



Preliminary Engineering Report

Water Treatment Plant

City of Ironwood, Michigan

IRCTY 154251 | June 26, 2020



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Water Treatment Plant
City of Ironwood, Michigan

SEH No. IRCTY 154251

June 26, 2020

I hereby certify that this report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Michigan.



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Executive Summary

The City of Ironwood (City) has had concentrations of manganese in their drinking water that have exceeded safe levels established by the Michigan Safe Drinking Water Act. Of the City's six drinking water wells, five of the wells consistently exceed the safe level for manganese of 300 micrograms per liter (ug/L). Manganese in drinking water also causes discolored water and staining. In addition to water quality concerns, some of Ironwood's water infrastructure is old and in need of replacement including the historic pump station and clearwell.

Drinking water options including new wells, connecting to the Gogebic Range Water Authority, and removing the manganese from the existing City wells were examined. Only removing the manganese from the existing wells was deemed feasible.

The most cost-effective method for removing manganese from drinking water is chemical oxidation followed by sand filtration. These processes require construction of a water treatment plant. Based upon an analysis of Ironwood's water demand, the capacity of the water treatment plant should be 2 million gallons per day (MGD). The proposed water treatment plant site is the Spring Creek Pump Station property.

For this study two treatment plant alternatives were evaluated including concrete gravity filtration and steel gravity filtration. With both gravity filtration options, the water flows by gravity through filter cells into a holding tank (clearwell). The water is then pumped into the distribution system.

Report level project and life cycle cost opinions for the two alternatives are included below. The project costs include the capital cost, plus contingency, administration, and engineering. Life cycle costs represent the total cost of owning the treatment plants for 50 years and include capital cost, equipment replacement, labor, gas, chemicals, insurance, electricity, and annual equipment repair.

	<u>Project Cost</u>	<u>50 Year Life Cycle Cost</u>
Concrete Gravity Filter Treatment Plant	\$9,724,000	\$30,670,000
Steel Gravity Filter Treatment Plant	\$10,529,000	\$32,950,000

A concrete gravity filter treatment facility is the recommended alternative due to its lower capital and life cycle cost. A water treatment plant project would also eliminate the need to replace aging infrastructure at the pump station site.

If the City elects to proceed with a water treatment plant project, the proposed project schedule could be as follows:

<u>Item</u>	<u>Completion Date</u>
Preparation of Plans	October 2020 – January 2021
Ad for Bid	February 2021
Bid Opening	March 2021
Construction Start	May 2021
Construction Complete	September 2022

Executive Summary (continued)

If a water treatment plant project is pursued, immediate distribution water quality improvements should not be expected. The water treatment plant will produce water free manganese and iron; however, it takes time for the manganese and iron deposits in the distribution system to dissipate and overall water quality to improve.

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Preliminary Engineering Report

Water Treatment Plant

Prepared for City of Ironwood

General

This Preliminary Engineering Report (PER) has been prepared on behalf of the City of Ironwood (City) in an effort to evaluate the existing aging water well fields, pumping, storage and treatment facilities. The goal is to develop solutions to reduce iron and manganese levels in the water system, in order to deliver the City's water customers a quality product. The report has been assembled in a format to meet the requirements of the United States Department of Agriculture – Rural Development. It is expected this document will be submitted to Rural Development as part of an application for funding assistance. The need for this study and analysis was determined by the City of Ironwood.

The City of Ironwood (City) has had concentrations of manganese in its drinking water that have exceeded levels established by the Michigan Safe Drinking Water Act. The Michigan Department of Health and Human Services ordered the City to place a Do Not Drink Advisory for infants under age 12 months from August 9, 2019 through September 6, 2019 based on elevated manganese in the source water. The Do Not Drink Advisory was a result of a fire that caused disruption in the distribution system and sediment being released due to fire hydrant use. Manganese in drinking water also causes discoloration and staining.

With the exception of the distribution system disruption caused by a fire, the City has been able to maintain levels of manganese below the regulatory standards in the distribution system by blending wells with a well low in manganese.

In addition to manganese in its drinking water, the City also has an aging pump station and clearwell that are in need of replacement.

The purpose of this report is to develop alternatives to provide the City of Ironwood with drinking water that has reliably safe levels of manganese and replace infrastructure that has reached the end of its useful life. This report will compare alternatives and recommend the most cost effective alternative that meets the City's needs.

1 Project Planning

1.1 Location

The City of Ironwood (City) is located in Gogebic County in the west end of the Upper Peninsula of Michigan. The community is situated near U.S. Highway 2 at the state border with Wisconsin. Lake Superior is located approximately 12 miles to the north, and the City is bordered on the south and west by the Montreal River and Wisconsin border. The topography in the area is highly varied with elevations ranging from approximately 1,420 to 1,820 feet above sea level datum, and an average elevation of 1,503 feet above MSL. The Gogebic Range is a series of low hills running generally east and west. The developed area of the City is located amongst these hills. A large sunken area bisects the City and is the result of subsidence due to previous mining activities. The subsidence has ceased with no major activity indicated over the last 35 years, and this portion of the City remains undeveloped.

The proposed water treatment facility project would be located at the site of the existing water pump station. This site is located approximately 3 miles north of the City limits in the Charter Township of Ironwood. The property is owned by the City of Ironwood.

The proposed upgrades to the Big Springs transmission main are located along the existing transmission main which connects the Big Springs Well Field and the existing pump station. The Big Springs well field is located approximately 3 miles west of the pump station. The main is located both within an existing easement along an abandoned railroad grade and also within the right-of-way of Big Springs Road.

The regional location of the project is presented in Appendix A Figure 1 – Site Location Map. Figures 2-4 show a detailed project area map for the Pump Station and Spring Creek Well Field (Figure 2), Big Springs Well Field (Figure 3), and Big Springs Transmission Main (Figure 4).

1.2 Environmental Resources Present

The existing environment is that of a small, rural community and the natural environment has been modified by the construction of homes, businesses, streets and other man-made improvements. The proposed Water Treatment Plant construction would take place at the current site of the existing high lift pumping station on Pump Station Road. Upgrades to the Big Springs Transmission main would take place by adding valves, hydrants and air reliefs vaults at roadway intersections throughout the length of this main.

The new treatment facility will be constructed on land owned by the City of Ironwood. The proposed project area is located southeast of the existing pump station and along the south side of the Spring Creek transmission main. This project would require land disturbance of an area approximately 3 acres in size. This area is primarily undeveloped land which is sparsely wooded. No existing structures will be affected by the construction of the proposed treatment facility, with the existing pumping facility to remain as an additional storage building. Spring Creek, a tributary to the Montreal River, runs westerly along the north half of the property. Construction activities would be approximately 550 feet south of Spring Creek.

Proposed upgrades to the Big Springs transmission main would take place at locations where the main crosses Pump Station Rd, Vanderhagen Rd, Junet Rd, and along Big Springs Road between Junet Rd and the Big Springs Well Field. The Big Springs transmission main primarily runs in an easement along the north side of the existing railroad right-of-way between the treatment plant and Junet Rd and then follows Big Springs Rd from Junet Rd to the Big Springs Well Field. Disturbance of land would be within the existing easements and/or roadway right-of-ways. The disturbed land would be of sparsely wooded areas above the existing existing transmission main.

The City, with the assistance of the Rural Community Assistance Partnership (RCAP), Short Elliott Hendrickson, Inc (SEH) and Coleman Engineering Company (CEC), has prepared an Environmental Report addressing short and long-term environmental impacts of the proposed project. Please refer to the Environmental Report for more detailed information.

1.3 Population Projections

According to published U.S. Census data, the population of the City declined from 6,293 persons in 2000 to 5,387 persons in 2010. This indicates a population decline of over 14% in the 10-year period. Persons 65 years of age and over in the City represent 21.7% of the population, while persons 65 years of age and over in the State of Michigan represent 13.8% of the population. The median age of persons in the City of Ironwood is 46 years of age as compared to statewide median of 38.9 years of age. The Census data indicates a generally older population that is decreasing in numbers.

The content of this report and the scope of anticipated work are based on replacement of the existing water pumping and treatment facility rather than extending service to outlying areas or adding significantly to the existing customer base. Replacement of the treatment system will help supply the community a more reliable water source. The proposed upgrades to the potable water system are also intended to correct deficiencies in the existing system.

Construction of a new treatment facility would create a higher quality water product and would only aid in the future potential for economic growth. The upgrades to the water supply system would allow for extensions to the existing distribution system if growth opportunities arise. Leaving the infrastructure system to age and degrade will only discourage growth and the economic viability of the community.

1.4 Community Engagement

The City will be holding several public meetings throughout the planning process that will explain the proposed project. The project costs and funding strategies will be discussed in detail. Newspaper articles and press releases will cover the project in detail beginning with potential project funding.

2 Existing Facilities

2.1 Location Map

Figure 5 in Appendix A provides an overview of the City's water service area. Hurley, Wisconsin on the west side of the service area is also a customer of the City water utility.

2.2 Water System Overview

The City of Ironwood receives its water from six (6) wells, three (3) of which are located in the Spring Creek wellfield and three (3) of which are located in the Big Springs wellfield. All six (6) wells pump to a 140,000 gallon concrete clearwell located at the Spring Creek pump station site. The clearwell is piped to three (3) high-lift pumps located in the pump house. The high-lift pumps send the water from the pump station into the Ironwood distribution system and the 2.5 million gallon (MG) Mt. Zion reservoir.

The Jessieville area in the southeast corner has an elevation that requires a second pressure district. The Jessieville booster station pumps water from the Ironwood distribution system into the Jessieville pressure zone and 150,000 elevation reservoir.

2.3 History

Prior to the 1920's, the City of Ironwood utilized the Montreal River for its drinking water. In the 1920's, the City developed the Spring Creek wellfield and constructed the existing Pump Station. The Spring Creek wellfield and pump station is located approximately 3 miles north of the City. Water was pumped from the pump station into the Ironwood distribution system and the 2.5 MG Mt. Zion reservoir.

In the 1940's the water in Spring Creek wellfield became polluted by mining activities and the Big Springs wellfield was developed. The Big Spring wellfield is located approximately 3 miles west of the Spring Creek pump station. The 140,000-gallon clearwell at the pump station site was constructed in conjunction with the Big Springs well field.

In the late 1940's, the City quit using the Spring Creek wellfield due to contamination. In the 1950's, the mines stopped discharging to Spring Creek. In 1962, the City began using the Spring Creek wellfield again.

In the 1990's it was determined that the Big Springs wells were influenced by surface water. To avoid treatment, three (3) new Big Spring wells were drilled deeper and the previous wells were abandoned.

Over time, various Spring Creek wells were abandoned and new ones were drilled. The newest Spring Creek well, Well 104, was drilled in 2003.

2.3.1 Recent Projects

In 2008, the Gogebic Range Water Authority (GRWA) installed approximately 4,000 feet of 16-inch pressure class 350 water main parallel to the existing 16-inch supply water main. The water main was installed from Jackson Road to Slade Road.

In 2011, 6,818 feet of 16-inch pressure class 350 water main was installed parallel to the existing 16-inch supply water main. The water main was installed from Slade Road to the Great Lakes Transmission gas pipeline.

In 2017 as part of the City of Ironwood Phase IV Utility Project, the 16-inch Transmission main was completed from the Great Lakes Transmission gas pipeline to the Pump Station. Approximately 5,400 feet of 16-inch pressure class 350 water main was installed parallel to the existing 16-inch supply water main.

The purpose of the projects were to provide redundancy for the aging sole transmission main from the well field to the City.

2.4 Water Demand

The water pumping demand ranges from 29.1 million gallons (MG) per month to 36.5 MG per month. The water pumping demand is fairly consistent in the 31 MG to 32 MG per month range or approximately 1.1 million gallons per day (MGD).

2.5 System Components

The following sections describe the individual components of the Ironwood water supply and high lift pumping.

2.6 Wells

2.6.1 Spring Creek Wellfield

The Spring Creek wellfield contains three (3) wells as described in Table 1.

Table 1 – Spring Creek Wellfield Well Data

Well No.	Year Constructed	Depth	Casing Size (in)	Capacity (gpm)	Pump Type
101	1974	140'	16"	600	Vertical Turbine
104	2003	98'	8"	180	Submersible
204	1999	141'	12"	620	Vertical Turbine

Wells 101 and 104 are located inside of the wellhouses. Well 104 is a submersible well and is located outside and pumps through the wellhouse. A polyphosphate/orthophosphate blend is added to the water in each wellhouse. Well piping, flowmeters, and electrical equipment and controls are located in each of the wellhouses.

