.00	687.00	(3,015.00)		0.00	(1,641.00)	0.00
Increase (decrease) in intergovernmental payables					0.00	0.00	0.00
Increase (decrease) in GASB68 pension expense	7,445.00	7,445.00	29,657.00		0.00	44,547.00	0.00
Total adjustments	38,881.21	73,857.10	76,702.94	0.00	0.00	189,441.25	0.00
Net cash provided (used) by operating activities	147,953.85	239,385.64	2,555.68	0.00	0.00	389,895.17	0.00
Noncash investing, capital, and financing activities:							
Borrowing under capital lease					0.00	0.00	0.00
Contributions of capital assets from government					0.00	0.00	0.00
Purchase of equipment on account					0.00	0.00	0.00
Increase in fair value of investments					0.00	0.00	0.00
Capital asset trade-ins					0.00	0.00	0.00

STATE FINANCIAL SERVICES DIVISION
LOCAL GOVERNMENT SERVICES BUREAU
Mitchell Building Room 255, PO Box 200547, Helena, Montana 59620-0547
Local Government Services Bureau Portal

ENTITY # **022801**

MONTANA
TOWN OF ENNIS
P.O. BOX 147
ENNIS, MT 59729

ANNUAL FINANCIAL REPORT

FISCAL YEAR ENDING JUNE 30, 2022

REVISED AUGUST 2022/VERSION 22.1

TOWN OF ENNIS
STATEMENT OF NET POSITION
PROPRIETARY FUNDS
FISCAL YEAR ENDING JUNE 30, 2022

Account Number	Description	Business-type Activities - Major Enterprise Funds: Fund #5210 Water	Fund #5310 Sewer	Fund #5510 Ambulance	Fund # Name	Fund # Name	Nonmajor Enterprise Funds	Totals	Governmental Activities: Internal Service
	ASSETS								
	Current Assets								
101000	Cash and cash equivalents	748,190.75	1,123,559.25	(15,713.76)			0.00	1,856,036.24	0.00
103000	Petty cash	125.00					0.00	125.00	0.00
101100	Investments (at fair value)						0.00	0.00	0.00
110000	Tax/assessment receivable (net of allowance for uncollectibles)						0.00	0.00	0.00
120000	Accounts/other receivables - (net of allowance for uncollectibles)	19,964.77	39,873.87				0.00	59,838.64	0.00
127500	Leases receivable						0.00	0.00	0.00
131000	Due from other funds	5,057.00					0.00	5,057.00	0.00
132000	Due from other governments						0.00	0.00	0.00
141000	Prepaid expense						0.00	0.00	0.00
150000	Inventories						0.00	0.00	0.00
	Total Current Assets	773,337.52	1,163,433.12	(15,713.76)	0.00	0.00	0.00	1,921,056.88	0.00
	Noncurrent Assets								
	Restricted Assets:								
102200	Cash and cash equivalents	230,745.52	60,507.06	243,106.63			0.00	534,359.21	0.00
102300	Investments						0.00	0.00	0.00
127500	Leases receivable - not current						0.00	0.00	0.00
133000	Advances to other funds						0.00	0.00	0.00
170000	Other debits	13,776.90					0.00	13,776.90	0.00
180000	Capital assets:								
	Land	120,414.28	72,364.79				0.00	192,779.07	0.00
	Construction in progress						0.00	0.00	0.00
	Buildings						0.00	0.00	0.00
	Improvements other than buildings	2,493.33	2,493.33				0.00	4,986.66	0.00
	Machinery and equipment	74,634.75	66,382.76	1.00			0.00	141,018.51	0.00
	Infrastructure (utility systems)	1,194,568.40	2,495,044.00				0.00	3,689,612.40	0.00
	Less: accumulated depreciation	(745,408.00)	(1,222,409.00)				0.00	(1,967,817.00)	0.00
18X500	Leased-Right-to-Use (RTU) Capital assets - not amortized						0.00	0.00	0.00
	Leased RTU Capital Assets						0.00	0.00	0.00
183500	Leased RTU Intangible capital assets						0.00	0.00	0.00
	Less: accumulated amoritization						0.00	0.00	0.00
	Capital assets - net of accumulated depreciation	646,702.76	1,413,875.88	1.00	0.00	0.00	0.00	2,060,579.64	0.00
	Total Noncurrent Assets	891,225.18	1,474,382.94	243,107.63	0.00	0.00	0.00	2,608,715.75	0.00
	Total Assets	1,664,562.70	2,637,816.06	227,393.87	0.00	0.00	0.00	4,529,772.63	0.00
	DEFERRED OUTFLOWS OF RESOURCES								
199000	Deferred Outflows of Resources - Pensions	16,293.00	17,311.00				0.00	33,604.00	0.00
199xxx	Deferred Outflows of Resources - OPEB						0.00	0.00	0.00
199500	Deferred Outflows of Resources - Leases						0.00	0.00	0.00
199xxx	Deferred Outflow of Resources - Others						0.00	0.00	0.00
	Total Deferred Outflows of Resources	16,293.00	17,311.00	0.00	0.00	0.00	0.00	33,604.00	0.00
	LIABILITIES								
	Current Liabilities								
202100	Accounts payable						0.00	0.00	0.00
203100	Judgments payable						0.00	0.00	0.00
204000	Contracts/loans/notes payable						0.00	0.00	0.00
204300	Leases payable						0.00	0.00	0.00
205200	Matured interest bonds payable						0.00	0.00	0.00
205500	Leases - short-term						0.00	0.00	0.00
206100	Other accrued payables						0.00	0.00	0.00
209100	Compensated absences	536.00	536.00				0.00	1,072.00	0.00
211000	Due to other funds						0.00	0.00	0.00
212000	Due to other governments						0.00	0.00	0.00
214000	Deposits payable						0.00	0.00	0.00
216000	Revenues collected in advance						0.00	0.00	0.00
	Total Current Liabilities	536.00	536.00	0.00	0.00	0.00	0.00	1,072.00	0.00
	Noncurrent Liabilities								
231000	Bonds payable						0.00	0.00	0.00
233000	Advance from other funds						0.00	0.00	0.00
234000	Judgments payable						0.00	0.00	0.00
235000	Contracts/loans/notes payable						0.00	0.00	0.00
235500	Leases payable						0.00	0.00	0.00
236000	Closure/postclosure care costs						0.00	0.00	0.00
237000	Pension Liability	60,260.00	64,026.00				0.00	124,286.00	0.00
238000	OPEB Liability						0.00	0.00	0.00
239000	Compensated absences	4,826.00	4,826.00				0.00	9,652.00	0.00
	Total Noncurrent Liabilities	65,086.00	68,852.00	0.00	0.00	0.00	0.00	133,938.00	0.00
	Total Liabilities	65,622.00	69,388.00	0.00	0.00	0.00	0.00	135,010.00	0.00
	DEFERRED INFLOWS OF RESOURCES								
220000	Deferred Inflows of Resources - Pensions	28,430.00	30,207.00				0.00	58,637.00	0.00
22xxxx	Deferred Inflows of Resources - OPEB						0.00	0.00	0.00
225000	Deferred Inflows of Resources - Leases						0.00	0.00	0.00
22xxxx	Deferred Inflows of Resources - Other						0.00	0.00	0.00
	Total Deferred Inflows of Resources	28,430.00	30,207.00	0.00	0.00	0.00	0.00	58,637.00	0.00
	NET POSITION								
	Net Investment in Capital Assets	646,702.76	1,413,875.88	1.00	0.00	0.00	0.00	2,060,579.64	0.00
	Restricted for:								
	Debt Service						0.00	0.00	0.00
							0.00	0.00	0.00
							0.00	0.00	
							0.00	0.00	
	Unrestricted	940,100.94	1,141,656.18	227,392.87	0.00	0.00	0.00	2,309,149.99	0.00
	Total Net Position	1,586,803.70	2,555,532.06	227,393.87	0.00	0.00	0.00	4,369,729.63	0.00
	Balance check (Should equal zero):	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*		
			Reconciliation to government-wide statement of net position:						
			Adjustment to reflect the consolidations of internal service funds						
			activities related to enterprise funds						
			Net position of business-type activities					4,369,729.63	

TOWN OF ENNIS
STATEMENT OF REVENUES, EXPENSES AND CHANGES IN FUND NET POSITION
PROPRIETARY FUNDS
FISCAL YEAR ENDING JUNE 30, 2022

Account Number	Description	Fund #5210 Water	Fund #5310 Sewer	Fund #5510 Ambulance	Fund # Name	Fund # Name	Nonmajor Enterprise Funds	Totals	Governmental Activities Internal Service
		Business-type Activities							
		Major Enterprise Funds							
	OPERATING REVENUES								
340000	Charges for services	281,569.66	375,226.74				0.00	656,796.40	0.00
360000	Miscellaneous revenues						0.00	0.00	0.00
363000	Special assessments						0.00	0.00	0.00
							0.00	0.00	
	Total Operating Revenues	281,569.66	375,226.74	0.00	0.00	0.00	0.00	656,796.40	0.00
	OPERATING EXPENSES								
100	Personal services	113,894.52	119,262.20	(46,704.00)			0.00	186,452.72	0.00
200	Supplies	26,075.64	22,405.27	555.36			0.00	49,036.27	0.00
300	Purchased services	78,850.19	68,314.09	50,553.91			0.00	197,718.19	0.00
400	Building materials						0.00	0.00	0.00
500	Fixed charges	6,184.00	9,070.00	3,173.00			0.00	18,427.00	0.00
810	Loss/Bad debt expense			311.85			0.00	311.85	0.00
830	Depreciation and Amortization	31,279.00	66,483.00				0.00	97,762.00	0.00
							0.00	0.00	0.00
	Total Operating Expenses	256,283.35	285,534.56	7,890.12	0.00	0.00	0.00	549,708.03	0.00
	Operating Income (Loss)	25,286.31	89,692.18	(7,890.12)	0.00	0.00	0.00	107,088.37	0.00
	NONOPERATING REVENUES (EXPENSES)								
310000	Taxes/assessment revenue						0.00	0.00	0.00
320000	Licenses/permits revenue						0.00	0.00	0.00
330000	Intergovernmental revenue	5,310.00	5,642.00				0.00	10,952.00	0.00
371000	Interest revenue	2,736.22	2,477.78				0.00	5,214.00	0.00
382030	Gain/Loss on Sale of Capital Assets (Loss is negative)						0.00	0.00	0.00
490000	Debt service interest expense (Enter as negative)						0.00	0.00	0.00
490500	Leases interest expense (Enter as negative)						0.00	0.00	0.00
384000	Special items - revenue						0.00	0.00	0.00
385000	Extraordinary items - revenue						0.00	0.00	0.00
524000	Special items - expense (enter as negative)						0.00	0.00	0.00
525000	Extraordinary items - expense (enter as negative)						0.00	0.00	0.00
	Total Non-Operating Revenues (Expenses)	8,046.22	8,119.78	0.00	0.00	0.00	0.00	16,166.00	0.00
	Income (Loss) before contributions and transfers	33,332.53	97,811.96	(7,890.12)	0.00	0.00	0.00	123,254.37	0.00
	Capital contributions						0.00	0.00	0.00
	Transfers in (out)	(115,174.00)	(51,761.00)				0.00	(166,935.00)	0.00
	Change in net position	(81,841.47)	46,050.96	(7,890.12)	0.00	0.00	0.00	(43,680.63)	0.00
	Total net position - July 1, 2021 as previously reported	1,668,645.17	2,509,481.10	235,283.99			0.00	4,413,410.26	0.00
	Prior period adjustments						0.00	0.00	0.00
	Total net position - July 1, 2021 as restated	1,668,645.17	2,509,481.10	235,283.99	0.00	0.00	0.00	4,413,410.26	0.00
	Total net position - June 30, 2022	1,586,803.70	2,555,532.06	227,393.87	0.00	0.00	0.00	4,369,729.63	0.00
			Reconciliation to government-wide statement of activities:						
			Adjustment to reflect the consolidation of internal service fund						
			activities related to enterprise funds						
			Change in net position of business-type activities					(43,680.63)	