2.6.2 Spring Creek Transmission Main

The transmission main from the Spring Creek wells to the clearwell consists of 8", 12", and 16" watermain. Because record plans do not exist for the transmission main, the sizes of the various segments is not known. Reduced pumping capacity has been observed when a second or third well from the Spring Creek wellfield is started, indicating a potential hydraulic restriction.

2.6.3 Big Springs Wellfield

The Big Springs wellfield contains three (3) wells as described in Table 2.

Table 2 – Big Springs Wellfield Well Data

Well No.	Year Constructed	Depth	Casing Size	Capacity (gpm)	Pump Type
201	1998	124'	12"	300	Submersible
202	1998	117'	12"	195	Submersible
203	1998	112'	12"	350	Submersible

All of the Big Springs wells are submersible wells located outside of the wellhouses. The wells pump through the wellhouses which contain piping, flowmeters, and electrical equipment and controls. A polyphosphate/orthophosphate blend is added to the water in each wellhouse.

Prior to leaving the Big Springs wellfield, the watermain passes beneath a chlorine/generator building. Chlorine can be injected into the watermain in a below-grade vault located in the building. The standby generator is used to provide backup power for the Big Springs wells.

2.6.4 Big Springs Transmission Main

The water from the Big Springs wells is conveyed approximately 3.5 miles in 12" and 14" watermain to the clearwell at the Spring Creek pumphouse site. The Big Springs transmission main has not had a history of significant leaking or repairs; however, it is approximately 80 years old and could be near the end of its useful life.

A hydrant was cut into the Big Springs watermain near the Spring Creek pumphouse in 2020. This section of watermain appeared to be in good condition.

2.6.5 Water Quality

Water samples were collected from all six of the Ironwood wells and analyzed for a variety of general water quality parameters. The water quality parameters are presented in Table 3.

Selected parameters are discussed in more detail in the following sections. Laboratory analytical results are located in Appendix B.

Table 3 – Water Quality Summary, March 2020 – City of Ironwood Wells

Parameter	Spring Creek Wells 2/5/20			Big Springs Wells			MCL ¹	Secondary ² Standard
	Well 101	Well 104	Well 204	Well 201	Well 202	Well 203		
Alkalinity (mg/L as CaCO ₃)	160	190	160	110	120	130		
Ammonia-N (mg/L)	0.44	ND	0.68	0.54	0.55	0.83		
Arsenic (ug/L)	ND	ND	1.3	ND	ND	0.84	10	
Hardness (mg/L)	150	180	160	100	100	130		120
Iron (ug/L)	260	ND	170	180	260	280		300
Manganese (ug/L)	450	0.65	340	510	460	400	300	50
TOC (mg/L)	2.2	1.2	1.7	1.4	1.6	1.7		
Notes:								
¹ – Maximum contaminant levels (MCLs) are legally enforceable standards.								
² – Secondary standards are aesthetic standards and are not legally enforceable.								

2.6.5.1.1 Manganese

The United States Environmental Protection Agency (US EPA) has established a Health Advisory for manganese of 300 micrograms per liter (ug/L, equivalent to parts per billion). The lifetime health advisory value of 300 ug/L protects against concerns of potential neurological effects. For infants less than 12 months old, the 300 ug/L level is also considered an acute exposure limit. Table 3 identifies 300 ug/L as the manganese “MCL”. While manganese technically does not have an established MCL, the US EPA and Michigan EGLE are enforcing the 300 ug/L level. Table 4 presents the manganese concentrations for all six (6) wells for three sampling events including the data from Table 3.

Table 4 – Manganese Concentrations in Wells

Well No.	Manganese (ug/L)			
	July 2019	October 2019	February 2020	EPA Advisory Level
101	710	430	450	300
104	1.2	2.4	0.65	300
204	310	310	340	300
201	520	770	510	300
202	450	410	460	300
203	370	370	400	300

As the data in Table 4 indicates, the concentrations of manganese are consistently above the US EPA advisory level of 300 ug/L in all of the wells except Well 104. If Well 104 were unavailable for blending, the City would not be able to maintain manganese levels in its distribution system below the US EPA advisory level.

In addition to the adverse health effects of manganese, water with concentrations of manganese above the secondary standard of 50 ug/L can cause discolored water, black or brown staining on fixtures, and taste complaints.

2.6.5.2 Ammonia

Ammonia in water exhibits a high chlorine demand and can make it difficult to have a free chlorine residual present. A free chlorine residual is used for disinfection.

When chlorine is added to water with ammonia, it creates chloramines. Approximately 9 mg/L of chlorine needs to be added for every 1 mg/L of ammonia before a free chlorine residual will be observed. This is called “breakpoint chlorination.”

As Table 3 indicates, Ironwood’s wells have ammonia concentrations ranging from 0.44 mg/L - 0.83 mg/L, with the exception of Well 104 which did not contain ammonia above the detection limit. The ammonia present in the wells requires higher than normal chlorine chemical feed rates to achieve a free chlorine residual.

2.6.5.3 Iron

The secondary standard for iron is 300 ug/L. Water with concentrations of iron above the secondary standard causes reddish-brown staining on fixtures. As shown on Table 3, the drinking water from the Ironwood’s wells is below the Secondary Standard for iron with concentrations ranging from below the detection limit to 280 ug/L.

2.6.5.4 TOC

Total organic carbon (TOC) in drinking water can create disinfection byproducts (DBPs) when chlorine is used as a disinfectant. DBPs have enforceable maximum contaminant levels.

As shown on Table 3, the concentration of TOC in Ironwood’s well ranges from 1.2 mg/L to 2.2 mg/L.

2.6.5.5 Disinfection Byproducts

As mentioned in the previous section, disinfection byproducts (DBPs) can be created when chlorine reacts with TOC in drinking water. Regulated DBPs include total trihalomethanes (THMs) and haloacetic acids (HAA5). Table 5 presents the DBP concentrations in the Ironwood distribution system.

Table 5 – DBPs in Distribution System

Year	HAA 5 (ug/L)	TTHM (ug/L)
2017	13.8	62
2017	17.3	44
2018	18.8	76
2018	16.0	63
2019	13.0	36
2019	13.0	31
MCL	60	80

As Table 5 indicates, the concentrations of DBPs in the distribution system have not exceeded the respective MCLs. It should be noted that TTHM values were close to the MCL in 2018. Water age (older water) can contribute to higher DBP values.

2.6.5.6 Hardness

Although not included as a secondary standard, water above 120 mg/L hardness is considered hard water. Hard water causes scaling on fixtures and can eventually cause piping to become plugged.

As shown on Table 3, the drinking water from Ironwood's water has hardness ranging from 100 mg/L to 180 mg/L. While technically the water from some of the wells may be considered hard, it is softer than many groundwater sources.

2.6.6 Clearwell

The clearwell at the Spring Creek pump station site is a square concrete structure that was constructed in approximately 1940. The structure is 42'-9" x 42'-9" by 12'-3" high with an overflow at 10'-6". The clearwell is buried and has two (2) access hatches. The clearwell holds 140,000 gallons of water.

2.6.7 Pump Station

The pump station was constructed in approximately 1920. The pump station is primarily constructed of mortar, stone, and brick masonry and has a pitched metal roof. The pump station includes a pump room, chlorine room, office, bathroom, mechanical room, and storage.



A generator building constructed in 1999 is located next to the pump station. The building houses a 750 kW diesel generator which provides standby power to the pump house and Spring Creek wells.

2.6.7.1 High Lift Pumps and Piping

Three (3) high lift pumps are installed in pump cans that are piped directly to the clearwell. Prior to 1940, the high lift pumps pumped water directly out of a wet well in the pump station. The pumps are rated at 850 gpm at 550' total dynamic head (TDH). A fourth backup-pump powered off a diesel engine is also located in the pump room.

2.6.7.2 Chlorine Room

A chlorine room was partitioned out of the pump room at some point in the past. Chlorine gas is injected into the water prior to leaving the pump station.

The chlorine room is accessed by a door from the pump room. The ventilation duct from the chlorine room is routed through the pump room.

2.6.7.3 Electrical

The electrical service and motor control center are also located in the pump room. It is estimated that the electrical equipment was replaced in the 1980s.

2.6.7.4 HVAC

The pump station is heated with a fuel oil furnace. The fuel tank is located in a room behind the office.

2.7 Condition of Existing Facilities

The following paragraphs describe the condition of the water supply, clearwell, and pump station infrastructure.

2.7.1 Wells and Transmission Mains

The wells and pump houses are relatively new and are in good condition. The following deficiencies were noted:

- The existing flowmeters are older style propeller meters that should be replaced with more accurate magnetic flowmeter.
- The existing well pump motor starters are across-the-line starters. To provide the operators with more flexibility, the existing motor starters should be replaced with variable frequency drives (VFDs).

The condition of the Big Springs and Spring Creek transmission mains are not known; however, both are 80 years old or older. Hydraulic restrictions could exist in the Spring Creek transmission main.

2.7.2 Clearwell

The clearwell was constructed in approximately 1940. The following deficiencies were noted with the clearwell:

- There is no way to take the clearwell out of service for cleaning or maintenance without shutting off the water supply to the City.
- Some concrete spalling was observed inside the clearwell in a recent inspection.
- The piping inside the clearwell is corroded.
- The access hatches have both deteriorated and need to be replaced.
- The access ladders and a masonry wall in the clearwell have collapsed are laying on the clearwell floor.

Due to the inability to take the clearwell out of service and the deficiencies noted, the clearwell should be replaced with a larger clearwell that can be partitioned.

2.7.3 Pump Station

The pump station is approximately 100 years old and many of its components are reaching the end of their useful life. The following deficiencies exist in the pump station:

- The chlorine room does not meet 10 States Standards for construction and safety. Access to the chlorine room should be from an outside door and not in the pump room. The exhaust fan ductwork should be routed directly out of the room and not through the pump room.
- The high lift pump supply and discharge piping is at least 80 years old and has no redundancy. If either the supply piping or discharge piping failed, the City would be out of water until it was repaired.
- The electrical service entrance and motor control center is estimated to be 30-40 years old and is reaching the end of its useful life.
- The pump station roof is prone to leaking and has been repaired several times.
- The pump station has an older fuel-oil furnace that is not cost effective to operate. The building is inefficient from an energy standpoint.



Structurally, the pump station building appears to be in fair condition. Most of the windows and doors in the building were likely replaced in the 1990s and are also in fair condition.

2.8 Financial Status of Existing Facilities

The most recent audit dated June 30, 2019 is attached. Currently the City has six (6) outstanding bonds with their water system.

The City has two remaining Water System Bonds from the 2010 Bond; Series B and Series C for the purpose of upgrading their water distribution system as part of the City of Ironwood – Phase II Utility Project. Maturity of these bonds will occur in 2020 and 2050 respectively.

In 2014, the City issued three Water System Bonds, Series A, B and C, for the purpose of upgrading their water distribution system as part of the City of Ironwood – Phase III Utility Project. Maturity of these bonds will occur in 2054.

In 2017, the City issued three Water System Bonds for the purpose of upgrading their water distribution system as part of the City of Ironwood – Phase IV Utility Project. Maturity of this bond will occur in 2057.

The current (FY 2019-2020) water budget is summarized in Appendix L, Attachment B. An excerpt from the most recent audit dated June 30, 2019 is attached in Appendix I. Included in this audit excerpt is a summary of all of the City's existing long-term debt.

Customers are billed based upon actual water usage in addition to the monthly meter charge. All customers have water meters installed. The City charges users based on the schedule in Table 6. The City's fee schedule is also attached in Appendix J for FY2018-2019 and FY2019-2020. The base service charges listed below are based on meter size and does not include any usage.

Table 6 – Water Customer Fee Schedule Summary

Meter Size	Monthly Meter Charge
5/8-inch	\$22.00
¾-inch	\$24.88
1-inch	\$45.21
1 ½-inch	\$113.03
2-inch	\$211.61
3-inch	\$482.88
4-inch	\$870.35
6-inch	\$1,964.37
Hurley 6-inch	\$586.84

Usage charge: \$5.76/100 cubic feet = \$7.700/1,000 gallons for all users except for the City of Hurley. City of Hurley usage rate is \$3.105/100 cubic feet = \$4.15/1,000 gallons.

* Rate schedule from the City, dated July 1, 2019.