TOWN OF ENNIS
STATEMENT OF CASH FLOWS
PROPRIETARY FUNDS
FISCAL YEAR ENDING JUNE 30, 2022

								Governmental
	Business-type Activities							Activities
	Major Enterprise Funds					Nonmajor		
	Fund #5210	Fund #5310	Fund #5510	Fund #	Fund #	Enterprise		Internal
Description	Water	Sewer	Ambulance	Name	Name	Funds	Totals	Service
CASH FLOWS FROM OPERATING ACTIVITIES								
Cash received from customers	293,771.69	380,623.02	7,224.26	0.00	0.00	0.00	681,618.97	0.00
Cash paid to suppliers	(111,109.83)	(99,789.36)	(54,594.12)	0.00	0.00	0.00	(265,493.31)	0.00
Cash paid to employees	(93,545.52)	(94,056.29)	0.00	0.00	0.00	0.00	(187,601.81)	0.00
Cash received from interfund services provided						0.00	0.00	0.00
Cash paid for interfund services used						0.00	0.00	0.00
Net cash provided (used) by operating activities	89,116.34	186,777.37	(47,369.86)	0.00	0.00	0.00	228,523.85	0.00
CASH FLOWS FROM NONCAPITAL FINANCING ACTIVITIES								
Transfers from (to) other funds	(115,174.00)	(51,761.00)	0.00	0.00	0.00	0.00	(166,935.00)	0.00
Advances from (to) other funds	5,028.33					0.00	5,028.33	0.00
Subsidies from taxes and other governments			0.00	0.00	0.00	0.00	0.00	0.00
Net cash provided (used) by capital and related financing activities	(110,145.67)	(51,761.00)	0.00	0.00	0.00	0.00	(161,906.67)	0.00
CASH FLOWS FROM CAPITAL AND RELATED FINANCING ACTIVITIES								
Proceeds from debt & leases						0.00	0.00	0.00
Capital contributions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Purchases/acquisition/construction of capital assets						0.00	0.00	0.00
Principal on debt & leases (Enter as a negative)						0.00	0.00	0.00
Interest paid on debt & leases(Enter as a negative)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Capital lease down payment						0.00	0.00	0.00
Proceeds from sales of capital assets						0.00	0.00	0.00
Net cash provided (used) by capital and related financing activities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CASH FLOWS FROM INVESTING ACTIVITIES								
Proceeds from sales of investments						0.00	0.00	0.00
Purchase of investments (Enter as negative)						0.00	0.00	0.00
Interest earnings	2,736.22	2,477.78	0.00	0.00	0.00	0.00	5,214.00	0.00
Net cash provided (used) by investing activities	2,736.22	2,477.78	0.00	0.00	0.00	0.00	5,214.00	0.00
Net increase (decrease) in cash and cash equivalents	(18,293.11)	137,494.15	(47,369.86)	0.00	0.00	0.00	71,831.18	0.00
Cash and cash equivalents - July 1, 2021	997,354.38	1,046,572.16	274,762.73			0.00	2,318,689.27	0.00
Cash and cash equivalents - June 30, 2022	979,061.27	1,184,066.31	227,392.87	0.00	0.00	0.00	2,390,520.45	0.00
	0.00	0.00	0.00					
Reconciliation of operating income to net cash provided (used by operating activities:								
Operating income	25,286.31	89,692.18	(7,890.12)	0.00	0.00	0.00	107,088.37	0.00
Adjustments to reconcile operating income to net cash provided (used) by operating activities								
Depreciation expense	31,279.00	66,483.00	0.00	0.00	0.00	0.00	97,762.00	0.00
(Increase) Decrease in accounts receivable	12,202.03	5,396.28	7,224.26			0.00	24,822.57	0.00
(Increase) Decrease in intergovernmental receivables						0.00	0.00	0.00
(Increase) Decrease in due to/from other funds						0.00	0.00	0.00
Increase in allowance for uncollectible accounts						0.00	0.00	0.00
(Increase) decrease in inventories						0.00	0.00	0.00
(Increase) decrease in prepaid items						0.00	0.00	0.00
Increase (decrease) in customer deposits						0.00	0.00	0.00
Increase (decrease) in accounts payable						0.00	0.00	0.00
Increase (decrease) in compensated absences pay.	(1,312.00)	(1,312.09)				0.00	(2,624.09)	0.00
Increase (decrease) in intergovernmental payables						0.00	0.00	0.00
Increase (decrease) in GASB68 pension expense	21,661.00	26,518.00	(46,704.00)			0.00	1,475.00	0.00
Total adjustments	63,830.03	97,085.19	(39,479.74)	0.00	0.00	0.00	121,435.48	0.00
Net cash provided (used) by operating activities	89,116.34	186,777.37	(47,369.86)	0.00	0.00	0.00	228,523.85	0.00
Noncash investing, capital, and financing activities:								
Borrowing under lease						0.00	0.00	0.00
Contributions of capital assets from government						0.00	0.00	0.00
Purchase of equipment on account						0.00	0.00	0.00
Increase in fair value of investments						0.00	0.00	0.00
Capital asset trade-ins						0.00	0.00	0.00

STATE FINANCIAL SERVICES DIVISION
LOCAL GOVERNMENT SERVICES BUREAU
Mitchell Building Room 255, PO Box 200547, Helena, Montana 59620-0547
Local Government Services Bureau Portal

ENTITY # **022801**

MONTANA
TOWN OF ENNIS
P.O. BOX 147
ENNIS, MT 59729

ANNUAL FINANCIAL REPORT

FISCAL YEAR ENDING JUNE 30, 2023

REVISED AUGUST 2022/VERSION 22.1

TOWN OF ENNIS
STATEMENT OF NET POSITION
PROPRIETARY FUNDS
FISCAL YEAR ENDING JUNE 30, 2023

Account Number	Description	Fund #5210 Water	Fund #5310 Sewer	Fund #5510 Ambulance	Fund # Name	Fund # Name	Nonmajor Enterprise Funds	Totals	Governmental Activities Internal Service
		Business-type Activities							
		Major Enterprise Funds							
	ASSETS								
	Current Assets								
101000	Cash and cash equivalents	673,454.30	1,288,407.96	(15,713.76)			0.00	1,946,148.50	0.00
103000	Petty cash	125.00					0.00	125.00	0.00
101100	Investments (at fair value)						0.00	0.00	0.00
110000	Tax/assessment receivable (net of allowance for uncollectibles)						0.00	0.00	0.00
120000	Accounts/other receivables - (net of allowance for uncollectibles)	22,340.82	36,548.22				0.00	58,889.04	0.00
127500	Leases receivable						0.00	0.00	0.00
131000	Due from other funds	5,057.02	(0.02)				0.00	5,057.00	0.00
132000	Due from other governments						0.00	0.00	0.00
141000	Prepaid expense						0.00	0.00	0.00
150000	Inventories						0.00	0.00	0.00
	Total Current Assets	700,977.14	1,324,956.16	(15,713.76)	0.00	0.00	0.00	2,010,219.54	0.00
	Noncurrent Assets								
	Restricted Assets:								
102200	Cash and cash equivalents	271,032.26	98,244.48	243,106.63			0.00	612,383.37	0.00
102300	Investments						0.00	0.00	0.00
127500	Leases receivable - not current						0.00	0.00	0.00
133000	Advances to other funds						0.00	0.00	0.00
170000	Other debits	11,891.21					0.00	11,891.21	0.00
180000	Capital assets:								
	Land	120,414.28	72,364.79				0.00	192,779.07	0.00
	Construction in progress	0.47					0.00	0.47	0.00
	Buildings	531,998.52					0.00	531,998.52	0.00
	Improvements other than buildings	2,493.33	2,493.33				0.00	4,986.66	0.00
	Machinery and equipment	74,634.75	66,382.76	1.00			0.00	141,018.51	0.00
	Infrastructure (utility systems)	676,595.41	2,495,044.00				0.00	3,171,639.41	0.00
	Less: accumulated depreciation	(777,851.00)	(1,288,893.00)				0.00	(2,066,744.00)	0.00
18X500	Leased-Right-to-Use (RTU) Capital assets - not amortized						0.00	0.00	0.00
	Leased RTU Capital Assets						0.00	0.00	0.00
183500	Leased RTU Intangible capital assets						0.00	0.00	0.00
	Less: accumulated amoritization						0.00	0.00	0.00
	Capital assets - net of accumulated depreciation	628,285.76	1,347,391.88	1.00	0.00	0.00	0.00	1,975,678.64	0.00
	Total Noncurrent Assets	911,209.23	1,445,636.36	243,107.63	0.00	0.00	0.00	2,599,953.22	0.00
	Total Assets	1,612,186.37	2,770,592.52	227,393.87	0.00	0.00	0.00	4,610,172.76	0.00
	DEFERRED OUTFLOWS OF RESOURCES								
199000	Deferred Outflows of Resources - Pensions	19,312.00	19,312.00				0.00	38,624.00	0.00
199xxx	Deferred Outflows of Resources - OPEB						0.00	0.00	0.00
199500	Deferred Outflows of Resources - Leases						0.00	0.00	0.00
199xxx	Deferred Outflow of Resources - Others						0.00	0.00	0.00
	Total Deferred Outflows of Resources	19,312.00	19,312.00	0.00	0.00	0.00	0.00	38,624.00	0.00
	LIABILITIES								
	Current Liabilities								
202100	Accounts payable						0.00	0.00	0.00
203100	Judgments payable						0.00	0.00	0.00
204000	Contracts/loans/notes payable						0.00	0.00	0.00
204300	Leases payable						0.00	0.00	0.00
205200	Matured interest bonds payable						0.00	0.00	0.00
205500	Leases - short-term						0.00	0.00	0.00
206100	Other accrued payables						0.00	0.00	0.00
209100	Compensated absences	646.00	646.00				0.00	1,292.00	0.00
211000	Due to other funds						0.00	0.00	0.00
212000	Due to other governments						0.00	0.00	0.00
214000	Deposits payable						0.00	0.00	0.00
216000	Revenues collected in advance						0.00	0.00	0.00
	Total Current Liabilities	646.00	646.00	0.00	0.00	0.00	0.00	1,292.00	0.00
	Noncurrent Liabilities								
231000	Bonds payable						0.00	0.00	0.00
233000	Advance from other funds						0.00	0.00	0.00
234000	Judgments payable						0.00	0.00	0.00
235000	Contracts/loans/notes payable						0.00	0.00	0.00
235500	Leases payable						0.00	0.00	0.00
236000	Closure/postclosure care costs						0.00	0.00	0.00
237000	Pension Liability	70,521.00	70,521.00				0.00	141,042.00	0.00
238000	OPEB Liability						0.00	0.00	0.00
239000	Compensated absences	5,816.00	5,816.00				0.00	11,632.00	0.00
	Total Noncurrent Liabilities	76,337.00	76,337.00	0.00	0.00	0.00	0.00	152,674.00	0.00
	Total Liabilities	76,983.00	76,983.00	0.00	0.00	0.00	0.00	153,966.00	0.00
	DEFERRED INFLOWS OF RESOURCES								
220000	Deferred Inflows of Resources - Pensions	3,601.00	3,601.00				0.00	7,202.00	0.00
22xxxx	Deferred Inflows of Resources - OPEB						0.00	0.00	0.00
225000	Deferred Inflows of Resources - Leases						0.00	0.00	0.00
22xxxx	Deferred Inflows of Resources - Other						0.00	0.00	0.00
	Total Deferred Inflows of Resources	3,601.00	3,601.00	0.00	0.00	0.00	0.00	7,202.00	0.00
	NET POSITION								
	Net Investment in Capital Assets	628,285.76	1,347,391.88	1.00	0.00	0.00	0.00	1,975,678.64	0.00
	Restricted for:								
	Debt Service	271,032.26	98,244.48	243,106.63			0.00	612,383.37	0.00
							0.00	0.00	0.00
							0.00	0.00	
							0.00	0.00	
	Unrestricted	651,596.35	1,263,684.16	(15,713.76)	0.00	0.00	0.00	1,899,566.75	0.00
	Total Net Position	1,550,914.37	2,709,320.52	227,393.87	0.00	0.00	0.00	4,487,628.76	0.00
	Balance check (Should equal zero):	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*		
			Reconciliation to government-wide statement of net position:						
			Adjustment to reflect the consolidations of internal service funds						
			activities related to enterprise funds						
			Net position of business-type activities					4,487,628.76	

TOWN OF ENNIS
STATEMENT OF REVENUES, EXPENSES AND CHANGES IN FUND NET POSITION
PROPRIETARY FUNDS
FISCAL YEAR ENDING JUNE 30, 2023

Account Number	Description	Fund #5210 Water	Fund #5310 Sewer	Fund #5510 Ambulance	Fund # Name	Fund # Name	Nonmajor Enterprise Funds	Totals	Governmental Activities Internal Service
		Business-type Activities							
		Major Enterprise Funds							
	OPERATING REVENUES								
340000	Charges for services	332,638.94	413,817.86				0.00	746,456.80	0.00
360000	Miscellaneous revenues						0.00	0.00	0.00
363000	Special assessments						0.00	0.00	0.00
							0.00	0.00	
	Total Operating Revenues	332,638.94	413,817.86	0.00	0.00	0.00	0.00	746,456.80	0.00
	OPERATING EXPENSES								
100	Personal services	58,976.29	58,951.73				0.00	117,928.02	0.00
200	Supplies	87,925.32	31,189.14				0.00	119,114.46	0.00
300	Purchased services	171,939.68	83,850.39				0.00	255,790.07	0.00
400	Building materials	1,719.12					0.00	1,719.12	0.00
500	Fixed charges	10,280.53	12,790.87				0.00	23,071.40	0.00
810	Loss/Bad debt expense						0.00	0.00	0.00
830	Depreciation and Amortization	31,978.00	66,483.00				0.00	98,461.00	0.00
							0.00	0.00	0.00
	Total Operating Expenses	362,818.94	253,265.13	0.00	0.00	0.00	0.00	616,084.07	0.00
	Operating Income (Loss)	(30,180.00)	160,552.73	0.00	0.00	0.00	0.00	130,372.73	0.00
	NONOPERATING REVENUES (EXPENSES)								
310000	Taxes/assessment revenue						0.00	0.00	0.00
320000	Licenses/permits revenue						0.00	0.00	0.00
330000	Intergovernmental revenue	2,188.00	2,188.00				0.00	4,376.00	0.00
371000	Interest revenue	40,286.74	37,737.42				0.00	78,024.16	0.00
382030	Gain/Loss on Sale of Capital Assets (Loss is negative)						0.00	0.00	0.00
490000	Debt service interest expense (Enter as negative)						0.00	0.00	0.00
490500	Leases interest expense (Enter as negative)						0.00	0.00	0.00
384000	Special items - revenue						0.00	0.00	0.00
385000	Extraordinary items - revenue						0.00	0.00	0.00
524000	Special items - expense (enter as negative)						0.00	0.00	0.00
525000	Extraordinary items - expense (enter as negative)						0.00	0.00	0.00
	Total Non-Operating Revenues (Expenses)	42,474.74	39,925.42	0.00	0.00	0.00	0.00	82,400.16	0.00
	Income (Loss) before contributions and transfers	12,294.74	200,478.15	0.00	0.00	0.00	0.00	212,772.89	0.00
	Capital contributions						0.00	0.00	0.00
	Transfers in (out)	(123,226.00)	(59,810.00)				0.00	(183,036.00)	0.00
	Change in net position	(110,931.26)	140,668.15	0.00	0.00	0.00	0.00	29,736.89	0.00
	Total net position - July 1, 2022 as previously reported	1,661,845.63	2,568,652.37	227,393.87			0.00	4,457,891.87	0.00
	Prior period adjustments						0.00	0.00	0.00
	Total net position - July 1, 2022 as restated	1,661,845.63	2,568,652.37	227,393.87	0.00	0.00	0.00	4,457,891.87	0.00
	Total net position - June 30, 2023	1,550,914.37	2,709,320.52	227,393.87	0.00	0.00	0.00	4,487,628.76	0.00
			Reconciliation to government-wide statement of activities:						
			Adjustment to reflect the consolidation of internal service fund						
			activities related to enterprise funds						
			Change in net position of business-type activities					29,736.89	

TOWN OF ENNIS
STATEMENT OF CASH FLOWS
PROPRIETARY FUNDS
FISCAL YEAR ENDING JUNE 30, 2023

								Governmental
	Business-type Activities							Activities
	Major Enterprise Funds					Nonmajor		
	Fund #5210	Fund #5310	Fund #5510	Fund #	Fund #	Enterprise		Internal
Description	Water	Sewer	Ambulance	Name	Name	Funds	Totals	Service
CASH FLOWS FROM OPERATING ACTIVITIES								
Cash received from customers	330,262.87	417,143.53	0.00	0.00	0.00	0.00	747,406.40	0.00
Cash paid to suppliers	(276,453.03)	(123,776.09)	0.00	0.00	0.00	0.00	(400,229.12)	0.00
Cash paid to employees	(68,733.29)	(68,708.73)	0.00	0.00	0.00	0.00	(137,442.02)	0.00
Cash received from interfund services provided						0.00	0.00	0.00
Cash paid for interfund services used						0.00	0.00	0.00
Net cash provided (used) by operating activities	(14,923.45)	224,658.71	0.00	0.00	0.00	0.00	209,735.26	0.00
CASH FLOWS FROM NONCAPITAL FINANCING ACTIVITIES								
Transfers from (to) other funds	(123,226.00)	(59,810.00)	0.00	0.00	0.00	0.00	(183,036.00)	0.00
Advances from (to) other funds						0.00	0.00	0.00
Subsidies from taxes and other governments			0.00	0.00	0.00	0.00	0.00	0.00
Net cash provided (used) by capital and related financing activities	(123,226.00)	(59,810.00)	0.00	0.00	0.00	0.00	(183,036.00)	0.00
CASH FLOWS FROM CAPITAL AND RELATED FINANCING ACTIVITIES								
Proceeds from debt & leases						0.00	0.00	0.00
Capital contributions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Purchases/acquisition/construction of capital assets						0.00	0.00	0.00
Principal on debt & leases (Enter as a negative)						0.00	0.00	0.00
Interest paid on debt & leases(Enter as a negative)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Capital lease down payment						0.00	0.00	0.00
Proceeds from sales of capital assets						0.00	0.00	0.00
Net cash provided (used) by capital and related financing activities	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CASH FLOWS FROM INVESTING ACTIVITIES								
Proceeds from sales of investments						0.00	0.00	0.00
Purchase of investments (Enter as negative)						0.00	0.00	0.00
Interest earnings	40,286.74	37,737.42	0.00	0.00	0.00	0.00	78,024.16	0.00
Net cash provided (used) by investing activities	40,286.74	37,737.42	0.00	0.00	0.00	0.00	78,024.16	0.00
Net increase (decrease) in cash and cash equivalents	(97,862.71)	202,586.13	0.00	0.00	0.00	0.00	104,723.42	0.00
Cash and cash equivalents - July 1, 2022	1,042,474.27	1,184,066.31	227,392.87			0.00	2,453,933.45	0.00
Cash and cash equivalents - June 30, 2023	944,611.56	1,386,652.44	227,392.87	0.00	0.00	0.00	2,558,656.87	0.00
	0.00	0.00	0.00					
Reconciliation of operating income to net cash provided (used by operating activities:								
Operating income	(30,180.00)	160,552.73	0.00	0.00	0.00	0.00	130,372.73	0.00
Adjustments to reconcile operating income to net cash provided (used) by operating activities								
Depreciation expense	31,978.00	66,483.00	0.00	0.00	0.00	0.00	98,461.00	0.00
(Increase) Decrease in accounts receivable	(2,376.07)	3,325.67	0.00			0.00	949.60	0.00
(Increase) Decrease in intergovernmental receivables						0.00	0.00	0.00
(Increase) Decrease in due to/from other funds						0.00	0.00	0.00
Increase in allowance for uncollectible accounts						0.00	0.00	0.00
(Increase) decrease in inventories						0.00	0.00	0.00
(Increase) decrease in prepaid items		4,054.31				0.00	4,054.31	0.00
Increase (decrease) in customer deposits						0.00	0.00	0.00
Increase (decrease) in accounts payable	(4,588.38)					0.00	(4,588.38)	0.00
Increase (decrease) in compensated absences pay.	1,100.00	1,100.00				0.00	2,200.00	0.00
Increase (decrease) in intergovernmental payables						0.00	0.00	0.00
Increase (decrease) in GASB68 pension expense	(10,857.00)	(10,857.00)				0.00	(21,714.00)	0.00
Total adjustments	15,256.55	64,105.98	0.00	0.00	0.00	0.00	79,362.53	0.00
Net cash provided (used) by operating activities	(14,923.45)	224,658.71	0.00	0.00	0.00	0.00	209,735.26	0.00
Noncash investing, capital, and financing activities:								
Borrowing under lease						0.00	0.00	0.00
Contributions of capital assets from government						0.00	0.00	0.00
Purchase of equipment on account						0.00	0.00	0.00
Increase in fair value of investments						0.00	0.00	0.00
Capital asset trade-ins						0.00	0.00	0.00

APPENDIX O

Public Outreach and Community Engagement

AFFIDAVIT OF PUBLICATION

STATE OF MONTANA
COUNTY OF MADISON

Cori Koenig, being duly sworn, says that she is a representative of **The Madisonian**, a weekly newspaper published in the City of Ennis, County of Madison, State of Montana; that the annexed notice is a true copy which was published in said newspaper for a period of 2 successive weeks, commencing on the 2nd day of February, ending on the 8th day of February, 2023.

Cori Koenig

Representative: Cori Koenig

Subscribed and sworn to before me this 22 day of Feb, 2023.

Maria Walker

NOTARY NAME HERE

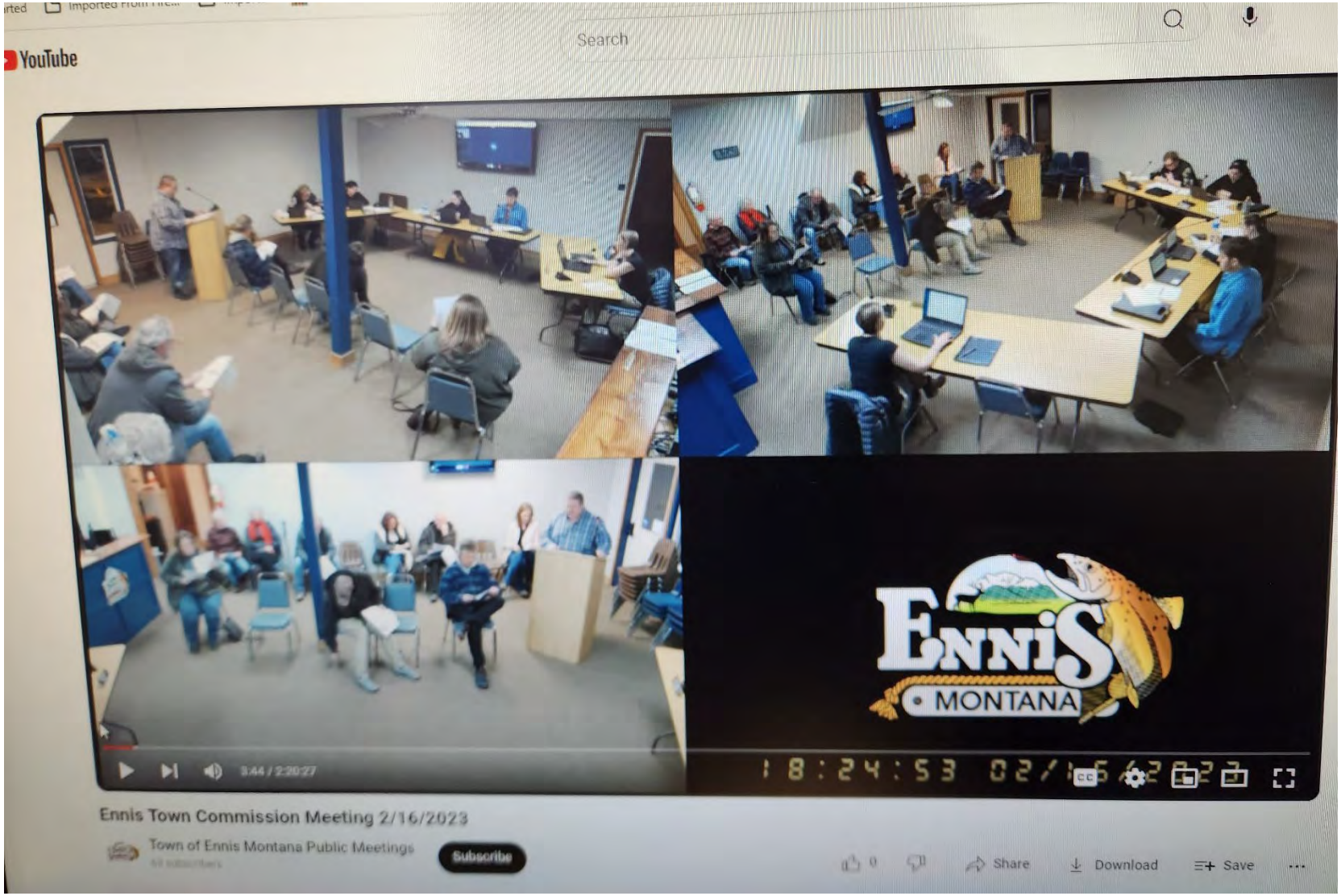
MARIA WALKER
Notary Public
for the State of Montana
Residing at:
Whitehall, Montana
My Commission Expires:
February 2, 2026