Example: A typical residential user with a 5/8-inch meter, using an average of 2,242 gallons (300 cf) per month, would pay \$22.00 for the meter charge and \$17.26 for the usage charge for a total charge of \$39.26.

2.9 Water/Energy/Waste Audits

The City water system has discrepancies between the amount of water pumped and the amount of water sold. The amount of water pumped is considerably higher than the amount of water sold. It is believed that the discrepancies are primarily due to old water meters at the pump station. The water losses tend to be higher in the winter with some “let runs” for freezing services and main.

3 Need for Project

3.1 Health and Safety

The concentration of manganese is consistently above the US EPA advisory level of 300 ug/L in all of Ironwood's wells except Well 104. If Well 104 were unavailable for blending, the City would not be able to maintain manganese levels in its distribution system below the US EPA advisory level.

The Michigan Department of Health and Human Services ordered the City to place a Do Not Drink Advisory for infants under age 12 months from August 9, 2019 through September 6, 2019 based on elevated manganese in the source water.

The chlorine gas chemical feed room at the Spring Creek pump house does not meet 10 States Standards for safety. If chlorine gas leaked from the chlorine cylinders, it could make its way into the rest of the pumphouse building, risking the safety of the operators.

In addition to the adverse health effects of manganese, water with concentrations of manganese above the secondary standard of 50 ug/L can cause discolored water, black or brown staining on fixtures, and taste complaints.

3.2 Aging Infrastructure

The Spring Creek pump station is approximately 100 years old. As described in Section 2.7.3, many of the building systems have reached the end of their useful lives; including pumps and piping, electrical, mechanical, and roof.

The clearwell at the pump station site is approximately 80 years old. Because the clearwell is not partitioned, there is no way to take it out of service without shutting down the entire water supply to the City. The clearwell also has structural deficiencies identified in Section 2.7.2.

3.3 Reasonable Growth

While significant growth is not anticipated for the City of Ironwood, tourism is very important and brings in travelers from outside of the City. In addition, the City would like to attract additional businesses to Ironwood. Without a safe, reliable drinking water system, the City will not be able to attract tourists or additional businesses to Ironwood.

4 Alternatives Considered

To provide safe reliable drinking water, the City of Ironwood needs to construct a water treatment plant which would replace the existing pump station and clearwell, or find a new water source. The following sections describe the alternatives considered.

4.1 Manganese Removal Options

The most common and most cost effective option for manganese removal is chemical oxidation followed by sand filtration. In groundwater, the manganese ions are in solution. When a strong oxidant is added to the water, it converts the manganese to a filterable solid. The chemical oxidant that is added for manganese oxidation is typically sodium or potassium permanganate. Chlorine is a less expensive chemical oxidant, but the reaction with manganese is too slow to be used in a filtration process.

Other options for manganese removal are chemical oxidation followed by membrane filtration or reverse osmosis. Both of these options are very expensive from a capital cost and operations and maintenance standpoint and are not being considered further.

4.2 Gravity Filter Water Treatment Plant

In a manganese gravity filtration system, water to be filtered is pumped, under low pressure, to the treatment facility where it flows by gravity through the various treatment processes. Following the oxidation process, the water flows through the filter cells from top to bottom. As the water passes through the filter media, the insoluble particles of manganese are removed.

As more and more water is filtered, the restriction to flow, created by the accumulation of manganese and iron solids on the media, steadily increases. In a gravity facility, this restriction to flow, called head, is measured in feet of water depth in the filter cells. As the solids accumulate, the depth of water in the filter cells increases. Due to the physical nature of a gravity filter, when the depth of water in a cell reaches its maximum designed head (high water level) backwashing is required. Failure to backwash at the proper time could result in the filter overflowing or poor effluent water quality being produced.

4.2.1 Alternative 1 – Concrete Gravity Filter Water Treatment Plant

A concrete gravity filter water treatment plant has sand filters that are constructed out of concrete (versus steel). Layouts showing a concrete gravity filter water treatment plant are included in Appendix C. Further discussion of the various water treatment plant processes and building features is included in Section 4.6.

4.2.2 Alternative 2 – Steel Gravity Filter Water Treatment Plant

A steel gravity filter water treatment plant has sand filters that are constructed out of steel (versus concrete). Whereas a concrete gravity filter is constructed in place by a Contractor, steel gravity filters are constructed by the filter manufacturer and delivered to the jobsite. Layouts showing a steel gravity filter water treatment plant are included in Appendix D. Further discussion of the various water treatment plant processes and building features is included in Section 4.6.

4.3 Pressure Filter Water Treatment Plant

A pressure filter treatment plant removes manganese and other constituents from the water in the same process as the gravity filters, except that the water flows through the filter by pressure instead of gravity. The sand layers and filtering rates are the same. The advantage of a pressure filter is that it is possible to only pump the water one time. The well pump provides the pressure to push the water through the filter and into the distribution system.

Because Ironwood is already pumping the water under low pressure to the Spring Creek pump house site where it is pumped again under high pressure into the distribution system, a pressure filter is not ideal for this scenario. Because pressure filters do not offer any advantages for Ironwood, they are not being evaluation further.

4.4 New Wells

A report prepared by Cooper Engineering Company, Inc. in June 1991 summarized the studies that have been prepared looking for additional well fields in the Ironwood vicinity. A summary of that report was provided by Cooper in 1995 as follows;

“Source water supply investigations conducted by Alvolo and Burdick in 1919, Francis Engineering Company in 1946, Layne Northwest Company in 1958, Keck and Associates in 1961, Williams and Works in 1962 and 1972, all agree that the Spring Creek/Big Spring Basin is the only discovered and developed natural aquifer in the Ironwood area that can provide an adequate quality water supply for Ironwood and neighboring users.”

Because numerous previous investigations have determined that additional sufficient groundwater resources are not present in Ironwood, this alternative is not being evaluated further.

4.5 Connect to Gogebic Range Water Authority

The Gogebic Range Water Authority is a water utility that buys water from the City of Wakefield and sells it to Ironwood Township, Bessemer Township and the Blackjack and Indianhead ski resorts. GRWA also has watermain connections to the City of Bessemer.

GRWA purchases and distributes approximately 125,000 gallons of water per day. The City of Ironwood uses approximately 1.1 million gallons of water per day. GWRA and Cities of Wakefield and Bessemer do not have adequate capacity to supply water to the City of Ironwood.

Because it is not feasible for GRWA or the Cities of Bessemer or Wakefield to provide water to the City of Ironwood, this alternative is not being evaluated further.

4.6 Design Criteria

The following sections identify the design criteria for a gravity filter manganese removal water treatment plant being evaluated as Alternative 1 and Alternative 2.

4.6.1 Independent Review

The City of Ironwood retained William Knocke, PE, PhD, a professor in the Environmental and Water Resources Engineering Department at Virginia Tech, to provide an independent review of the proposed manganese removal unit processes and the pilot study. William Knocke's feedback was incorporated into this report.

4.6.2 Water Treatment Plant Capacity

As discussed in Section 2.4, the existing average day water demand for the Ironwood water system is approximately 1.1 million gallons per day (MGD). This is based upon the 2018-2019 fiscal year and an annual water pumped of 392 MG. Maximum day demands are approximately 1.5 MGD due to large water main breaks or fire.

To provide sufficient capacity to meet maximum day demands, a water treatment plant capacity of 2 MGD has been selected. A capacity of 2 MGD allows the water treatment plant to operate approximately 13 hours per day on average demand days.

4.6.3 Pilot Study

A pilot study was performed by John Thom of SEH on Ironwood's Well 101 in March 2020. The Pilot Study Report is included in Appendix E. The objectives of the pilot study were to evaluate the ability for rapid sand filters to remove manganese below the secondary standard of 0.05 mg/L, evaluate filter loading rates, filter run times, and attempt to determine the effectiveness of unit processes.

The pilot study found that the combination of chlorine feed followed by permanganate was capable of oxidizing the ammonia, iron, and manganese. The pilot study demonstrated that the manganese could be removed without detention; however, detention can still offers benefits if flocculation is encouraged.

The solids produced were able to be filtered at a rate of 3 gallons per minute per square foot for 40 hours. The filter media that produced the most effective results was manganese greensand and anthracite media.

4.6.4 Detention Tank

The first step in the treatment process is a baffled concrete tank that will allow for 30 minutes of detention time. Chlorine will be added ahead of the detention tank to oxidize ammonia and iron. Sufficient chlorine will be added to carry a chlorine residual of at least 0.75 mg/l through the filters. Sodium permanganate will be added in the detention tank several minutes after chlorine. Baffles will be included in the detention tank to provide plug flow and allow for particle flocculation.

4.6.5 Filters

The required filter area is determined by dividing the nominal filtration capacity by a flux rate (filtration rate). Ten States Standards requires sand filtration rates from 2 to 4 gpm/ft². Because the required filtration capacity is 2 MGD (1,400 gpm) under normal operating conditions, the facility will be designed for 2 MGD at 2 gpm/ ft². Therefore, if 3 MGD is necessary, the filtration rate will still be in the acceptable range (i.e. approximately 3 gpm/ft²). With a capacity of 2 MGD and a filtration rate of 2 gpm/ft², it is necessary to have 700 ft² of filter media. To have reasonable backwash rates and operational flexibility, this will be broken into four filter cells.

Dual media filters will be provided to promote filtration throughout the depth of the filter. Dual media filters have been demonstrated to provide longer filter run times. Anthracite over manganese greensand is recommended.

As indicated in Section 4.6.3, a free chlorine residual will be carried through the filters. This will allow for the formation of manganese oxides on the anthracite media which will allow for contact oxidation of manganese.

A filter-to-waste process will be considered for bringing the filters back online after backwashing. Turbidimeters will also be considered for monitoring particulate breakthrough in the filters.

4.6.6 Clearwell

After leaving the filters, the water will go into a 500,000 gallon clearwell. The clearwell will be partitioned and have valves to allow for either half of the clearwell to be taken out of service while the other half remains in service. Baffle walls will be included to provide plug flow so that water in the clearwell does not become stagnant.

Clearwell storage is necessary to: (1) maintain a volume of water for backwashing filter cells, (2) to provide the flexibility to treat water at a rate different than the raw water pumping rate, and (3) to provide additional storage for the distribution system.

4.6.7 High Service Pumps

Three vertical-turbine high service pumps will be provided to pump water from a pump chamber connected to the clearwell into the distribution system. The pumps will each have a capacity of 1,000 gpm and one of the pumps will provide firm capacity.

4.6.8 Backwash Process

When terminal headloss is reached in a filter, a filter backwash will be initiated. A combined air-water backwash process is recommended which uses both air and water simultaneously to clean the filter media. The combined air-water backwash is followed by a water only re-stratification step. The backwash water will be provided by a dedicated backwash pump in the pump chamber and the airwash will be provided by an airwash blower. A filter-to-waste process will be considered for bringing the filters back online after backwashing.

The backwash wastewater will be sent to an infiltration basin on the water treatment plant site where the water will percolate into the ground. The infiltration basin will be sized for two backwashes of all four filters. Because the manganese and iron removed from the water are solids, they will not be reintroduced to the groundwater in the infiltration basin.

4.6.9 Building Layout/General Sequence

Gravity filter building layouts are included in Appendix C and Appendix D. A site plan is included as Figure 2 in Appendix A. The chemical rooms are located on the south side of the building, with exterior doors accessible for deliveries. The electrical, mechanical, and high service pump rooms are located in close proximity to each other to allow for short conduit runs to motors.

The gravity filter layout occurs on two levels to allow for filter height to provide head for the filtering process. The raw water enters the building through the meter room where chlorine is added, followed by potassium permanganate. The water travels through the filters by gravity to the clearwell. The water travels from the clearwell to the high service pump chamber where it is pumped into the distribution system. Chlorine and phosphates will be added to the finished water.

4.6.10 Main Level

4.6.10.1 Chemical Rooms

Chemical rooms are clustered on the south side of the building with exterior doors to allow easy access for chemical deliveries. It is expected that chemical rooms will be required for chlorine gas, sodium permanganate, and phosphates. A spare chemical feed room is being provided.

4.6.10.2 High Service Pump Room

The high service pump room contains the pumps that pump treated water from the clearwell into the distribution system. Because most of the electrical load is located in the high service pump room, it is in close proximity to the electrical room and generator room. A dedicated backwash supply pump will also be located in the high service pump room.

4.6.10.3 Electrical Room

The electrical room contains the service entrance, motor control center, and electrical panels. The location of this room in close proximity to the high service pump room, and mechanical room provide for short conduit and wire runs.

The service entrance for the water plant will be connected to an automatic transfer switch which will transfer the water plant to generator power in the event of an electrical outage. The existing 750 kW generator has sufficient capacity to run the water treatment plant.

4.6.10.4 Mechanical/Blower Room

This room contains the backwash blower, make-up air, and HVAC equipment. The location of this room on an outside wall provides space for air louvers.

4.6.10.5 Office/Control Room/Lab

An office/control room/lab is provided for operators to have a SCADA computer to monitor and control the water system. A lab sink and desktop analyzer will be provided to allow operators to monitor water quality. The office is located next to the vestibule and will have windows facing the parking lot.

4.6.10.6 Garage

A garage is included on the east end of the building. The purpose of the garage is to store water related equipment and materials and to be able to park equipment in a tempered space, out of the snow.

4.6.10.7 Upper Level

The upper level consists of filters and walkways. Windows will be provided in the filter room to allow for natural lighting. Walkways will be provided around the filters to allow the plant operator to inspect the operating conditions of the filters. Control panels (fixed or mobile) will be provided to allow the operators to manually initiate backwashes from the upper level.

4.7 Architectural Design

Because the water treatment plant and pump station are on the same property, the water treatment plant architecture needs to complement the historic pump station. The proposed architecture of the building includes pre-cast concrete wall panels that have a stone pattern cast into the panels. The

stone pattern will be stained to match the existing pump station. An actual stone façade will be utilized if it is more cost effective.

Other architectural features include arched window and door openings, taller parapet gable ends, and a pitched metal clay-tile roof. The portions of the building that do not have the stone pattern will have insulated concrete wall panels that are stained with colors that complement the historic pump station.

The renderings included in Appendix F demonstrate the architectural design concept.

4.8 Existing Pump Station

The existing pump station will be converted from its current use to storage. The historic nature of the pump station will not be modified as part of this project.

4.9 Map

A site plan showing the proposed water treatment plant, clearwell, and backwash infiltration basin is included as Figure 2 in Appendix A. An overall site location map is included as Figure 1 in Appendix A.

4.10 Environmental Impacts

Construction of a new water treatment plant is not anticipated to have significant environmental impacts. The proposed water treatment plant will be located in a rural area on property already owned by the City. Potential impacts and mitigation efforts are included in the following sections.

4.10.1 Historic Buildings

The existing pump station is on the historic register. The historic nature of the existing pump station will not be modified as part of this project. The new water treatment plant will have architectural features that complement the existing pump station.

4.10.2 Threatened or Endangered Plants or Animals

An environmental review by RCAP, CEC and SEH as discussed in Section 1.2 has been completed. The project is located in an area of concern for the Northern Long Eared Bat. The City has provided a request on May 21, 2020 to the US Fish and Wildlife Service to perform tree removal in the period from November 1 to March 31 such that the removal will not disrupt the bat.

4.10.3 Erosion Control

Construction of the water treatment plant, clearwell, and infiltration basin will disturb existing soils. Proper erosion control measures will be implemented during construction.

4.11 Land Requirements and Site Planning

As shown on Figure 2 in Appendix A, the proposed project will require approximately two (2) acres of land. The proposed water treatment plant site is on the pump station property and is already owned by the City.

The proposed water treatment plant building is located just to the south of the existing clearwell and pump station. A new 500,000 gallon clearwell is located just west of the water treatment plant.

The transmission mains from the Big Springs and Spring Creek wellfields will be routed to the pipe room at the northeast corner of the water treatment plant. A new finished water transmission main will connect the high service pumps to the existing transmission main.

The backwash water will be discharged to an infiltration basin located northeast of the water treatment plant.

4.12 Potential Construction Problems

The proposed project is in a rural area and is not likely to cause traffic problems or complaints from the neighbors.

Because the proposed water treatment plant and associated new infrastructure are separate from the existing water infrastructure, there is not a significant risk of impacting existing operations during construction.

The greatest construction project risk is likely connecting the new finished watermain to the existing transmission mains. Because there are two existing transmission mains, the first connection can be made and put into service prior to making the second connection.

4.13 Sustainability Considerations

4.13.1 Water Efficiency

The proposed water treatment plant will use relatively little potable water. There is one sink and one bathroom proposed. The bathroom will have a water efficient toilet and faucet.

The largest use of water for this water treatment plant project is for backwashing the filters. As discussed in Section 4.6.7, the backwash water is not wasted because it will be discharged to an infiltration basin where it will percolate back into the ground.

4.13.2 Energy Efficiency

The largest use of energy in the water treatment plant will be high service pumps. Premium efficiency motors and variable frequency drives will be used to reduce the amount of wasted energy.

The use of natural light will be maximized to reduce the need for indoor lights. Occupancy sensors and lighting controls will be utilized for indoor lights except where safety concerns are present.

Sustainable architectural features will include natural daylighting throughout including the filter room, low maintenance poured-in-place and plant precast concrete structure and wall panels, building insulation which surpasses the current energy code.

4.13.3 Green Infrastructure

A filtration basin or raingarden will be utilized to capture runoff from the site and filter the runoff prior to discharge.

4.14 Cost Estimates

Feasibility level opinions of probable cost (OPC) broken down by construction category were prepared for Alternatives 1 and 2. A breakdown of these costs by division are included in Appendix G. Tables 7 and 8 present the capital costs for Alternatives 1 and 2.

Table 7 – Capital Cost Opinion Summary
Alternative 1 – Concrete Gravity Filter Water Treatment Plant

Item	Cost
Water Treatment Plant Construction Cost	\$7,657,000
Contingency (10%)	\$766,000
Engineering/Construction Admin (15%)	\$1,148,000
Admin/Legal (2%)	\$153,000
Total Estimated Project Cost:	\$9,724,000

Table 8 – Capital Cost Opinion Summary
Alternative 2 – Steel Gravity Filter Water Treatment Plant

Item	Cost
Water Treatment Plant Construction Cost	\$8,291,000
Contingency (10%)	\$829,000
Engineering/Construction Admin (15%)	\$1,243,000
Admin/Legal (2%)	\$166,000
Total Estimated Project Cost:	\$10,529,000

5 Alternative Evaluation and Selection

5.1 Life Cycle Cost Opinions

Life cycle costs represent the total cost of owning the treatment plants for 50 years and include capital cost, equipment replacement, labor, gas, chemicals, insurance, electricity, and annual equipment repair. Detailed life cycle cost tables are included in Appendix H.

The life cycle costs presented in Table 9 and Table 10 assume a 40 year financing period on the capital costs with 2% interest rates and 2.75% inflation.

Table 9 – 50-Year Life Cycle Cost Summary
Alternative 1 – Concrete Gravity Filter Water Treatment Plant

Item	50-Year Life Cycle Cost	Annual Cost
Capital Project Costs	\$9,724,000	\$355,000
Equipment Replacement	\$2,896,470	\$92,000
Labor	\$4,719,000	\$80,000
Gas	\$590,000	\$10,000
Chemicals	\$2,949,000	\$50,000
Insurance	\$590,000	\$10,000
Electricity	\$6,488,000	\$110,000
Equipment Repair	\$2,713,000	\$46,000
Total 50 Year Life Cycle Cost	\$30,970,000	

Table 10 – 50-Year Life Cycle Cost Summary
Alternative 2 – Steel Gravity Filter Water Treatment Plant

Item	50-Year Life Cycle Cost	Annual Cost
Capital Project Costs	\$10,529,000	\$385,000
Equipment Replacement	\$3,963,000	\$126,000
Labor	\$4,719,000	\$80,000
Gas	\$590,000	\$10,000
Chemicals	\$2,949,000	\$50,000
Insurance	\$590,000	\$10,000
Electricity	\$6,488,000	\$110,000
Equipment Repair	\$3,126,000	\$53,000
Total 50 Year Life Cycle Cost	\$32,950,000	

5.2 Non-Monetary Factors

Although the two alternatives are fairly similar, the concrete gravity filter water treatment plant (Alternative 1) has some advantages over steel gravity filters (Alternative 2) including the following:

1. Concrete gravity filters are open for viewing and filtering and backwash processes can be easily monitored by operators.

2. Steel gravity filters require more maintenance due to corrosion from the wet environment.

5.3 Alternative Selection

The two options for removing manganese and iron from Ironwood's drinking water that have been evaluated include concrete gravity filters (Alternative 1) and steel gravity filters (Alternative 2).

The capital cost of a concrete gravity filter treatment plant is less than the steel gravity filter treatment plant (\$9.72 million versus \$10.53 million). In addition, the life cycle cost of the concrete gravity filter treatment plant is less than the steel gravity filter treatment plant (\$30.67 million versus \$32.95 million).

In addition to having higher capital and life cycle costs, a steel gravity water treatment plant has other maintenance and operational disadvantages.

A concrete gravity filter treatment facility (Alternative 1) is the recommended alternative due to its lower costs and operational and maintenance benefits.

6 Proposed Project

The recommended alternative to provide the City of Ironwood with drinking water that has safe levels of manganese and replaces aging infrastructure is a new concrete gravity filter water treatment plant (Alternative 1).

6.1 Preliminary Project Design

The proposed water treatment plant layout is shown in Appendix C. The proposed site plan is shown on Figure 2 in Appendix A. The proposed water treatment plant project has the following features:

- Water treatment plant building constructed primarily of concrete and masonry with pitched metal roof and an attached garage
- 30 minutes of baffled detention
- Four concrete gravity, dual-media filters with a filtration rate of 2 gpm/ft²
- Chlorine, sodium permanganate, and orthophosphate chemical feed rooms
- 500,000 gallon concrete clearwell
- High service pumping with a firm capacity of 2,000 gpm
- Backwash water infiltration basin
- Converting the existing pump station to cold storage

6.2 Contingency Projects

In the event that the construction bids come in less than what was budgeted, the City has other water projects need to be completed. These projects are as follows:

1. **Rehabilitating two wells.** The condition of two existing pumps, motors, wire, and pump column needs to be evaluated as replaced as necessary. The estimated cost to perform the necessary rehabilitation is **\$50,000**.
2. **Reconfigure Pump Station.** Reconfigure the interior of the existing pump station from its current use to storage. This could involve removing existing pumps and piping, removing chlorine room and office partition walls, and filling the pump chamber. It should be noted that no work will be done that will affect the historic nature of the pump station. The estimated cost to complete this work is **\$40,000**.
3. **Replace Spring Creek Transmission Main.** Portions of the Spring Creek raw water transmission main is 100 years old. Up to 1,500 feet of the Spring Creek transmission main will be replaced with new 12" watermain. The estimated cost to complete this work is **\$150,000**.

6.3 Schedule

If the City elects to proceed with a water treatment plant project, the proposed project schedule could be as follows:

<u>Item</u>	<u>Completion Date</u>
Preparation of Plans	October 2020 – January 2021
Ad for Bid	February 2021
Bid Opening	March 2021
Construction Start	May 2021
Construction Complete	September 2022

6.4 Permit Requirements

A Water Supply Systems permit is required for the project from the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Drinking Water and Environmental Health Division.

Building permits will be required from the City of Ironwood and/or Charter Township of Ironwood. Mechanical, electrical, and heating permits will be required from the State of Michigan.

6.5 Sustainability Considerations

6.5.1 Energy Efficiency

The largest use of energy in the water treatment plant will be high service pumps. Premium efficiency motors and variable frequency drives will be used to reduce the amount of wasted energy.

The use of natural light will be maximized to reduce the need for indoor lights. Occupancy sensors and lighting controls will be utilized for indoor lights except where safety concerns are present.

Sustainable architectural features will include natural daylighting throughout including the filter room, low maintenance poured-in-place and plant precast concrete structure and wall panels, building insulation which surpasses the current energy code.

6.5.2 Green Infrastructure

A filtration basin or raingarden will be utilized to capture runoff from the site and filter the runoff prior to discharge.

6.6 Opinion of Probable Cost

Feasibility level opinions of probable cost (OPC) broken down by construction category were prepared for Alternative 1. A breakdown of these costs by division are included in Appendix G. Table 11 presents the capital costs for Alternative 1.