NOTICE OF PUBLIC HEARING

The Town of Ennis will hold a public hearing at a scheduled meeting of the Ennis Town Commission on February 16, 2023. The public hearing will begin at 6:15 p.m. at Ennis Town Hall, 328 West Main Street, Ennis, MT 59729. The Commission has scheduled the hearing to obtain public comments regarding the proposed improvements to Ennis's water system. With assistance from Great West Engineering, the Town is preparing a water preliminary engineering report (PER) and may prepare applications for funding from agencies including the Montana Department of Commerce, Montana Department of Natural Resources and Conservation, USDA Rural Development, and/or the Department of Environmental Quality's Drinking Water State Revolving Fund Program. At the public hearing, representatives of Ennis and Great West Engineering will explain the purpose of the project, the project area, the scope of work, budget, possible sources of funding, and any costs that may result for local citizens because of the project. Great West Engineering will also present its assessment of the project's impact on the environment. Copies of the draft environmental assessment and draft PER are available upon request. During the public hearing, residents may ask questions and express their opinions regarding the project and its impact on the Town of Ennis. Residents can submit comments and questions about the project at any time via Great West Engineering's Project Manager Collette Anderson, PE at (406) 495-6164 or ctanderson@greatwesteng.com.

CLERK TOWN OF ENNIS

Published Feb. 2 and Feb. 8, 2023


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TOWN OF ENNIS

Water System

Preliminary Engineering Report

Public Meeting

February 16, 2023

Presented by:

GreatWest ENGINEERING

1.0 BACKGROUND AND SCOPE

1.1 Preliminary Engineering Report Objectives

- What is a Preliminary Engineering Report (PER)
  - Describes Existing System
  - Problem Definition
  - Evaluate Alternatives including Selection of a Preferred Alternative
  - Establishes Costs and Potential Funding Scenarios
  - Implementation Schedule
  - Facilitate Public Comment
  - Required by Regulatory Agencies for Compliance Issues and by Funding Agencies for Grants and Loans

2.0 PROJECT PLANNING

2.1 Population and Planning Period

- Planning period is 20 years (Design Year 2042)
- Montana Department of Commerce & US Census Data

TABLE 1
HISTORICAL POPULATION

Year	Ennis	% Annual Increase/Decrease	Madison County	% Annual Increase/Decrease
1980	660	-	5,448	-
1990	773	1.71	5,989	0.99
2000	840	0.87	6,851	1.44
2010	838	-0.02	7,691	1.23
2020	917	0.94	8,623	1.21
Average		0.88		1.22
2042(2)	1,100	1.0		

(1) US Census Bureau
(2) Population of Town at Design Year (2042) estimated from 2020 Census at conservative 1.0% Annual Growth

- 2042 Design Population Estimate– 1,100

3.0 EXISTING SYSTEM

3.1 Existing Water Demand

- Knowing current water demand is necessary to calculate future water needs throughout the planning period.
- Future water demand calculations are based on 2021 well hour meter data, well pumping rates and resulting water source monthly flows. Table 2 summarizes monthly average daily source flows and resulting per capita per day water use.

TABLE 2
2021 WATER USE BASED ON
WELL HOUR METER DATA

Month	Total Monthly Source Flow (gallons per day)(1)	Average Daily Source Flow (gallons per day)(1)	Average Per Capita Use (gpcd)(2)
January	6,987,000	225,387	241
February	6,999,000	249,964	267
March	7,617,000	245,710	263
April	7,557,000	251,900	269
May	6,351,000	204,871	219
June	14,667,000	488,900	523
July	16,392,000	528,774	566
August	12,837,000	414,097	443
September	10,740,000	358,000	383
October	7,176,000	231,484	248
November	5,469,000	182,300	195
December	5,598,000	180,581	193
Yearly Total	111,522,000		
Average		305,540	326

Notes:
(1)Based on 2021 well hour meter data.
(2)Based on existing service population of 935

- Average day per capita use = 326 gpcd
- Average day demand = 305,540 gallons per day and 212 gpm
- Maximum day demand = 639,000 gpd and 444 gpm (based on highest daily total hour meter usage)

3.2 Projected Water Demands

- With a projected population and average per capita use, projected water demands can be estimated

Table 3 Town of Ennis Projected Water System Demands					
Year	Estimated Service Population	Average Day Demand		Maximum Day Demand	
		(gpd)[1]	(gpm)	(gpd)	(gpm)
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2042	1,100	358,600	249	751,300	522
Notes: [1]Based on 326 gpcd					

3.3 Water Supply

- Well #2 produces approximately 350 gpm and Well #3 produces approximately 250 gpm.

- Adequacy of Supply

  - Per DEQ standards, the water system must be able to provide the maximum daily demand with the highest capacity pump out of service.
  - The 2042 projected maximum day demand is 522 gpm.
  - With the largest well out of service, only 250 gpm can be provided.
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- Neither well is equipped with chlorination equipment to allow for disinfection of the distribution system should contamination be suspected.

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- Neither the new Well #3 site nor the storage tank site have any security fencing. A lack of security fencing makes it difficult to prevent vandalism and ensure safe drinking water for all consumers.

3.4 Water Storage

- 530,000-gallon on-grade epoxy coated bolted steel tank
  - Constructed in 1995
  - Fair condition, is leaking and due for a recoating

- Water storage is critical for two primary reasons:
  - Provides operational storage
  - Provides fire suppression storage

- Required Storage Capacity:
  - DEQ Circular 1, Chapter 7 requires “minimum allowable storage must be equal to the average day demand plus fire flow demand…where fire protection is provided”.

- Current Scenario:
  - Average Day Demand: 305,540 gallons
  - Fire Flow Demand: 2,500 gpm (commercial) for 2 hours = 300,000 gallons
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- The existing storage capacity is not sufficient to meet current or future demands. An additional 130,000 gallons of storage is needed to meet future demands.

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- In general, the distribution system is well laid out. DEQ-1 requires that "the minimum size of water main for providing fire protection and serving fire hydrants shall be six-inch diameter" and "larger size mains will be required if necessary to allow the withdrawal of the required fire flow while maintaining the minimum residual pressure specified." A majority of the distribution system is 6-inches or larger. Static pressures in the system range between 100 psi in the downtown area and 75 psi in the southwest portion of the system.

- In order to evaluate the water pressures and flows, data for the existing system was input into a computer hydraulic modeling program called WaterCAD. The computer model is used to identify specific problem areas and to determine the most effective modifications to improve the system. The WaterCAD program uses standard loop equation techniques to solve for flow through the pipe network and determine resulting pressures at the system nodes (pipe junctions) using the Hazen-Williams equation.

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- The system was then modeled for available fire flows throughout the system. These fire flows are modeled concurrently with the future peak daily demand flow. With the exception of a few dead-end mains on the extreme south and east sides of the system, a minimum fire flow of 1,000 gpm is available throughout the system, which is a standard for residential areas. Available fire flows in the commercial area (Main Street) and the

school area exceed 2,500 gpm, which meets recommended standards. The identified piping deficiencies are the dead-end mains on the east end of the system.

- Portions of the distribution system do not have sufficient valves to properly isolate sections of water main and facilitate directional flushing of the system in the event of an emergency.

- There are several old fire hydrants in the distribution system that need to be replaced.

3.6 System Leakage

- In April of 2012, a nighttime tank drawdown test was conducted over two consecutive nights. The protocol of the test was to fill the tank at 2:00 am, turn the well pumps off, and then measure the tank level drawdown between 2:00 am and 5:30 am.

- During this time period, very little water usage should be occurring, and it can be assumed that most of the change in the water level in the tank is due to leakage in the distribution system. Both nights that this test was conducted, the water level in the tank dropped 1.7 feet in 3.5 hours. Based on the geometry of the tank, this correlates to a volume of 22,500 gallons and a flow rate over that time period of 107 gpm.

- Recognizing that some usage occurs during the night, it was assumed that 90% of the drawdown during this time period could be attributed to leakage. 90% of 107 gpm is 96 gpm or 138,200 gpd and 50,400,000 gallons per year.

- Common rule-of-thumb: 15% unaccounted-for water is considered acceptable. Based on these numbers, unaccounted for water in Ennis is approximately 45%.

3.7 Water Meters

- Individual water service meters are over 25-years old and have likely exceeded their service life. The meters should be replaced to ensure the Town is accurately metering all of the usage by the customers and to maximize the revenue potential.

4.0 ALTERNATIVES

4.1 Supply

- Additional supply is needed to ensure max day demands can be met with largest source out of service.

- **New Water Supply Wells at the Rodeo Grounds**
  - In August 2011 and June 2012, the Town completed two exploratory test wells at a 2-acre parcel the Town purchased from the Ennis Rodeo Grounds. The deeper well is a nominal 12-inch diameter well, screened and completed to depth of 220 feet below ground surface (bgs). The shallower well is a nominal 6-inch diameter well with a 4-inch screen completed to a depth of 78 feet bgs.
  - Initial testing of the wells in 2012 did not result in well capacities the Town was hoping for, and the Town elected to not pursue further work on the test wells at that time.
  - Due to continued water supply concerns, in 2021 the Town moved forward with a Water Supply Hydrogeologic and Exploration Recommendations Report.