Table 11 – Capital Cost Opinion Summary
Concrete Gravity Filter Water Treatment Plant

Item	Cost
Water Treatment Plant Construction Cost	\$7,657,000
Contingency (10%)	\$766,000
Engineering/Construction Admin (15%)	\$1,148,000
Admin/Legal (2%)	\$153,000
Total Estimated Project Cost:	\$9,724,000

6.7 Annual Operating Budget

The following sections analyze the annual operating budgets for the proposed water treatment plant project.

6.7.1 Projected Income

Projected income is based on the revenue needed to cover the following annual system costs: bond interest and principal, reserve account in accordance with Rural Development guidelines, annual operation and maintenance and short-lived depreciation. USDA – RD, Michigan Guide 2, Attachment 1 is presented in Appendix K and provides the projected income for anticipated rates and equivalent dwelling units. **The estimated annual income is \$2,181,596 for FY 2023-2024. This projected annual income is based on receiving all loan funding with no grant funding. This increase would be more than the City is able to pay without some amount of grant assistance.** The estimated annual income includes water sales to Hurley, Wisconsin is included in the estimated annual income total. Water sales to Hurley is variable amount annually and they are not guaranteed to continue purchasing water from the City. A 9-year average (2010-2019) of water sales to Hurley is being considered to determine the estimated income resulting from sales to Hurley. This amount is estimated to be \$188,194 annually.

6.7.2 Operation and Maintenance Costs

The breakdown of the annual estimated Operation and Maintenance (O&M) costs are listed in Table 12 – Water System Budget. **The total system expenses are estimated to be \$2,148,746 per year including Bond reserves, RRI (Repair, Replacement, and Improvements Fund) and Lead Service Line Replacements.**

Table 12 – Water System Budget

Expenditure	Proposed Cost
Repairs and Maintenance	\$ 398,100.00
Utilities	\$ 143,600.00
Salaries and Benefits	\$ 532,600.00
Admin / Financial	\$ 94,900.00
Professional Services	\$ 34,000.00
Lead Service Line Replacements	\$ 146,685.00
Repair, Replacement and Improvements *	\$ 40,317.00
Annual Debt Service (Bonds)	
RD Phase 2 - 2010C - Principal	\$ 24,000.00
RD Phase 2 - 2010C - Interest	\$ 22,420.14
RD Phase 2 - 2010C - Reserve	\$ 5,050.00
RD Phase 3 - 2014A - Principal	\$ 28,000.00
RD Phase 3 - 2014A - Interest	\$ 23,660.00
RD Phase 3 - 2014B - Principal	\$ 28,000.00
RD Phase 3 - 2014B - Interest	\$ 23,380.00
RD Phase 3 - 2014C - Principal	\$ 58,000.00
RD Phase 3 - 2014C - Interest	\$ 49,100.00
RD Phase 3 - 2014A, B, C - Reserve	\$ 21,160.00
RD Phase 4 - Principal	\$ 53,000.00
RD Phase 4 - Interest	\$ 39,398.10
RD Phase 4 - Reserve	\$ 9,300.00
RD Phase 5 - WTP - Principal	\$ 169,899.00
RD Phase 5 - WTP - Interest	\$ 170,170.00
RD Phase 5 - WTP - Reserve	\$ 34,007.00
Total	\$ 2,148,746.24

* Please refer to the following attachments in Appendix L. See Operating Budget form for O & M account, Attachment B for the Current City of Ironwood budget, and Attachment D for Repair, Replacement, and Improvements.

6.7.3 Debt Repayment

If no grant funds are secured for the project cost of \$9,724,000, the bond repayment on a 40-year loan at 1.75% interest would be \$340,069 for the first year (see the proposed Phase 5 – Water Treatment Plant bond schedule in Appendix L, Attachment C).

6.7.4 Reserves

Debt Service Reserve – The project reserve account on the debt retirement of the total project cost of \$9,724,000 as stated above would be 10% of the annual debt repayment or \$34,007 (based on year 1 of the proposed Water Treatment Plant bond schedule in Appendix L, Attachment C) if no grant funds are obtained. Total accumulated required reserves are included on page 46 of the June 30, 2019 Audit (See Appendix M).

6.7.5 Repair, Replacement, and Improvements

Short-lived depreciation is estimated at \$40,317 (See Appendix L, Attachment D).

6.7.6 Hurley EDU Consideration

Bulk or Wholesale Customer: Hurley, Wisconsin

The City of Ironwood currently sells water to the City of Hurley, Wisconsin on a bulk or wholesale basis. This sale is done under an existing Water Purchase Contract that can be cancelled by Hurley with 90-day notice. The negotiated Hurley charge for water is less than the rate charged to the individual customers in the City of Ironwood. As such, the City of Ironwood requests that USDA Rural Development consider Hurley, Wisconsin a bulk user and not include them in the Equivalent Dwelling Unit calculations. The Hurley use and resulting income is variable and not guaranteed. Their income can be counted in the financial analyses of this Preliminary Engineering Report, but this income is not guaranteed on a long-term basis since the Water Purchase Contract can be cancelled upon a 90-day notice. The City of Hurley is in talks with the City of Montreal, WI to purchase more water from Montreal, so it expected the water sale from Ironwood will decrease in the near future. For the purpose of estimating the income from Hurley, a 9-year average of water purchase volume has been used.

Pertinent information regarding the bulk sale of water to Hurley includes:

Revenue:

Median Household Income	\$29,693
Number of EDU's without Hurley	3,610 (2018-19 FY)
Wholesale Cost to Hurley per 1,000 gallons	\$4.35 (current rate and FY 2018-19 Use)
Wholesale gallons per month (1,000 gal)	2,993 (9-year average)
Other Operating Income (Monthly)	\$5,333 (Current)

Expenses:

Operation & Maintenance	\$1,349,885 (Current 2019-20 Budget)
Replacement Reserves – Short-Lived Assets	\$30,100 (Current 2019-20 Budget)
Debt Service and Reserve	\$384,468 (2023-24 without project)

The current contractual charges to Hurley are a monthly meter charge of \$586.84 and a use charge of \$4.15 per 1,000 gallons. With a monthly use of 2,993,000 gallons (9-year average), the resulting current overall bulk charge is \$4.35 per 1,000 gallons.

Please refer to the Water User Charge Analysis in Table 14 on page 28 of this report and the Operating Budget in Appendix L for back-up information on the values shown above.

If one element of grant eligibility is having a minimum EDU charge equal to 1.5% of the Median Household Income, an analysis of a maximum project cost that could be afforded without having to charge at least 1.5% of the Median Household Income is presented below:

Table 13 – Loan Determination at 1.5% of Median Household Income

Item	Value	Notes
Monthly Cost per EDU	\$37.12	1.5% MHI of Ironwood
Number of EDU's	3610	without Hurley
Income from EDU's	\$134,003.20	
Wholesale Cost to Hurley/1,000 Gal	\$4.35	\$4.08 per 1,000 plus \$586.84/2992.922
Wholesale Gallons Monthly (1,000's)	2993	9 year Average
Wholesale Income Per month from Hurley	\$13,019.55	Current Charge Rate
Other Op. Income (Monthly)	\$5,333.00	
Operating Income Monthly	\$152,355.75	
Operating Income Annual	\$1,828,269.00	
Non-Operating Income Annual	\$0.00	
Total Cash Available Annual	\$1,828,269.00	
O&M (Less Interest & Depreciation Annual	\$1,349,885	with project and lead services
Replacement Reserve-Short Lived Assets	\$30,100	Current w/o new project
Other Annual Expenses	\$0	
Debt Service & Reserve	\$384,468	Current w/o new project
Total Cash Outflow Annual	\$1,764,453	

Balance Available for New Loan/Year	\$63,816
USDA Max Loan Amount (40 year 1.625%) (Accounting for 10% New Reserves)	\$1,696,594

Based on the above analysis and the proposed project cost of \$9,724,000, we ask that Rural Development consider the City of Ironwood as being grant eligible for this project. In addition to this cost analysis based on 1.5% of the Median Household Income, the letter from the Michigan Department of Environment, Great Lakes and Energy discussing system deficiencies is found in Appendix N.

6.7.7 User Charge Analysis

Table 14 – Water User Charge Analysis, located on the following page, is a summary of the estimated water system's annual financing if the project was to be constructed with no grant funds and only loan funding. This method is based upon the standard EDU for Rural Development as used for determination of Grant and Loan amounts.

Appendix L, Attachment A is a probable rate structure the City would use to generate the revenue for a Loan Only project. This Attachment A should be compared to the Section 2.8 of this report to see the impact to a City of Ironwood Water Customer.

Table 14 – Water User Charge Analysis

Fiscal Year Ending June 30, 2024
(1.75% INTEREST LOAN; ASSUMES NO GRANT)
IRONWOOD WATER TREATMENT PLANT

CAPITAL COSTS (1)

CONSTRUCTION	\$7,657,474
ENGINEERING, LEGAL, ADMINISTRATION, LAND, EASEMENTS, CONTINGENCIES, ETC.	\$2,066,526
TOTAL	\$9,724,000

GRANT/LOAN AMOUNTS

POTENTIAL GRANT = 0%	\$0
USDA-RD LOAN (2) = 100%	\$9,724,000
TOTAL PROJECT COST - WATER PROJECT NO. 4 =	\$9,724,000
<i>Interest Rate (Percent): 1.750%</i>	<i>Loan Period (Years): 40</i>

USER CHARGE SCENARIO

ANNUAL LOAN PAYMENT - NEW (3)	\$340,069
ANNUAL USDA-RD RESERVE - NEW	\$34,007
ANNUAL O&M	\$1,203,200
Pre-Existing Debt	\$384,468
Short Lived Depreciation	\$40,317
TOTAL ESTIMATED ANNUAL EXPENSES (IWD and Hurley Shared)	\$2,002,060
Estimated Hurley Annual Expenses (9.4 % of Total Expenses)	\$188,194
Estimated Ironwood Annual Expenses	\$1,813,867
Lead Service Line Replacement	\$146,685
TOTAL ESTIMATED ANNUAL EXPENSES (IWD)	\$1,960,552
Charge per EDU (2201 gallons) - Loan Only	\$45.26

(1) CAPITAL COSTS ARE BASED ON THE DETAILED BREAKDOWNS WHICH ARE INCLUDED IN THIS PRELIMINARY ENGINEERING REPORT.

(2) CAPITALIZED INTEREST HAS NOT BEEN INCLUDED IN THIS ANALYSIS.

(3) THIS ANALYSIS ASSUMES THE FINANCING MECHANISM WILL BE THROUGH USDA-RD REVENUE BOND ISSUE, WHICH FOR COST ESTIMATING PURPOSES, HAS AN INTEREST RATE OF 1.75% WITH A 40 YEAR PAYBACK PERIOD. THIS ANALYSIS IS FROM YEAR ONE OF THE PROPOSED PHASE 4 BOND SCHEDULE IN APPENDIX L, ATTACHMENT C.

(4) THIS ANALYSIS ASSUMES THE FOLLOWING ANNUAL WATER USAGE:

Hurley EDU's	1360
Residential Users with 2,201 gallon minimum	2,401
Other Users Equivalent with 2,201 being an EDU	1,209
Total Equivalent Users with 2,201 gallon minimum	3,610
Hurley Estimated Usage	2,993,131
Residential Estimated Monthly Usage	5,285,049
Other Estimated Monthly Usage	2,661,791
Total Estimated Monthly Usage	10,939,971

With the increase need for a 0% grant funding, the average residential monthly water bill would be \$45.26.

Table 15 – Water Budget Summary, located on the following page, is a breakdown of the annual project budget at different levels of loan/grant funding.

The City has taken the necessary initiative annually to raise rates due to Cost-of-Living Adjustment (COLA) to account for inflation on expenses.

Table 15 – Water Budget Summary

TABLE 13 - WATER BUDGET SUMMARY
IRONWOOD WATER TREATMENT PLANT

GRANT %	0%	25%	50%	75%
LOAN AMOUNT - NEW	\$9,724,000	\$7,293,000	\$4,862,000	\$2,431,000
<u>DESCRIPTION</u>				
Loan Payment - New Construction	\$340,069	\$255,051	\$170,034	\$85,017
Reserve - New Construction	\$34,007	\$25,505	\$17,003	\$8,502
Loan Payment - RD Series 2010 C	\$46,420	\$46,420	\$46,420	\$46,420
Reserve - RD Series 2010 C Bond	\$5,050	\$5,050	\$5,050	\$5,050
Loan Payment - RD Series 2014 A, B, and C Bond	\$210,140	\$210,140	\$210,140	\$210,140
Reserve - RD Series 2014 A, B, and C Bond	\$21,160	\$21,160	\$21,160	\$21,160
Loan Payment - RD Series 2017 Bond	\$92,398	\$92,398	\$92,398	\$92,398
Reserve - RD Series 2017 Bond	\$9,300	\$9,300	\$9,300	\$9,300
Annual Operation & Maintenance	\$1,203,200	\$1,203,200	\$1,203,200	\$1,203,200
Short-Lived Depreciation	\$40,317	\$40,317	\$40,317	\$40,317
Subtotal Expenses (Ironwood & Hurley Shared)	\$2,002,061	\$1,908,542	\$1,815,023	\$1,721,504
Hurley Expenses	\$188,194	\$179,403	\$170,612	\$161,821
Lead Service Line Replacement	\$146,685	\$146,685	\$146,685	\$146,685
Total Estimated Annual Expenses (IWD Only)	\$1,960,552	\$1,875,824	\$1,791,096	\$1,706,368
Total Estimated Monthly Expenses (IWD Only)	\$163,379	\$156,319	\$149,258	\$142,197
Effective Monthly Rate Per EDU	\$45.26	\$43.30	\$41.35	\$39.39

7 Public Participation

7.1 Public Meeting on Project Alternatives

A public meeting was held at 5:20 p.m. on June 22, 2020 at City of Ironwood Memorial Building in the Auditorium. The public meeting notice was published in the local newspaper, the Ironwood Daily Globe on May 21, 2020, which meets the 30-day notice requirement. The Affidavit of Publication is included in Appendix O. A list of attendees is also included in Appendix O. A sign-in sheet was not passed around at the meeting due to COVID-19 concerns. Chris Larson of SHE of Michigan presented on the contents of the Project Plan. Jeff Sjoquist of Coleman Engineering discussed the funding application processes. Considered alternatives were discussed as were environmental impacts and mitigation. Mr. Larson and Mr. Sjoquist responded to questions which mostly centered around the funding processes. See Appendix O for video recording of the public meeting, which is in the form of a USB drive. The City did not receive any formal written comments from the public. There were some questions asked by the public and City representatives at the public meeting that were answered verbally by the presenters. No changes to the plan were recommended or discussed.

7.2 Adoption of the Project Plan

On June 22, 2020 the City of Ironwood Commission passed a resolution approving submission of the DWRP Project Plan the Michigan Department of Environment Great Lakes and Energy. See Appendix P for the signed resolution.

8 Conclusions and Recommendations

The City of Ironwood has had concentrations of manganese in their drinking water that have exceeded levels established by the Michigan Safe Drinking Water Act for safety. In addition to manganese in its drinking water, the City also has an aging pump station and clearwell that are in need of replacement.

The most cost-effective way to reliably remove manganese from Ironwood's drinking water is to construct a water treatment plant. The water treatment plant would also replace existing aging infrastructure. The project cost for a water treatment plant is estimated to be approximately \$9.72 million.

It is recommended that the City start the planning process and begin pursuing funding options for a new water treatment plant.

If a water treatment plant project is pursued, immediate distribution water quality improvements should not be expected. The water treatment plant will produce water free of manganese; however, it takes time for the iron and manganese deposits in the distribution system to dissipate.

Appendix A

Figures

WATER TREATMENT PLANT

City of Ironwood, Michigan

Location Map



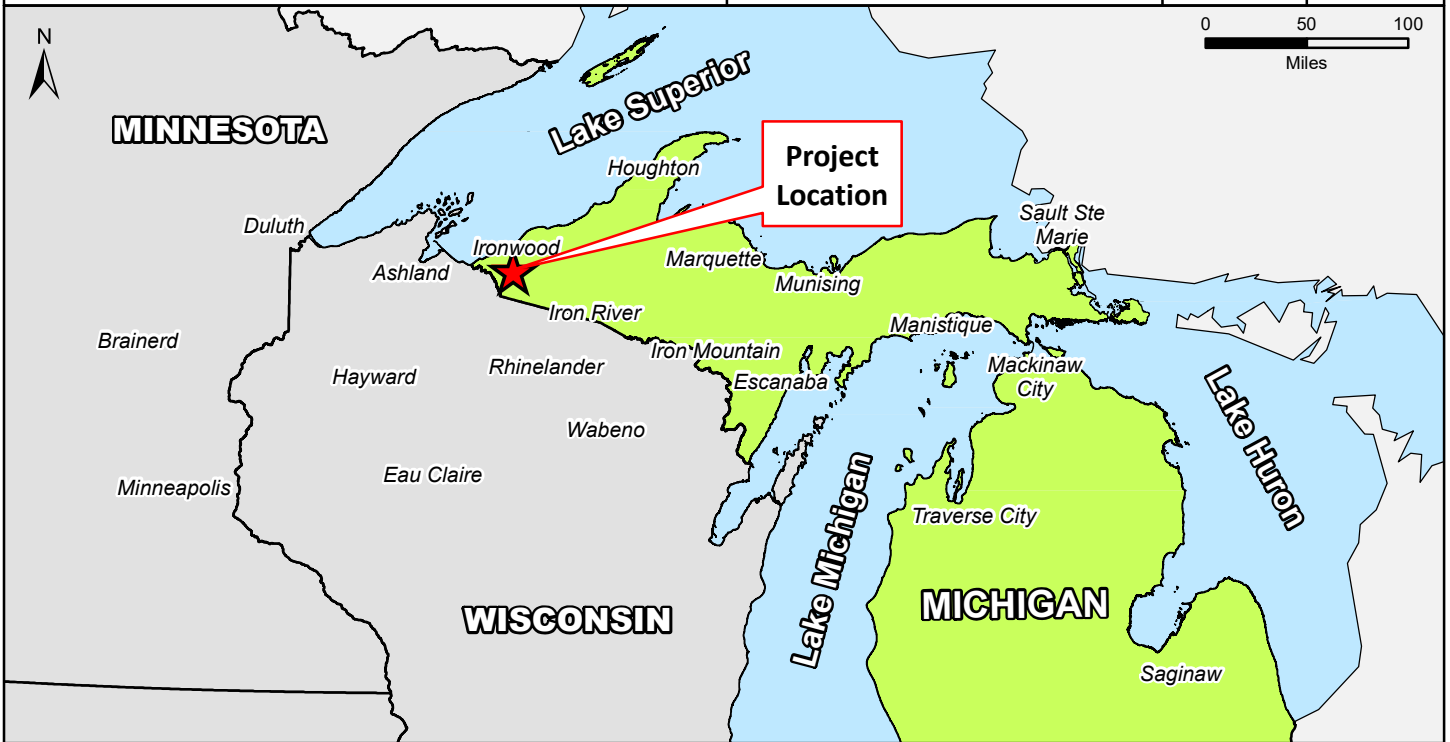
COLEMAN ENGINEERING COMPANY
635 CIRCLE DRIVE • IRON MOUNTAIN, MI 49801 • PHONE: 906-774-3440
200 EAST AYER STREET • IRONWOOD, MI 49938 • PHONE: 906-932-5048

Project No:
191079

Figure No:
Fig 1

Map Date:
Feb 05, 2020

Drawn By:
MCG



TREATMENT PLANT & SPRING CREEK WELL FIELD

City of Ironwood, Michigan

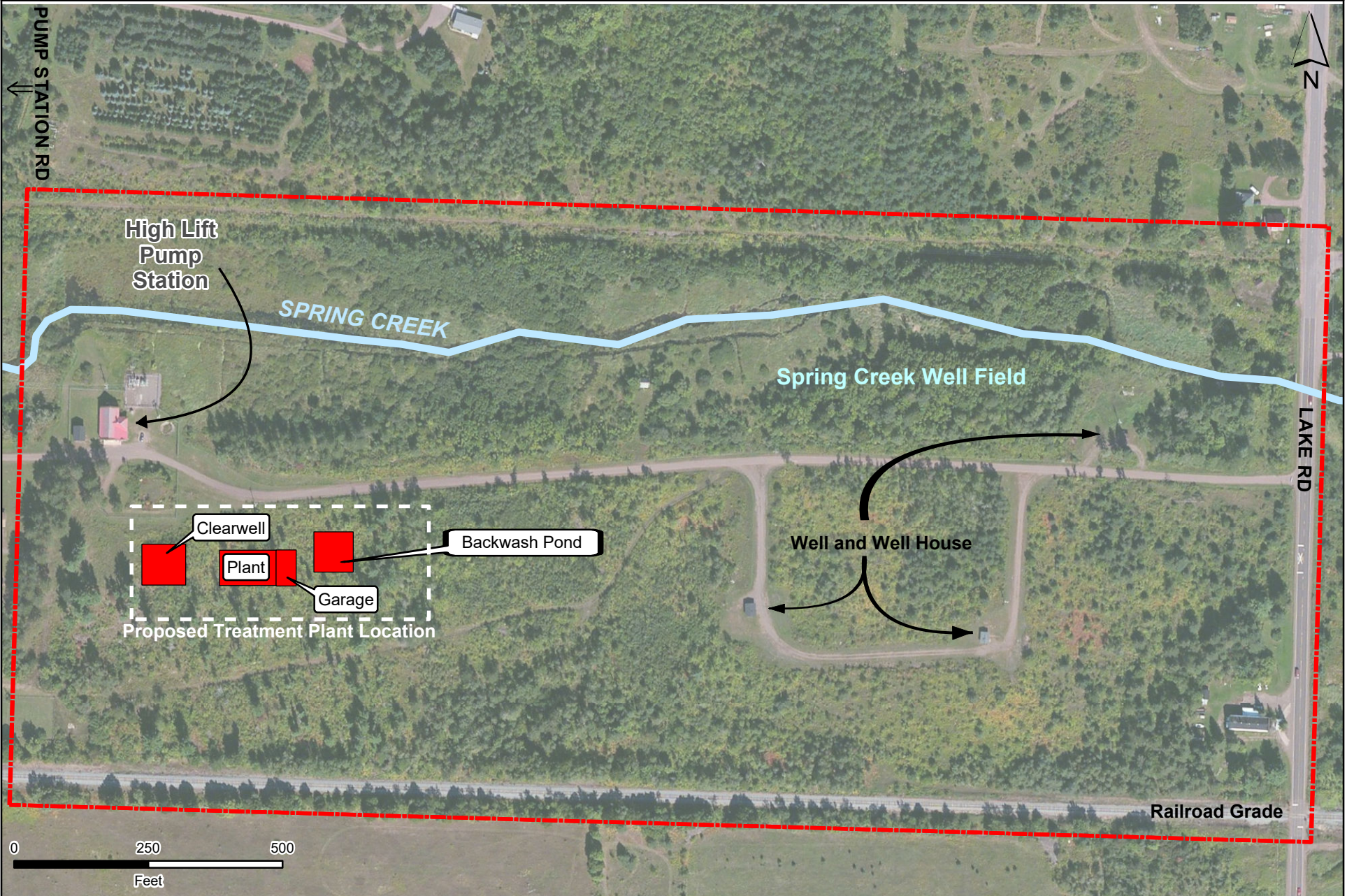
Photograph Location Map



COLEMAN ENGINEERING COMPANY
635 CIRCLE DRIVE • IRON MOUNTAIN, MI 49801 • PHONE: 906-774-3440
200 EAST AYER STREET • IRONWOOD, MI 49938 • PHONE: 906-932-5048

Project No:
191079
Map Date:
Feb 12, 2020

Figure No:
Fig 2
Drawn By:
MCG



Big Springs Well Field

City of Ironwood, Michigan

Photograph Location Map



COLEMAN ENGINEERING COMPANY
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200 EAST AYER STREET • IRONWOOD, MI 49938 • PHONE: 906-932-5048