- When locating a redundant groundwater supply source for the Town, several factors need to be considered including, hydrogeology, source protection, proximity to the Town's existing water infrastructure, planned and expected growth and the price and availability of real estate.
- After the analysis was completed, the recommendation was to complete additional development and testing of the wells at the Rodeo Grounds. This work was completed in the summer of 2022.
- Deep Well (220') – Can produce 150 gpm, which would allow the Town to use 100 gpm, as DEQ standards only allow for 2/3 usage of total well capacity. Could likely be completed as a Redundant Well by DNRC definition and process. Water rights permitting may not be needed. This well has already gone through full DEQ approval process.
- Shallow Well (78') – Produces 90 gpm, which would allow for 60 gpm usage. Was constructed strictly as an observation well for testing purposes. Did not undergo DEQ approval. Unlikely to be considered a Redundant Well due to depth to water bearing formation. Full water rights permitting would be anticipated for any shallow well.
- Modeling suggests that drilling another deep well roughly 100' away from the existing deep well could potentially yield 105 gpm with a net usable capacity of 75 gpm. Could also likely be completed as a Redundant Well by DNRC definition and process. Water rights permitting may not be needed. This well would need to go through full DEQ approval process.
- Current water rights limit total pumping rate at any one time to 550 gpm.
- Estimated Capital Cost: $925,000

o **Add Chlorination at Each Well House**
- Estimated Capital Cost: $95,000

o **Security Fencing at Well #3**
- Estimated Capital Cost: $11,000

o **Install Backup Generator at Well #2**
- Estimated Capital Cost: $116,000

4.2 Storage

o **Recoat and Rehab the Existing Tank and add a New 150,000 Gallon On-Grade Glass-Lined Steel Storage Tank**
- Estimated Capital Cost: $1,675,000

o **New 700,000 Gallon On-Grade Glass Lined Steel Storage Tank**
- Estimated Capital Cost: $2,587,000

o **New 700,000 Gallon Prestressed Concrete Storage Tank**
- Estimated Capital Cost: $3,083,000

4.3 Distribution

o **Replace Old Fire Hydrants**
- Estimated Capital Cost: $152,000

o **New Valves in Distribution System**
- Estimated Capital Cost: $111,000

- **Loop Dead-End Water Mains**
  - Estimated Capital Cost: $1,120,000

4.4 Water Meters

- Replace 20% of Water Meters
  - Estimated Capital Cost: $117,000

4.5 Selection of an Alternative

- Comparative Analysis
  - Life Cycle Costs
  - Operational and Maintenance Considerations
  - Permitting Requirements
  - Social Impacts
  - Environmental Impacts
  - Public Health and Safety
  - Land Acquisition
  - Product Availability

4.6 Recommended Preferred Alternatives and Priority List

TABLE 4
TOWN OF ENNIS
RECOMMENDED IMPROVEMENT PROGRAM

ITEM	DESCRIPTION	ESTIMATED COST
Priority #1	New Water Supply Wells at Rodeo Grounds	$ 925,000
Priority #2	New 700,000 Gallon Prestressed Concrete Storage Tank	$ 3,083,000
Priority #3	Replace Old Fire Hydrants	$ 152,000
Priority #4	Replace 20% of Water Meters	$ 117,000
Priority #5	Install New Backup Generator at Well #2	$ 116,000
Priority #6	New Valves in Distribution System	$ 111,000
Priority #7	Add Chlorination at Each Well House	$ 95,000
Priority #8	Security Fencing at Well #3	$ 11,000
Priority #9	Distribution System Improvements (Loop dead-end mains)	$ 1,120,000

5.0 FUNDING STRATEGIES

5.1 Montana Department of Commerce Target Rate

- Dept. of Commerce has established a target rate that communities must be paying for water and wastewater services to be eligible for grants.

- Target rate is based on a percentage of a community's Median Household Income (MHI) from 2015-2019 American Communities Survey data. The percentages are 1.4% for water only, 0.9% for wastewater only and 2.3% for communities with both water and wastewater systems.
- Median Household Income for Ennis: $46,280
- 2.3% of MHI for combined water and wastewater: $88.70 per month

5.2 Existing Average Residential Monthly Rate

- Water: $38.50
- Wastewater: $45.65
- Combined: $84.15 (95% of target rate)

5.3 State Grant Programs

- Montana Coal Endowment Program: Must be at 100% of target rate minimum to be eligible for up to $500,000; 125% of target rate is eligible for $625,000; 150% of target rate is eligible for $750,000. Grant requires a dollar-for-dollar match. Match can be in the form of other grants, loans or local funds. Applications are accepted in even years and then must go to the Legislature for approval.
- DNRC Renewable Resource Grant Program: Grants up to $125,000, no match requirement. Applications are accepted in even years and then must go to the Legislature for approval.

5.4 Loan Programs

- Montana Department of Environmental Quality State Revolving Fund (DEQ and DNRC): 2.5% Interest, 20-year term typical, can go up to 30-years if improvements have that life expectancy. 75% loan forgiveness possible, up to $750,000. Must be at target rate to qualify for loan forgiveness.

5.5 American Rescue Plan Act (ARPA) Minimum Allocation Grants (MAG)

- Madison County has allocated $225,000 of its MAG funding to Ennis for water system improvements.
- Town has committed $214,133 of its MAG funding for the project.

5.6 Proposed Funding Scenario for Recommended Project

- **New Water Supply Wells at Rodeo Grounds**
- **New 700,000 Gallon Prestressed Concrete Storage Tank**

Madison County MAG Grant	$ 225,000
Town of Ennis MAG Grant	$ 214,133
Town Reserves	$ 10,867
SRF Loan Forgiveness	$ 750,000
SRF Loan (2.5% - 20-yrs)	$2,808,000
Total Project Cost	$4,008,000

Estimated Monthly Rate Increase $23/month

AFFIDAVIT OF PUBLICATION

STATE OF MONTANA

County of Madison

(Susanne Hill &/or Cori Koenig) being duly sworn, says she is publisher of *The Madisonian*, a weekly newspaper published in the City of Ennis; County of Madison, State of Montana; and that the annexed notice is a true copy which was published in said newspaper for a period of 2 successive weeks, commencing on the 1 day of Feb, 2024, and ending on the 8 day of Feb, 2024.

Cori Koenig

PUBLISHER SIGNATURE

Subscribed and swore to before me this 9th day of FEBRUARY, 2024.

NOTARY NAME HERE

MATT HILL
Notary Public for the
State of Montana
Residing at DEER LODGE, MT
My Commission Expires
January 13, 2026

NOTICE OF PUBLIC HEARING

The Town of Ennis will hold a public hearing before its monthly Commission meeting on February 8, 2024. The public hearing will begin at 6:15 p.m. at Ennis Town Hall, 328 West Main Street, Ennis, MT 59729. The Commission has scheduled the hearing to obtain public comments regarding the proposed improvements to Ennis's water system. With assistance from Great West Engineering, the town is preparing a water preliminary engineering report (PER) and is considering preparing applications for funding from the Montana Department of Commerce, Montana Department of Natural Resources and Conservation, USDA Rural Development, and the Department of Environmental Quality's Clean Water State Revolving Fund Program. At the public hearing, representatives of Ennis and Great West Engineering will explain the purpose of the project, the project area, the scope of work, budget, possible sources of funding, and any costs that may result for local citizens because of the project. Great West Engineering will also present its assessment of the project's impact on the environment. Copies of the draft environmental assessment and PER are available upon request. During the public hearing, residents may ask questions and express their opinions regarding the project and its impact on the Town of Ennis. Residents can submit comments and questions about the project at any time via Great West Engineering Project Managers Joel Pilcher (jpilcher@greatwesteng.com) or Collette Anderson (ctanderson@greatwesteng.com) or at 406-449-8627.
CLERK TOWN OF ENNIS
Published February 01 and February 08, 2024

Minutes of the

Ennis Town Commission Public Hearing & Meeting

February 8, 2024

Town Hall – 328 W. Main Street, Ennis, MT 59729

Public Hearing:

Joel Pilcher with Great West Engineering distributed the Preliminary Engineering Report dated 2/8/24 followed by a complete narrative of the report. There were public comments from Karen Ketchu, Mike Delaney, Tony Treglia, and Brittney Hirsch. Staff & commission comments and questions were from Eric Olson, Craig Abernethy, Nikki Hankins, Cory Hardy and Mayor Haas. There were no comments/questions from the go-to meting attendees.

Motion to approve was made by Commissioner Way and seconded by Commissioner Hankins. Discussion followed and Public Works Director Eric Olson offered his comments to justify the portion of the report that addressed the need for a new water storage tank. Motion was M/S/C, unanimous.

Commission Meeting:

1. The meeting was called to order at 7:37 by Mayor Nici Haas.
2. Roll call found all commissioners present.
3. Mayor Haas led the Pledge of Allegiance.
4. Motion was made by Commissioner Abernethy and seconded by Commissioner Way to approve the minutes of the January 11, 2024 commission meeting. Motion M/S/C, unanimous.
5. Department Reports;
    a. Library – Karen reported and provided a written report. Library board as adopted a working draft of their strategic plan. She asked the commission to ask what do you need and what do you want to know" and she will address those items in future reports. "New ways to get things done in a small town" meeting begin next Monday meeting.
    b. Law Enforcement – See written report. John Moore had a conflicting commitment as was not able to attend.
    c. Public Works – Director Eric Olson provided a written report and added that the Lagoon aeration blower motor is in for repair (the back up is operating). ETA for it being back in service and cost are currently unknown. The PW budget provides for these types of repairs. Eric has received two (local) quotes for the proposed office building addition. He is also currently working with the conservation district on a plan to improve the dike.

d. Zoning – See written report. Susie attended via go-to meeting and there were no questions for her.
e. Clerks – Ginger asked the commission to provide her with what they want her to include in her monthly report. She offered that the audit will be taking place in April, not February as previously reported.
f. Legal – Mr. Greenbaum reported the following

- The PRR from Madison County was received on 2/7/24. He has no opinion or advise until he has had a chance to review it.
- Lions Club Park agreement has been reviewed between the Mayor and Lion's representatives.
- Montana DOT agreement regarding the new Madison Foods sidewalks has been received.
- MMIA, Montana League of Cities and Towns are excellent resources for Commission/Mayor and staff to receive training. Good idea to participate in what is available.
- He is processing justice court cases as they come in.

6. Claims – Motion to approve made by Commissioner Palmerton and seconded by Commissioner Hankins. M/S/C, unanimous.
7. None
8. None
9. Scheduled Matters
    a. Lion's Club Agreement - Discussion and vote. Agreement has not been voted on yet by the Lion's as they will meet later this month. Motion to approve the lease and reduce insurance requirement from $1.5 million to $1 million, was made by Commissioner Way and seconded by Commissioner Hardy. M/S/C, unanimous.
    b. Resolution 596-2024. Mayor Haas explained the Local Government Review process and its 10-year cycle. After commission discussion a motion was made by Commissioner Way and Seconded by Commissioner Hardy to approve Resolution 596-2024. M/S/C, unanimous.
    c. Mayor Haas asked Commissioner's Way and Hardy if they would be willing to service with her as the Advisory Committee to complete the review and offer a resolution to the Sheriff's MOU. Commissioner Hardy accepted and Commissioner Way accepts conditioned on a timeline being set to complete the entire process. Motion to approve committee appointments was made by Commissioner Palmerton and seconded by Commissioner Abernethy. M/S/C, unanimous. This committee agreed to meet within the next 2 weeks to start their review of the PRR documents.
    d. HB819 Grant Application (Part of Growth Policy) was discussed. Motion to approve made by Commissioner Abernethy and seconded by Commissioner Hankins. M/S/C, unanimous.
10. Commission Reports

    Commissioner Abernethy noted that the "Reimagine Rural" meeting at the library was a great program. The next Planning Board meeting is scheduled for 2/13/24 at 6:15pm.

    Commissioner Way offered that he worked on bringing the Lion's agreement to conclusion. He is reviewed the Big Sky 10-year CIP plan and recommends the commission pay close attention to it and participate as it relates to our hospital, library, and school district.

    Commissioner Hankins thanked Karen for bringing the Reimagining Rural program/meetings to our library.