Project No:
191079

Figure No:
Fig 3

Map Date:
Feb 05, 2020

Drawn By:
MCG

SPRINGCREEK

Big Springs Well Field

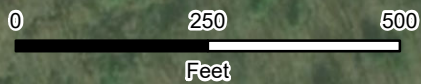
Well and Well House

Generator and
Chlorine Building

Well and Well House

Well and Well House

Big Springs Road



TRANSMISSION MAIN

City of Ironwood, Michigan

Photograph Location Map



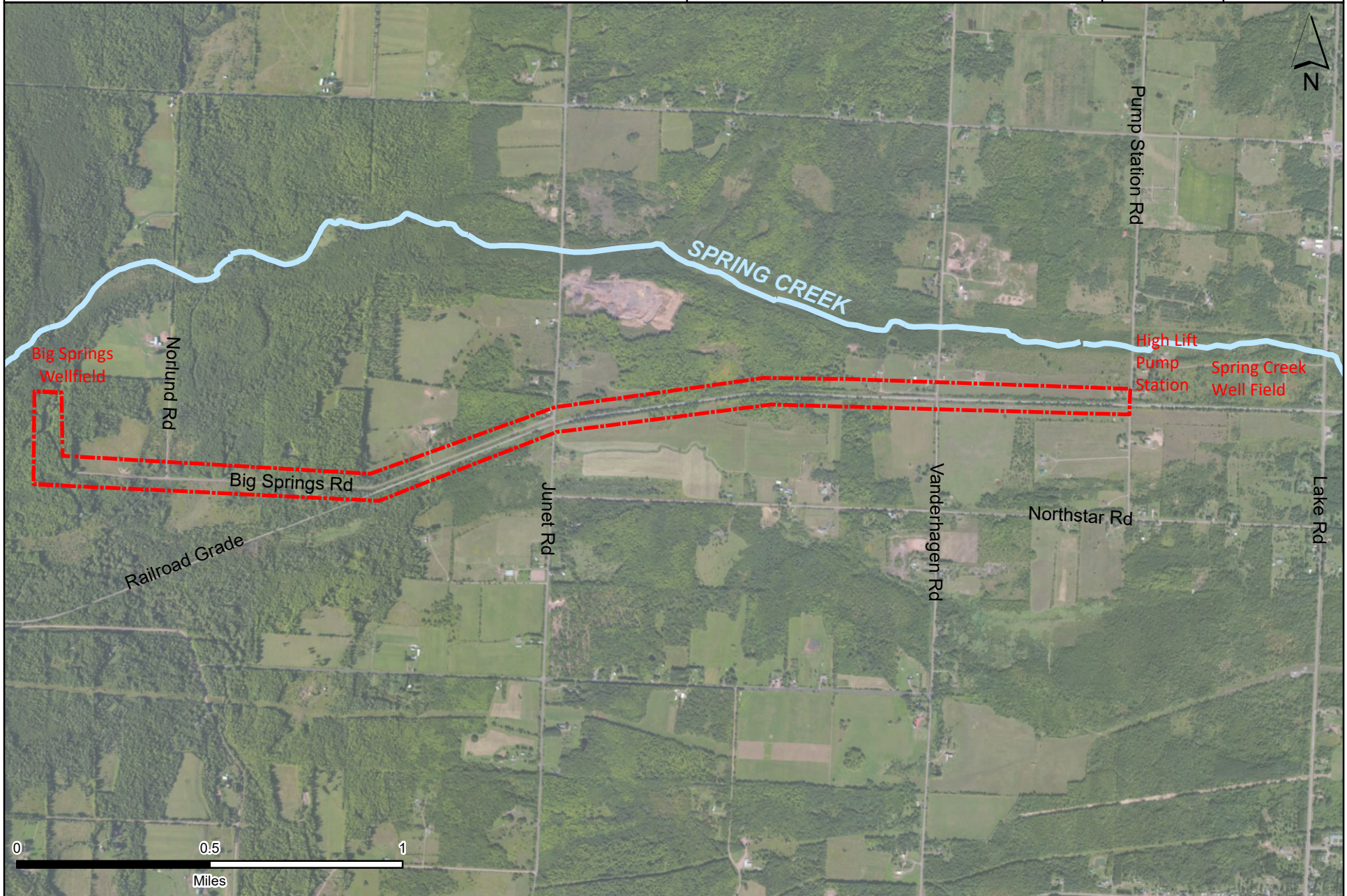
COLEMAN ENGINEERING COMPANY
635 CIRCLE DRIVE • IRON MOUNTAIN, MI 49801 • PHONE: 906-774-3440
200 EAST AYER STREET • IRONWOOD, MI 49938 • PHONE: 906-932-5048

Project No:
191079

Figure No:
Fig 4

Map Date:
Feb 05, 2020

Drawn By:
MCG



CUSTOMER SERVICE AREA

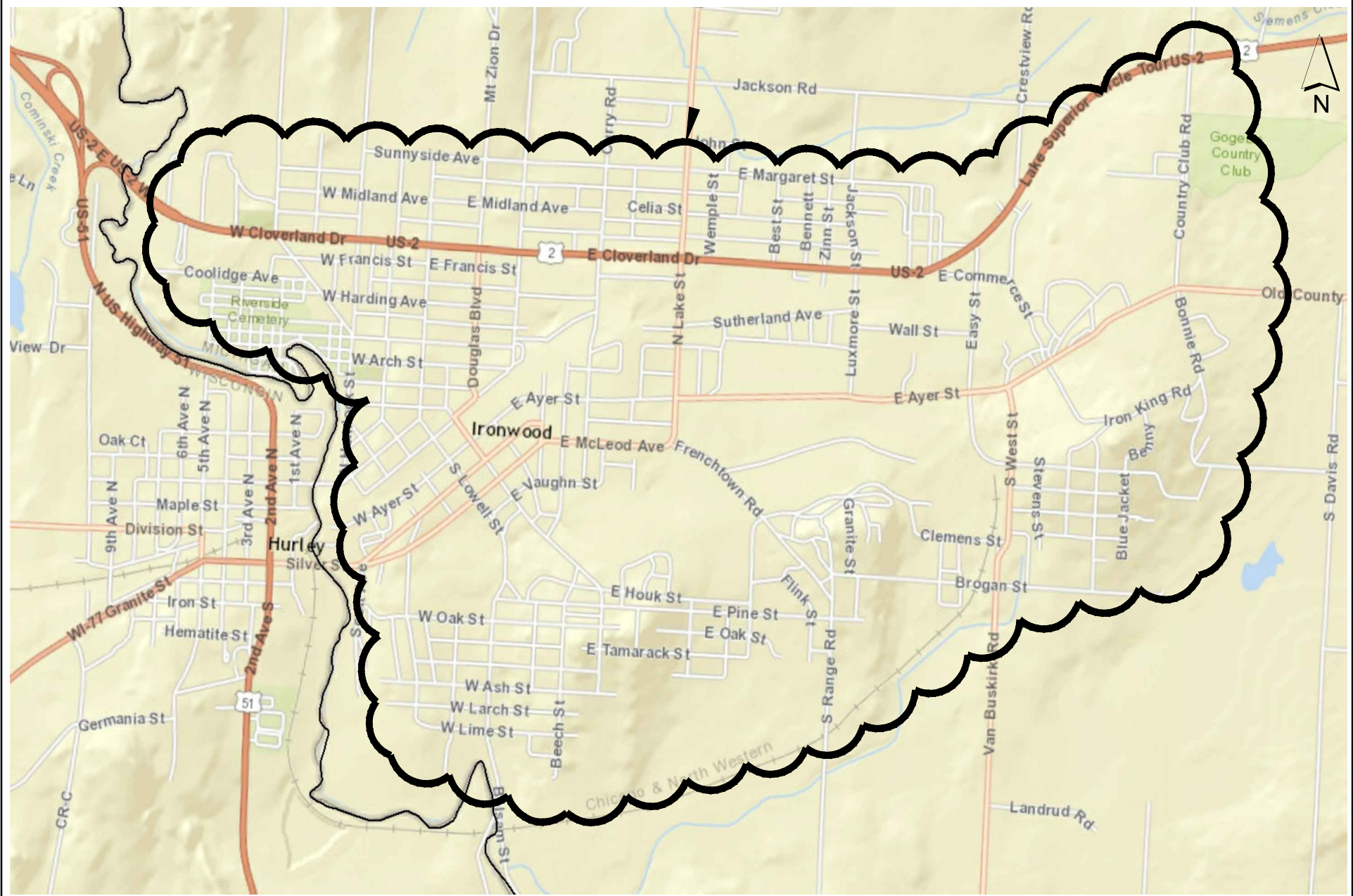
City of Ironwood, Michigan

Photograph Location Map



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Project No: 191079	Figure No: Fig 5
Map Date: Feb 05, 2020	Drawn By: MCG



Appendix B

Laboratory Analytical Results



429 River Lane • PO Box 27 Amasa, MI 49903 • Ph (906) 822-7889 • Fax -7977

Client: City of Ironwood
Project: WSSN 3420
Date Received: 2/6/2020

WWA Job #: 87766
Sample Matrix: Drinking water
Date Reported: 3/4/2020

Sample Number | ID | Description | Date/Time Sampled

87766-001 | Well 104 | 2/5/2020 8:30:00 AM

Test	Result	Flags	Units	Date/Time	Method	MDL	SQL	Analyst
Alkalinity (t) as CaCO ₃	190		mg/L	2/7/2020 15:46	310.2	6.0	30	NK
Ammonia-N	ND		mg/L	2/11/2020 16:32	4500-NH ₃ G	0.17	1.0	NK
Arsenic (dw)	ND		ug/L	2/11/2020 15:50	200.8	0.68	5.0	AH
Calcium (dw)	54		mg/L	2/25/2020 16:45	200.7	0.04	0.20	SB
Chloride (dw)	ND		mg/L	2/13/2020 12:39	4500-Cl- E	9.8	20	NK
Hardness (dw)	180		mg/L	2/25/2020 10:01	2340B	0.3	1.3	SB
Iron (dw)	ND		ug/L	2/25/2020 16:45	200.7	19	50	SB
Magnesium (dw)	12		mg/L	2/25/2020 16:45	200.7	0.06	0.20	SB
Manganese (dw)	0.65	J	ug/L	2/25/2020 16:45	200.7	0.50	2.0	SB
pH Lab	7.5		pH Units	2/6/2020 11:40	4500H+ B	0.10	0.10	TM
Sulfate (dw)	9.3	J	mg/L	2/14/2020 12:28	4500-SO ₄ - E	3.1	12	NK
Sulfide	ND		mg/L	2/18/2020 15:19	4500-S ₂ D	0.05	0.05	OL
Total Dissolved Solids	200	H	mg/L	2/13/2020 16:10	2540C	10	10	WS
Total Organic Carbon (t)	1.2		mg/L	2/21/2020 4:45	5310B	0.50	1.0	OL
Total Phosphorus (t)	ND		mg/L	2/11/2020 11:39	365.4	0.06	0.20	NK

87766-002 | Well 101 | 2/5/2020 8:45:00 AM

Test	Result	Flags	Units	Date/Time	Method	MDL	SQL	Analyst
Alkalinity (t) as CaCO ₃	160		mg/L	2/7/2020 15:48	310.2	6.0	30	NK
Ammonia-N	0.44	J	mg/L	2/11/2020 16:33	4500-NH ₃ G	0.17	1.0	NK
Arsenic (dw)	ND		ug/L	2/11/2020 15:52	200.8	0.68	5.0	AH
Calcium (dw)	43		mg/L	2/25/2020 17:05	200.7	0.04	0.20	SB
Chloride (dw)	ND		mg/L	2/13/2020 12:40	4500-Cl- E	9.8	20	NK
Hardness (dw)	150		mg/L	2/25/2020 10:01	2340B	0.3	1.3	SB
Iron (dw)	260		ug/L	2/25/2020 17:05	200.7	19	50	SB
Magnesium (dw)	9.6		mg/L	2/25/2020 17:05	200.7	0.06	0.20	SB
Manganese (dw)	450		ug/L	2/25/2020 17:05	200.7	0.50	2.0	SB
pH Lab	8.0		pH Units	2/6/2020 11:40	4500H+ B	0.10	0.10	TM
Sulfate (dw)	ND		mg/L	2/14/2020 12:30	4500-SO ₄ - E	3.1	12	NK
Sulfide	ND		mg/L	2/18/2020 15:20	4500-S ₂ D	0.05	0.05	OL
Total Dissolved Solids	170	H	mg/L	2/13/2020 16:15	2540C	10	10	WS
Total Organic Carbon (t)	2.2		mg/L	2/21/2020 5:35	5310B	0.50	1.0	OL
Total Phosphorus (t)	0.12	J	mg/L	2/11/2020 11:39	365.4	0.06	0.20	NK



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Client: City of Ironwood
Project: WSSN 3420
Date Received: 2/6/2020