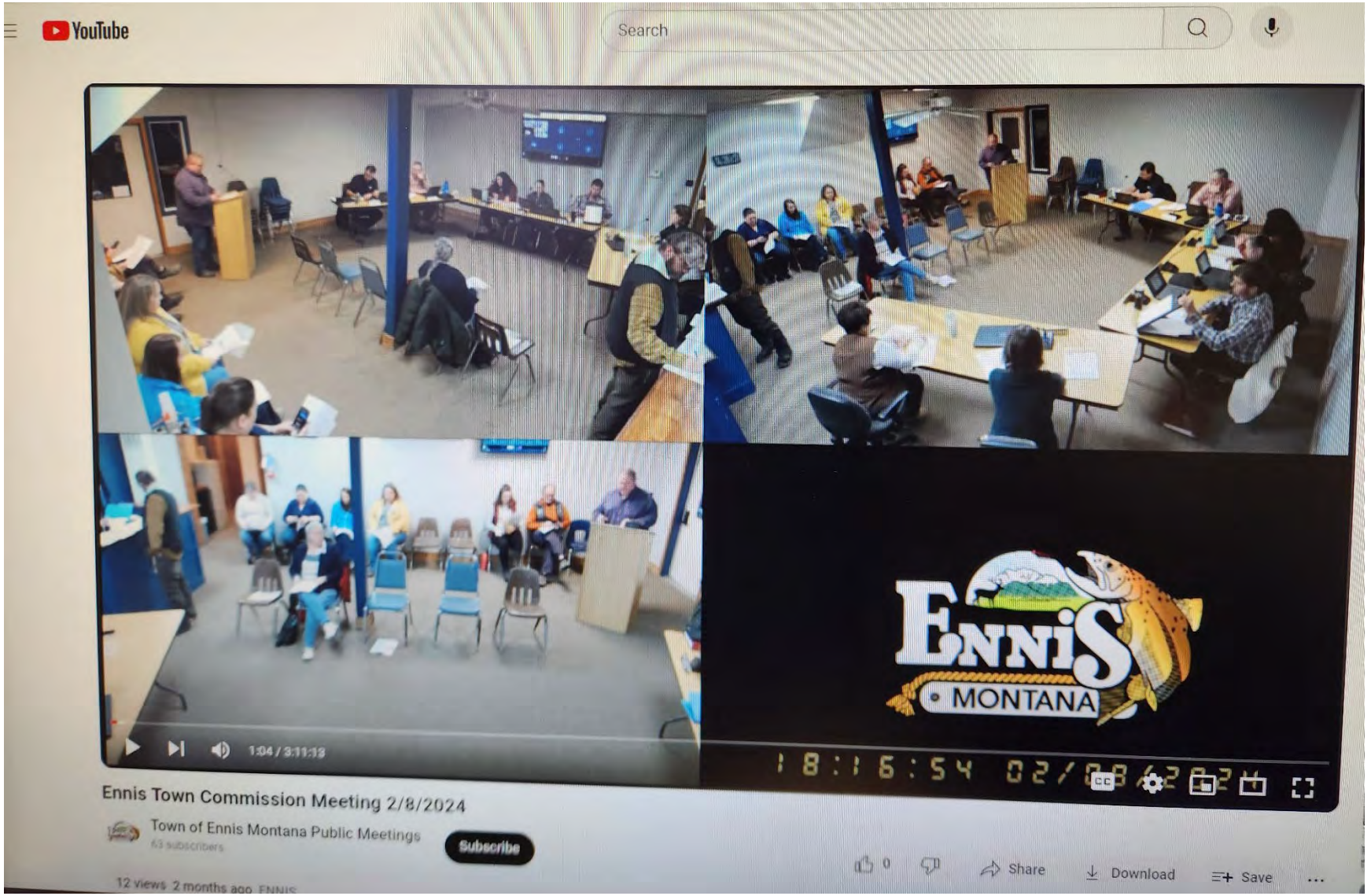
    Commissioner Palmerton asked that air BNB and resort comments move forward and asked that all commissioners send the mayor any legislative items they want to reviewed this year.

Commissioner Hardy echoed Commissioner Way's comments relative to Big Sky CIP. His "to do" list is a resort tax committee. He attended human resources training provided by MMIA in January and the Reimagine Rural meetings at our library.

11. Mayor's Report – Mayor Haas has been working on;
    - Grant application with the Planning Board representative Linden Seed. The board is moving forward with a new CIP. There are an estimated $40K in grants available.
    - Lion's Club Park agreement
    - Reimagining Rural facilitator training
    - Budget for water PER
    - Attended MMIA HR training in January and will schedule future quarterly trainings
12. Unscheduled matters – None
13. Adjourn – motion to adjourn made by Commissioner Hankins and seconded by Commissioner Palmerton. M/S/C unanimous.

Respectfully Submitted,

Maria Marzullo, Utility Clerk


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TOWN OF ENNIS

Water System

Preliminary Engineering Report

Public Meeting

February 8, 2024

Presented by:

GreatWest ENGINEERING

1.0 BACKGROUND AND SCOPE

1.1 Preliminary Engineering Report Objectives

- What is a Preliminary Engineering Report (PER)
  - Describes Existing System
  - Problem Definition
  - Evaluate Alternatives including Selection of a Preferred Alternative
  - Establishes Costs and Potential Funding Scenarios
  - Implementation Schedule
  - Facilitate Public Comment
  - Required by Regulatory Agencies for Compliance Issues and by Funding Agencies for Grants and Loans

2.0 PROJECT PLANNING

2.1 Population and Planning Period

- Planning period is 20 years (Design Year 2042)
- Montana Department of Commerce & US Census Data

TABLE 1
HISTORICAL POPULATION

Year	Ennis	% Annual Increase/Decrease	Madison County	% Annual Increase/Decrease
1980	660	-	5,448	-
1990	773	1.71	5,989	0.99
2000	840	0.87	6,851	1.44
2010	838	-0.02	7,691	1.23
2020	917	0.94	8,623	1.21
Average		0.88		1.22
2042(2)	1,100	1.0		

(1) US Census Bureau
(2) Population of Town at Design Year (2042) estimated from 2020 Census at conservative 1.0% Annual Growth

- 2042 Design Population Estimate– 1,100

3.0 EXISTING SYSTEM

3.1 Existing Water Demand

- Knowing current water demand is necessary to calculate future water needs throughout the planning period.
- Future water demand calculations are based on 2021 well hour meter data, well pumping rates and resulting water source monthly flows. Table 2 summarizes monthly average daily source flows and resulting per capita per day water use.

TABLE 2
2021 WATER USE BASED ON
WELL HOUR METER DATA

Month	Total Monthly Source Flow (gallons per day)(1)	Average Daily Source Flow (gallons per day)(1)	Average Per Capita Use (gpcd)(2)
January	6,987,000	225,387	241
February	6,999,000	249,964	267
March	7,617,000	245,710	263
April	7,557,000	251,900	269
May	6,351,000	204,871	219
June	14,667,000	488,900	523
July	16,392,000	528,774	566
August	12,837,000	414,097	443
September	10,740,000	358,000	383
October	7,176,000	231,484	248
November	5,469,000	182,300	195
December	5,598,000	180,581	193
Yearly Total	111,522,000		
Average		305,540	326

Notes:
(1)Based on 2021 well hour meter data.
(2)Based on existing service population of 935

- Average day per capita use = 326 gpcd
- Average day demand = 305,540 gallons per day and 212 gpm
- Maximum day demand = 639,000 gpd and 444 gpm (based on highest daily total hour meter usage)

3.2 Projected Water Demands

- With a projected population and average per capita use, projected water demands can be estimated

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- Additional supply is needed to ensure max day demands can be met with largest source out of service.

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  - In August 2011 and June 2012, the Town completed two exploratory test wells at a 2-acre parcel the Town purchased from the Ennis Rodeo Grounds. The deeper well is a nominal 12-inch diameter well, screened and completed to depth of 220 feet below ground surface (bgs). The shallower well is a nominal 6-inch diameter well with a 4-inch screen completed to a depth of 78 feet bgs.

- Initial testing of the wells in 2012 did not result in well capacities the Town was hoping for, and the Town elected to not pursue further work on the test wells at that time.

- Due to continued water supply concerns, in 2021 the Town moved forward with a Water Supply Hydrogeologic and Exploration Recommendations Report.

- When locating a redundant groundwater supply source for the Town, several factors need to be considered including, hydrogeology, source protection, proximity to the Town's existing water infrastructure, planned and expected growth and the price and availability of real estate.

- After the analysis was completed, the recommendation was to complete additional development and testing of the wells at the Rodeo Grounds. This work was completed in the summer of 2022.

- Deep Well (220') – Can produce 150 gpm, which would allow the Town to use 100 gpm, as DEQ standards only allow for 2/3 usage of total well capacity. Could likely be completed as a Redundant Well by DNRC definition and process. Water rights permitting may not be needed. This well has already gone through full DEQ approval process.

- Shallow Well (78') – Produces 90 gpm, which would allow for 60 gpm usage. Was constructed strictly as an observation well for testing purposes. Did not undergo DEQ approval. Unlikely to be considered a Redundant Well due to depth to water bearing formation. Full water rights permitting would be anticipated for any shallow well.

- Modeling suggests that drilling another deep well roughly 100' away from the existing deep well could potentially yield 105 gpm with a net usable capacity of 75 gpm. Could also likely be completed as a Redundant Well by DNRC definition and process. Water rights permitting may not be needed. This well would need to go through full DEQ approval process.

- Current water rights limit total pumping rate at any one time to 550 gpm.

- Estimated Capital Cost: $925,000

o **Add Chlorination at Each Well House**
  - Estimated Capital Cost: $95,000

o **Security Fencing at Well #3**
  - Estimated Capital Cost: $11,000

o **Install Backup Generator at Well #2**
  - Estimated Capital Cost: $116,000

4.2 Storage

o **Recoat and Rehab the Existing Tank and add a New 150,000 Gallon On-Grade Glass-Lined Steel Storage Tank**
  - Estimated Capital Cost: $1,675,000

o **New 700,000 Gallon On-Grade Glass Lined Steel Storage Tank**
  - Estimated Capital Cost: $2,587,000

- **New 700,000 Gallon Prestressed Concrete Storage Tank**
  - Estimated Capital Cost: $3,083,000

4.3 Distribution

- **Replace Old Fire Hydrants**
  - Estimated Capital Cost: $152,000

- **New Valves in Distribution System**
  - Estimated Capital Cost: $111,000

- **Loop Dead-End Water Mains**
  - Estimated Capital Cost: $1,120,000

4.4 Water Meters

- Replace 20% of Water Meters
  - Estimated Capital Cost: $117,000

4.5 Selection of an Alternative

- Comparative Analysis
  - Life Cycle Costs
  - Operational and Maintenance Considerations
  - Permitting Requirements
  - Social Impacts
  - Environmental Impacts
  - Public Health and Safety
  - Land Acquisition
  - Product Availability

4.6 Recommended Preferred Alternatives and Priority List

TABLE 4 TOWN OF ENNIS RECOMMENDED IMPROVEMENT PROGRAM		
ITEM	**DESCRIPTION**	**ESTIMATED COST**
Priority #1	New Water Supply Wells at Rodeo Grounds	$ 925,000
Priority #2	New 700,000 Gallon Prestressed Concrete Storage Tank	$ 3,083,000
Priority #3	Replace Old Fire Hydrants	$ 152,000
Priority #4	Replace 20% of Water Meters	$ 117,000
Priority #5	Install New Backup Generator at Well #2	$ 116,000
Priority #6	New Valves in Distribution System	$ 111,000
Priority #7	Add Chlorination at Each Well House	$ 95,000
Priority #8	Security Fencing at Well #3	$ 11,000
Priority #9	Distribution System Improvements (Loop dead-end mains)	$ 1,120,000

5.0 FUNDING STRATEGIES

5.1 Montana Department of Commerce Target Rate

- Dept. of Commerce has established a target rate that communities must be paying for water and wastewater services to be eligible for grants.
- Target rate is based on a percentage of a community's Median Household Income (MHI) from 2015-2019 American Communities Survey data. The percentages are 1.4% for water only, 0.9% for wastewater only and 2.3% for communities with both water and wastewater systems.
- Median Household Income for Ennis: $46,280
- 2.3% of MHI for combined water and wastewater: $88.70 per month

5.2 Existing Average Residential Monthly Rate

- Water: $38.50
- Wastewater: $45.65
- Combined: $84.15 (95% of target rate)

5.3 State Grant Programs

- Montana Coal Endowment Program: Must be at 100% of target rate minimum to be eligible for up to $500,000; 125% of target rate is eligible for $625,000; 150% of target rate is eligible for $750,000. Grant requires a dollar-for-dollar match. Match can be in the

form of other grants, loans or local funds. Applications are accepted in even years and then must go to the Legislature for approval.

- DNRC Renewable Resource Grant Program: Grants up to $125,000, no match requirement. Applications are accepted in even years and then must go to the Legislature for approval.

5.4 Loan Programs

- Montana Department of Environmental Quality State Revolving Fund (DEQ and DNRC): 2.5% Interest, 20-year term typical, can go up to 30-years if improvements have that life expectancy. 75% loan forgiveness possible, up to $750,000. Must be at target rate to qualify for loan forgiveness.

5.5 American Rescue Plan Act (ARPA) Minimum Allocation Grants (MAG)

- Madison County has allocated $225,000 of its MAG funding to Ennis for water system improvements.
- Town has committed $214,133 of its MAG funding for the project.

5.6 Proposed Funding Scenario for Recommended Project

- **New Water Supply Wells at Rodeo Grounds**
- **New 700,000 Gallon Prestressed Concrete Storage Tank**

Madison County MAG Grant	$ 225,000
Town of Ennis MAG Grant	$ 214,133
Town Reserves	$ 10,867
RRGL Grant	$ 125,000
MCEP Grant	$ 500,000
SRF Loan Forgiveness	$ 750,000
SRF Loan (2.5% - 20-yrs)	$2,183,000
Total Project Cost	$4,008,000

8

Estimated Monthly Rate Increase $18/month

Environmental Assessment

- What is an Environmental Assessment?
  - Public document analyzing the complexity and seriousness of environmental issues

- Draft EA has been completed and is available
  - All recommended State and Federal agencies have been contacted
  - Public comments can be provided tonight

- Received comments from several agencies

- To date, no comments have been of significant impact

- Decision:
  - Environmental Assessment is acceptable;
  - Environmental Impact Statement (EIS) is not necessary

AFFIDAVIT OF PUBLICATION

STATE OF MONTANA

County of Madison

(Susanne Hill &/or Cori Koenig) being duly sworn, says she is publisher of *The Madisonian*, a weekly newspaper published in the City of Ennis; County of Madison, State of Montana; and that the annexed notice is a true copy which was published in said newspaper for a period of 2 successive weeks, commencing on the 28th day of March, 2024, and ending on the 4th day of April, 2024.

Cori Koenig

PUBLISHER SIGNATURE

Subscribed and swore to before me this 4th day of April, 2024.

NOTARY NAME HERE

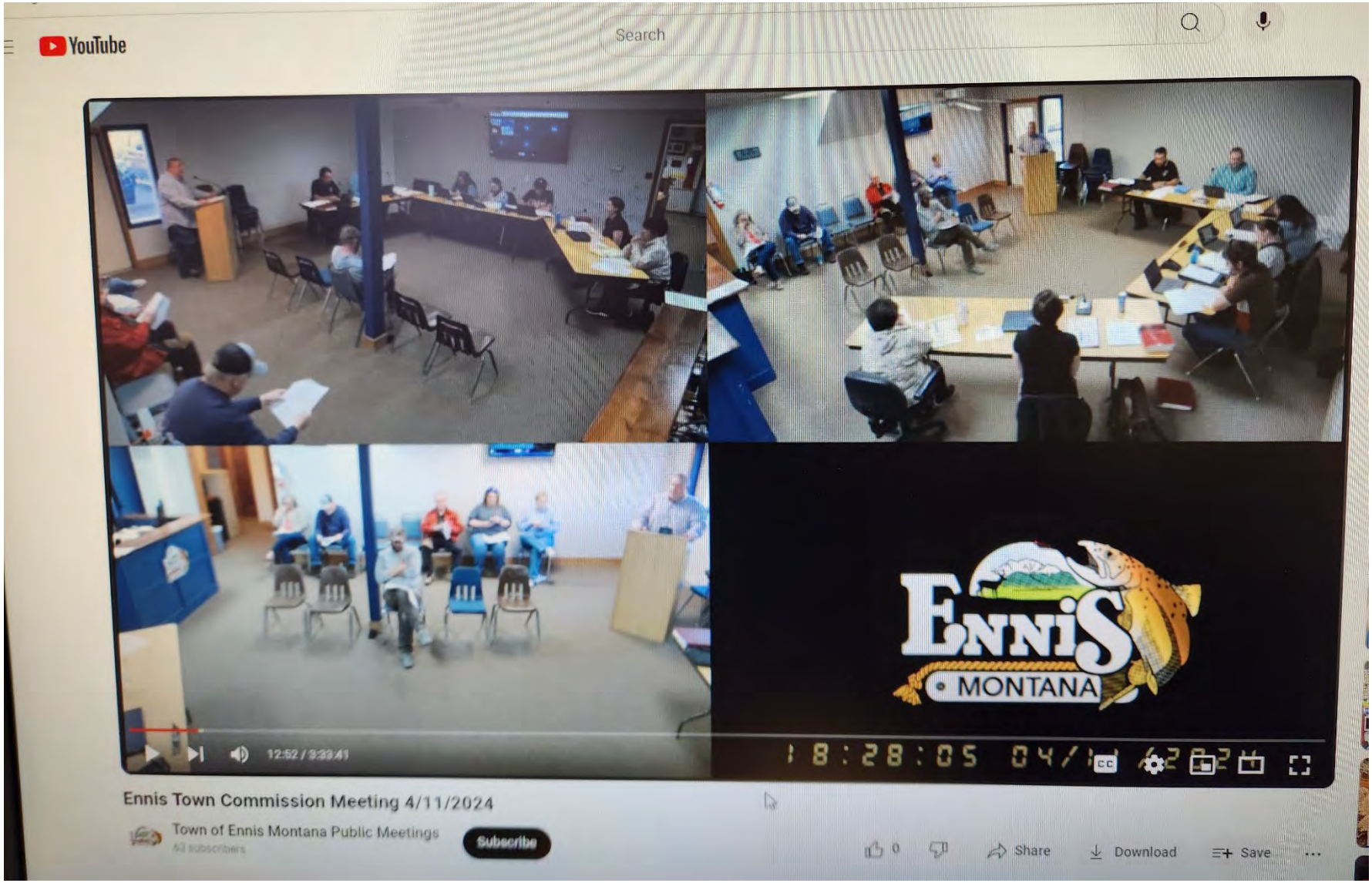
MATT HILL
Notary Public for the
State of Montana
Residing at DEER LODGE, MT
My Commission Expires
January 13, 2026

NOTICE OF PUBLIC HEARING

The Town of Ennis will hold a second public hearing before its monthly Commission meeting on April 11, 2024. The public hearing will begin at 6:15 p.m. at Ennis Town Hall, 328 West Main Street, Ennis, MT 59729. The Commission has scheduled the hearing to obtain public comments regarding the proposed improvements to Ennis's water system and to discuss proposed funding applications. With assistance from Great West Engineering, the Town is preparing a water preliminary engineering report (PER) and applications for funding from agencies including the Montana Department of Commerce, Montana Department of Natural Resources and Conservation, USDA Rural Development, and/or the Department of Environmental Quality's Drinking Water State Revolving Fund Program. At the public hearing, representatives of Ennis and Great West Engineering will review the purpose of the project, the project area, the scope of work, budget, possible sources of funding, and any costs that may result for local citizens because of the project. Great West Engineering will also present its assessment of the project's impact on the environment. Copies of the draft environmental assessment and draft PER are available upon request. During the public hearing, residents may ask questions and express their opinions regarding the project and its impact on the Town of Ennis. Residents can submit comments and questions about the project at any time via Great West Engineering's Project Managers Joel Pilcher, PE at (406) 495-6186, jpilcher@greatwesteng.com, or Collette Anderson, PE at (406) 495-6164, canderson@greatwesteng.com.

CLERK, TOWN OF ENNIS

Published March 28 and April 4, 2024


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TOWN OF ENNIS

Water System

Preliminary Engineering Report and Grant Applications

Public Meeting

April 11, 2024

Presented by:

GreatWest ENGINEERING

1.0 BACKGROUND AND SCOPE

1.1 Preliminary Engineering Report Objectives

- What is a Preliminary Engineering Report (PER)
  - Describes Existing System
  - Problem Definition
  - Evaluate Alternatives including Selection of a Preferred Alternative
  - Establishes Costs and Potential Funding Scenarios
  - Implementation Schedule
  - Facilitate Public Comment
  - Required by Regulatory Agencies for Compliance Issues and by Funding Agencies for Grants and Loans

2.0 PROJECT PLANNING

2.1 Population and Planning Period

- Planning period is 20 years (Design Year 2042)
- Montana Department of Commerce & US Census Data
- 2042 Design Population Estimate– 1,100

3.0 EXISTING SYSTEM

3.1 Existing Water Demand

- Knowing current water demand is necessary to calculate future water needs throughout the planning period.
- Average day per capita use = 326 gpcd
- Average day demand = 305,540 gallons per day and 212 gpm
- Maximum day demand = 639,000 gpd and 444 gpm

3.2 Projected Water Demands

- With a projected population and average per capita use, projected water demands can be estimated
- Average day demand = 358,600 gallons per day and 249 gpm
- Maximum day demand = 751,300 gpd and 522 gpm

3.3 Water Supply

- Well #2 produces approximately 350 gpm and Well #3 produces approximately 250 gpm.

- Adequacy of Supply

  - Per DEQ standards, the water system must be able to provide the maximum daily demand with the highest capacity pump out of service.
  - The 2042 projected maximum day demand is 522 gpm.
  - With the largest well out of service, only 250 gpm can be provided.
  - An additional 272 gpm of source capacity is needed to meet projected growth and DEQ standards

- Neither well is equipped with chlorination equipment to allow for disinfection of the distribution system, should contamination be suspected.

- The water supply is not equipped with a backup power source. In the event of a power outage, the system would need to rely on the storage volume to maintain service to the users. A prolonged power outage could result in the community being without water after less than two full days at average daily flows.

- Neither the new Well #3 site nor the storage tank site have any security fencing. A lack of security fencing makes it difficult to prevent vandalism and ensure safe drinking water for all consumers.

3.4 Water Storage

- 530,000-gallon on-grade epoxy coated bolted steel tank
  - Constructed in 1995
  - Fair condition, is leaking and due for a recoating

- Water storage is critical for two primary reasons:
  - Provides operational storage
  - Provides fire suppression storage

- Required Storage Capacity:
  - DEQ Circular 1, Chapter 7 requires “minimum allowable storage must be equal to the average day demand plus fire flow demand…where fire protection is provided”.
  - Current Scenario:
    - Average Day Demand: 305,540 gallons
    - Fire Flow Demand: 2,500 gpm (commercial) for 2 hours = 300,000 gallons
    - Total Storage Required: 605,540 gallons

  - Future (year 2042) Scenario:
    - Average Day Demand: 358,600 gallons
    - Fire Flow Demand: 2,500 gpm (commercial) for 2 hours = 300,000 gallons
    - Total Storage Required: 658,600 gallons

  - Total storage provided: 530,000 gallons

  - The existing storage capacity is not sufficient to meet current or future demands. An additional 130,000 gallons of storage is needed to meet future demands.

3.5 Water Distribution System

- In general, the distribution system is well laid out. Static pressures in the system range between 100 psi in the downtown area and 75 psi in the southwest portion of the system.

- Hydraulic modeling was used to evaluate flows and pressures in the distribution system. The computer model scenario of average daily demands shows no obvious problems. The model indicates that normal operating pressures are well above 35 psi. Computer runs with peak daily and peak hourly demands yield similar results.

- The system was then modeled for available fire flows throughout the system. These fire flows are modeled concurrently with the future peak daily demand flow. With the exception of a few dead-end mains on the extreme south and east sides of the system, a minimum fire flow of 1,000 gpm is available throughout the system, which is a standard for residential areas. Available fire flows in the commercial area (Main Street) and the school area exceed 2,500 gpm, which meets recommended standards. The identified piping deficiencies are the dead-end mains on the east end of the system.

- Portions of the distribution system do not have sufficient valves to properly isolate sections of water main and facilitate directional flushing of the system in the event of an emergency.

- There are several old fire hydrants in the distribution system that need to be replaced.

3.6 Water Meters

- Individual water service meters are over 25-years old and have likely exceeded their service life. The meters should be replaced to ensure the Town is accurately metering all of the usage by the customers and to maximize the revenue potential.

4.0 ALTERNATIVES

4.1 Supply

- Additional supply is needed to ensure max day demands can be met with largest source out of service.

- **New Water Supply Wells at the Rodeo Grounds**
  - In August 2011 and June 2012, the Town completed two exploratory test wells at a 2-acre parcel the Town purchased from the Ennis Rodeo Grounds. The deeper well is a 12-inch diameter well, screened and completed to depth of 220 feet below ground surface (bgs). The shallower well is a 6-inch diameter well with a 4-inch screen completed to a depth of 78 feet bgs.

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- Town has committed $214,133 of its MAG funding for the project.

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- **New Water Supply Wells at Rodeo Grounds**
- **New 700,000 Gallon Prestressed Concrete Storage Tank**

Madison County MAG Grant	$ 225,000
Town of Ennis MAG Grant	$ 214,133
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SRF Loan (2.5% - 20-yrs)	$2,183,000
Total Project Cost	$4,008,000

Estimated Monthly Rate Increase $18/month

Environmental Assessment

- What is an Environmental Assessment?
  - Public document analyzing the complexity and seriousness of environmental issues

- Draft EA has been completed and is available
  - All recommended State and Federal agencies have been contacted
  - Public comments can be provided tonight

- Received comments from several agencies

- To date, no comments have identified any significant impacts

- Decision:
  - Environmental Assessment is acceptable;
  - Environmental Impact Statement (EIS) is not necessary

APPENDIX P

Resolutions

RESOLUTION NO. 599-2024

A RESOLUTION OF THE TOWN OF ENNIS TO ADOPT A DETAILED PRELIMINARY ENGINEERING REPORT PREPARED BY GREAT WEST ENGINEERING, INC.

WHEREAS, The Town of Ennis has completed a Preliminary Engineering Report (PER) describing the condition and performance of its existing water system;

WHEREAS, the PER has identified needs for the water system and developed, evaluated, and recommended preferred alternatives for improvements;

WHEREAS, the PER provides recommendations for financing the recommended water system improvements;

WHEREAS, the Town held a public meeting to review the PER, the recommended funding alternative, the chosen funding scenario and its impact to user rates, and to solicit public comment;

NOW, THEREFORE, BE IT RESOLVED THAT:

1. The Town of Ennis adopts the final PER and the PER funding recommendations for completion of the Water System Improvements; and

2. That the Town hereby authorizes Nici Haas, Mayor to execute and attest any documents required to adopt the PER and effectuate its submission to the appropriate governing agencies:

PASSED AND ADOPTED on this 18 day of April, 2024

APPROVED

Nici Haas

Nici Haas, Mayor

ATTEST:

Ginger Guinn

Ginger Guinn
Town Clerk
Town of Ennis

TOWN OF ENNIS MONTANA
INCORPORATED TOWN SEAL
NOV. 6, 1956

RESOLUTION NO. 600-2024

A RESOLUTION OF THE TOWN OF ENNIS TO ACCEPT THE DETERMINATION THAT AN ENVIRONMENTAL ASESSMENT IS APPROPRIATE FOR THE TOWN OF ENNIS WATER SYSTEM IMPROVEMENTS PROJECT

WHEREAS, the Town of Ennis has completed an assessment to identify potential environmental impacts of the proposed Water System Improvements Project;

WHEREAS the draft Environmental Assessment was made available for public comment and the findings were presented and reviewed at a public meeting;

WHEREAS the Town did not receive substantive public comment;

WHEREAS the Town of Ennis has determined that the improvements to its drinking water system will not significantly affect the quality of the human environment and accordingly the Town has determined the preparation of an Environmental Impact Statement is not necessary;

NOW, THEREFORE, BE IT RESOLVED by the Town of Ennis to adopt the final Environmental Assessment for the water system improvements project.

PASSED AND ADOPTED on this 16 day of April, 2024

APPROVED

Nici Haas

Nici Haas, Mayor

ATTEST:

Ginger Guinn

Ginger Guinn
Town Clerk
Town of Ennis

TOWN OF ENNIS MONTANA
INCORPORATED TOWN SEAL
NOV. 6, 1956

APPENDIX Q

SRF Priority List Survey

DWSRF and WPCSRF PROJECT PRIORITY LIST SURVEY

Proposed water or wastewater system improvement needs, excluding operation, maintenance, and growth development.

NAME OF COMMUNITY OR SYSTEM: **Town of Ennis**

COUNTY OR COUNTIES: **Madison County**

POPULATION OF SERVICE AREA: **849**

MEDIAN HOUSEHOLD INCOME FOR SERVICE AREA: **$46,280**

CURRENT AVERAGE MONTHLY RESIDENTIAL WATER RATE: **$37.54**

CURRENT AVERAGE MONTHLY RESIDENTIAL SEWER RATE: **$47.43**

CURRENT AVERAGE MONTHLY RESIDENTIAL SOLID WASTE RATE: **N/A**

Name & Title of Contact Person: **Nici Haas, Mayor**

Address: **P.O. Box 147, Ennis, MT 59729**

Telephone**: (406) 682-4287** Fax: ( )

==========

Please provide the following information:

1. A brief description of the project. As a guideline, do not exceed approximately 200 words.

   The Town of Ennis' domestic water system consists of several components. The existing source of water for the system currently consists of two wells. These wells, located in the west-central and southeast portions of Town, pump water directly into the distribution piping, which in turn feeds the user demands and fills the reservoir. The storage reservoir is a 530,000 gallon on-grade bolted steel tank located on a hill west of Town. Telemetry systems run between the wells and the tank enabling control of the reservoir level and pumping cycles. Both the supply and storage capacities are insufficient to meet system demands. The proposed project includes construction of a new wellhouse and development of two new redundant water supply wells. The project also includes replacement of the existing storage tank with a new 700,000 gallon prestressed concrete storage tank.

2. Provide an estimated project budget, including potential funding sources. Include engineering, legal, and administrative costs in addition to construction related costs. Please provide a break out of these costs. Include other funding sources.

   The total project cost for the proposed project is $4,008,000, including estimated loan reserves, construction, engineering, land acquisition, legal and administrative costs.

   The Town's preferred funding package for the proposed project is shown below:

Madison Co ARPA MAG	**$225,000**
Town ARPA MAG	**$214,133**
MCEP Grant	**$500,000**
DNRC Grant	**$125,000**
SRF DWF Forgiveness	**$750,000**
SRF Loan (20 Years)	**$2,183,000**
Town Reserves	**$10,867**

The Minimum Allocation Grants from Madison County and Town of Ennis have already been committed to the project, along with the Town's reserves. The Town will apply for the MCEP and RRGL funding in May 2024.

The table below provides the budget break-down:

Detailed Project Budget

Completed by: Great West Engineering For: Town of Ennis Date: April 2024

ADMINISTRATIVE and FINANCIAL COSTS:	SOURCE: Madison County MAG	SOURCE: Town of Ennis MAG	SOURCE: Town Reserves	SOURCE: SRF A Loan	SOURCE: SRF B Loan	SOURCE: MCEP	SOURCE: RRGL	TOTAL
Grant & Loan Administration Services	$ 15,000			$ 10,000	$ 10,000			$ 35,000
Legal Costs	$ 10,000							$ 10,000
Audit Fees					$ 15,000			$ 15,000
Loan Reserves					$ 67,900			$ 67,900
Bond Counsel and Related Costs					$ 20,000			$ 20,000
TOTAL ADMINISTRATIVE/FINANCIAL COSTS	$ 25,000	$ -	$ -	$ 10,000	$ 115,100			$ 147,900
ACTIVITY COSTS:								
Geotechnical Investigation		$ 35,000						$ 35,000
Engineering – Basic Services	$ 200,000	$ 97,133	$ 10,867					$ 308,000
Engineering – Resident Project Representative Services				$ 51,500	$ 153,500			$ 205,000
Construction		$ 32,000		$ 546,300	$ 1,502,700	$ 500,000	$ 125,000	$ 2,706,000
Land Acquisition		$ 50,000						$ 50,000
Contingency				$ 142,200	$ 413,900			$ 556,100
TOTAL ACTIVITY COSTS	$ 200,000	$ 214,133	$ 10,867	$ 740,000	$ 2,067,900	$ 500,000	$ 125,000	$ 3,860,100
TOTAL PROJECT COSTS	$ 225,000	$ 214,133	$ 10,867	$ 750,000	$ 2,183,000	$ 500,000	$ 125,000	$ 4,008,000

3. What is the reason for the project? What compliance issue is being addressed? For drinking water projects, are there supply, treatment, distribution, or storage problems? For wastewater projects, are there collection, treatment, or disposal problems? For wastewater projects, what is the benefit to water quality? Again, limit your response to approximately 200 words.

   The water supply does not meet DEQ-1 standards which require that the system be able to provide the maximum daily demand with the highest capacity well out of service. Ennis' current maximum day demand is 444 gpm. The Town's current production capacity is 250 gpm with the largest well out of service. The system cannot meet the current maximum day demand with the largest well out of service. The future max day demand is 522 gpm. An additional 272 gallons per minute of source capacity is needed to meet projected demands and DEQ standards.

   The existing steel water storage tank is 29 years old, is leaking and requires significant maintenance should it remain in service. The existing storage capacity is not sufficient to meet system demands and provide the needed fire protection. DEQ-1 standards state *"The minimal allowable storage must be equal to the average daily demand for a 24-hour period plus fire flow demand where fire protection is provided".* The existing storage capacity is deficient by 130,000 gallons.

4. Provide the following information as an indication of your readiness to proceed:

   a) Project Schedule – Include REASONABLE milestone dates for: PER completion (allow sufficient time for SRF review of draft and final document and EA process), COMPLETE draft plan and spec submittal to the SRF program, bid advertisement (allow sufficient time for SRF review of draft and final plans and specs), bid opening, construction start and finish. DEQ may adjust these schedules to make them more realistic, if necessary.

   Please see table below for detailed information on the proposed project schedule:

Project Implementation Schedule

Project Implementation Schedule	
Action	**Date**
Public Hearing on Draft PER & EA	April 2024
Prepare Final PER	May 2024
Apply for DNRC & MCEP Grants	May 2024
Submit SRF Application	July 2024
Begin Design	July 2024
Design Basis Report/Cost Estimates to the Town	August 2024
Submit Design Plans and Specifications to MDEQ	September 2024
MDEQ Review & Approval	October 2024
Finalize Grant Financing	May/June 2025
Advertise for Bids	May 2025
Finalize SRF Loan Financing	June 2025
Start Construction	July 2025
Complete Construction	December 2025

b) Has a planning document or preliminary engineering report been prepared? Submitted? Approved?

A Preliminary Engineering Report is being prepared and will be completed in May 2024

c) Has an engineer been hired?

The Town has an on-call contract with Great West Engineering.

d) Has a design contract been executed? What date did design begin?

A design contract has not yet been executed.

e) Have plans and specifications been prepared and submitted to the SRF program?

Plans and specifications will be prepared and submitted for approval likely by September 2024.

f) Has a bond resolution been adopted?

A bond resolution has not been adopted.

g) Are rates and charges in place to allow for additional debt service? If so, submit user rate ordinance for final rates including debt service, O&M and coverage (if required).

An additional rate increase will be required as part of this construction project. The current average monthly residential rate is $37.54. The projected rate upon project completion is $55.40. Rates will need to increase by $17.86 per month per user with the proposed funding package, which includes the estimated debt service, O&M and coverage.

h) Are there any outstanding legal issues that could potentially delay construction start? Please explain in detail.

There are no outstanding legal issues that could potentially delay construction to the best of our knowledge.

i) If land purchase, lease, right-of-way or other land acquisition is required prior to design and construction, what is the status of these processes and what issues remain to be addressed?

It is anticipated that land acquisition will be necessary for the proposed tank site and possibly at the well site. This will be addressed once design commences.

5. Has a county water and/or sewer district been formed? Do you anticipate the formation of an RSID? Do you anticipate the issuance of a Revenue or General Obligation Bond? What type of loan security are you planning? Please limit your response to approximately 200 words.

The issuance of a Revenue Bond is anticipated for this project. A half a year's payment is included in the project budget to cover the SRF Bond Reserve requirement.