WWA Job #: 87766
Sample Matrix: Drinking water
Date Reported: 3/4/2020

Sample Number | ID | Description | Date/Time Sampled

87766-003 | Well 204 | 2/5/2020 9:00:00 AM

Test	Result	Flags	Units	Date/Time	Method	MDL	MLQ	Analyst
Alkalinity (t) as CaCO ₃	160		mg/L	2/7/2020 15:48	310.2	6.0	30	NK
Ammonia-N	0.68	J	mg/L	2/11/2020 16:34	4500-NH ₃ G	0.17	1.0	NK
Arsenic (dw)	1.3	J	ug/L	2/11/2020 15:54	200.8	0.68	5.0	AH
Calcium (dw)	49		mg/L	2/25/2020 17:10	200.7	0.04	0.20	SB
Chloride (dw)	38		mg/L	2/13/2020 12:41	4500-Cl- E	9.8	20	NK
Hardness (dw)	160		mg/L	2/25/2020 10:01	2340B	0.3	1.3	SB
Iron (dw)	170		ug/L	2/25/2020 17:10	200.7	19	50	SB
Magnesium (dw)	9.9		mg/L	2/25/2020 17:10	200.7	0.06	0.20	SB
Manganese (dw)	340		ug/L	2/25/2020 17:10	200.7	0.50	2.0	SB
pH Lab	8.1		pH Units	2/6/2020 11:40	4500H+ B	0.10	0.10	TM
Sulfate (dw)	ND		mg/L	2/14/2020 12:31	4500-SO ₄ - E	3.1	12	NK
Sulfide	ND		mg/L	2/18/2020 15:20	4500-S ₂ D	0.05	0.05	OL
Total Dissolved Solids	220	H	mg/L	2/13/2020 16:20	2540C	10	10	WS
Total Organic Carbon (t)	1.7		mg/L	2/21/2020 5:53	5310B	0.50	1.0	OL
Total Phosphorus (t)	0.16	J	mg/L	2/11/2020 11:40	365.4	0.06	0.20	NK

87766-004 | Well 203 | 2/5/2020 9:20:00 AM

Test	Result	Flags	Units	Date/Time	Method	MDL	MLQ	Analyst
Alkalinity (t) as CaCO ₃	130		mg/L	2/7/2020 15:48	310.2	6.0	30	NK
Ammonia-N	0.83	J	mg/L	2/11/2020 16:35	4500-NH ₃ G	0.17	1.0	NK
Arsenic (dw)	0.84	J	ug/L	2/11/2020 15:56	200.8	0.68	5.0	AH
Calcium (dw)	37		mg/L	2/25/2020 17:15	200.7	0.04	0.20	SB
Chloride (dw)	46		mg/L	2/13/2020 12:41	4500-Cl- E	9.8	20	NK
Hardness (dw)	130		mg/L	2/25/2020 10:01	2340B	0.3	1.3	SB
Iron (dw)	280		ug/L	2/25/2020 17:15	200.7	19	50	SB
Magnesium (dw)	8.9		mg/L	2/25/2020 17:15	200.7	0.06	0.20	SB
Manganese (dw)	400		ug/L	2/25/2020 17:15	200.7	0.50	2.0	SB
pH Lab	7.8		pH Units	2/6/2020 11:40	4500H+ B	0.10	0.10	TM
Sulfate (dw)	ND		mg/L	2/14/2020 12:32	4500-SO ₄ - E	3.1	12	NK
Sulfide	ND		mg/L	2/18/2020 15:21	4500-S ₂ D	0.05	0.05	OL
Total Dissolved Solids	200	H	mg/L	2/13/2020 16:25	2540C	10	10	WS
Total Organic Carbon (t)	1.7		mg/L	2/21/2020 6:11	5310B	0.50	1.0	OL
Total Phosphorus (t)	0.22		mg/L	2/11/2020 11:40	365.4	0.06	0.20	NK



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Client: City of Ironwood
Project: WSSN 3420
Date Received: 2/6/2020

WWA Job #: 87766
Sample Matrix: Drinking water
Date Reported: 3/4/2020

Sample Number | ID | Description | Date/Time Sampled**87766-005 | Well 201 | 2/5/2020 9:35:00 AM**

Test	Result	Flags	Units	Date/Time	Method	MDL	MQL	Analyst
Alkalinity (t) as CaCO ₃	110		mg/L	2/7/2020 15:48	310.2	6.0	30	NK
Ammonia-N	0.54	J	mg/L	2/11/2020 16:35	4500-NH ₃ G	0.17	1.0	NK
Arsenic (dw)	ND		ug/L	2/11/2020 15:58	200.8	0.68	5.0	AH
Calcium (dw)	28		mg/L	2/25/2020 17:31	200.7	0.04	0.20	SB
Chloride (dw)	12	J	mg/L	2/13/2020 12:42	4500-Cl- E	9.8	20	NK
Hardness (dw)	100		mg/L	2/25/2020 10:01	2340B	0.3	1.3	SB
Iron (dw)	180		ug/L	2/25/2020 17:31	200.7	19	50	SB
Magnesium (dw)	7.7		mg/L	2/25/2020 17:31	200.7	0.06	0.20	SB
Manganese (dw)	510		ug/L	2/25/2020 17:31	200.7	0.50	2.0	SB
pH Lab	7.8		pH Units	2/6/2020 11:40	4500H+ B	0.10	0.10	TM
Sulfate (dw)	3.7	J	mg/L	2/14/2020 12:34	4500-SO ₄ - E	3.1	12	NK
Sulfide	ND		mg/L	2/18/2020 15:21	4500-S ₂ D	0.05	0.05	OL
Total Dissolved Solids	130	H	mg/L	2/13/2020 16:30	2540C	10	10	WS
Total Organic Carbon (t)	1.4		mg/L	2/21/2020 6:28	5310B	0.50	1.0	OL
Total Phosphorus (t)	0.14	J	mg/L	2/11/2020 11:41	365.4	0.06	0.20	NK

87766-006 | Well 202 | 2/5/2020 10:00:00 AM

Test	Result	Flags	Units	Date/Time	Method	MDL	MQL	Analyst
Alkalinity (t) as CaCO ₃	120		mg/L	2/7/2020 15:49	310.2	6.0	30	NK
Ammonia-N	0.55	J	mg/L	2/11/2020 16:39	4500-NH ₃ G	0.17	1.0	NK
Arsenic (dw)	ND		ug/L	2/11/2020 16:13	200.8	0.68	5.0	AH
Calcium (dw)	29		mg/L	2/25/2020 17:36	200.7	0.04	0.20	SB
Chloride (dw)	15	J	mg/L	2/13/2020 12:43	4500-Cl- E	9.8	20	NK
Hardness (dw)	100		mg/L	2/25/2020 10:01	2340B	0.3	1.3	SB
Iron (dw)	260		ug/L	2/25/2020 17:36	200.7	19	50	SB
Magnesium (dw)	7.7		mg/L	2/25/2020 17:36	200.7	0.06	0.20	SB
Manganese (dw)	460		ug/L	2/25/2020 17:36	200.7	0.50	2.0	SB
pH Lab	7.8		pH Units	2/6/2020 11:40	4500H+ B	0.10	0.10	TM
Sulfate (dw)	ND		mg/L	2/14/2020 12:34	4500-SO ₄ - E	3.1	12	NK
Sulfide	ND		mg/L	2/18/2020 15:22	4500-S ₂ D	0.05	0.05	OL
Total Dissolved Solids	140	H	mg/L	2/13/2020 16:35	2540C	10	10	WS
Total Organic Carbon (t)	1.6		mg/L	2/21/2020 6:46	5310B	0.50	1.0	OL
Total Phosphorus (t)	0.17	J	mg/L	2/11/2020 11:45	365.4	0.06	0.20	NK



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Client: City of Ironwood
Project: WSSN 3420
Date Received: 2/6/2020

WWA Job #: 87766
Sample Matrix: Drinking water
Date Reported: 3/4/2020

Sample Number | ID | Description | Date/Time Sampled

CERTIFICATION

I certify that the data contained in this Final Report has been generated and reviewed in accordance with approved methods and White Water Associates Standard Operating Procedures. Exceptions, if any, are discussed in the accompanying sample narrative. Release of this Final Report is authorized by White Water Associates management, as is verified by the following signature.

Approved By: Electronically signed by Bette J. Premo

NOTES

- ND = not detected, MDL = method detection limit, MQL = method quantitation limit
- ppm = mg/L (liquid) or mg/kg (solid), ppb = ug/L (liquid) or ug/kg (solid)
- Negative = No coliform bacteria detected, Positive = Coliform bacteria detected
- B The analyte was found in the associated blank as well as in the sample.
- H Indicates analytical holding time exceedance.
- J The quantitation is an estimated value because the result is less than the sample quantitation limit but greater than the detection limit.
- M A matrix effect was present.
- V Insufficient sample volume received (100 ml is required by MI EGLE).
- * RPD/RSD exceeds limits.
- # Indicates reading exceeds US EPA Maximum Contaminant Level for Arsenic (10 ug/L).
- † Indicates reading exceeds US EPA Action Level for Copper (1300 ug/L).
- ‡ Indicates reading exceeds US EPA Action Level for Lead (15 ug/L).

MI EGLE Certification Number: 9306

COMMENTS:

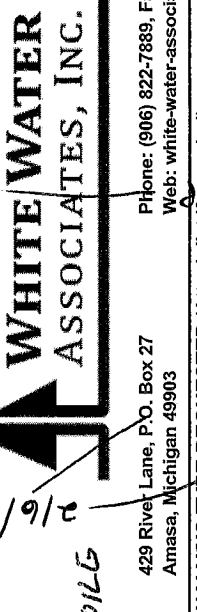
<u>Sample Number (if applicable)</u>	<u>Notes (if any)</u>
	TAL Cert. 9937, 9925

Job # (WWA office use): 877666

CHAIN-OF-CUSTODY RECORD

2/6/20
2/6/20
Version 191002

CLIENT NAME / BILL TO CITY OF Ironwood			EMAIL ADDRESS City of Ironwood																		
ADDRESS 213 S.M ANQUETTE			TELEPHONE (906) 285-9026																		
CITY Ironwood	STATE MI	ZIP 49938	CONTRACT / PO / PROJECT NAME / WSSN# 3420																		
SAMPLER NAME (print first/last name) Tim Pentile			PAGE 1	OF 1																	
SAMPLER'S SIGNATURE 			COUNTY OF LOCATION GOLEBIK																		
SAMPLE ID AND LOCATION Containers for each sample may be combined on one line.	DATE	TIME	Check off preservatives for each bottle upon arrival and indicate total number of bottles. WWA database contains bottle preservation details.						Total Number of Containers												
			Drinking water	Aqueous	Sed.	Soil	Other:	None		H2SO4	HNO3	HCl	NaOH	Na Thio	Other:						
1 well 104	2-5-20	8:00 AM						X													
2 well 104	2-5-20	8:45 AM																			
3 well 204	2-5-20	9:00 AM																			
4 well 203	2-5-20	9:20 AM																			
5 well 201	2-5-20	9:35 AM																			
6 well 202	2-5-20	10:00 AM																			



ANALYSIS TYPE REQUESTED (Attach list if needed)	ARSENIC - TOC	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	AMMONIA	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	HYDROGEN SULFIDE	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	CALCIUM, IRON & MANGNESIUM + Mn	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	HARDNESS - ALKALINITY	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	PH	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
CALCIUM - SULFATE	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
PHOSPHORUS (P)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
LABILE INDEX	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	

Instructions to White Water: Send my report by: email mail

Unless otherwise noted, drinking water report copies are sent to EGLE and Health Dept.

REMARKS (Note any special instructions provided by client or conditions of receipt noted by WWA lab staff. Also note any residual chlorine.)

Temp - 46.99
Temp - 46.22
Temp - 46.22
Temp - 46.22
Temp - 44.78
Temp - 45.32

Date: 2/6/20

Relinquished by: _____ Date: _____ Time: _____

Relinquished by: _____ Date: _____ Time: _____

Received by: **T. Moncrieff** Date: **2/6/20** Time: **8:30**

Received by: _____ Date: _____ Time: _____

Comments/sample temp on receipt: _____

Packing: Ice Cooler



Login Checklist

Project No.: 87766 **Date logged in.:** 2/6/2020 **Login person's initials:** AH
Client: City of Ironwood **Number of coolers:** 1
Project name: WSSN 3420 **Courier/shipper:** USPS

- 1. Custody seals/original packing tape were intact (if applicable).
- 2. Samples are in good condition, i.e. not broken or leaking.
- 3. Samples were received within holding times.
- 4. Samples were received on ice (in direct contact with the samples).
- 5. Temperature of the samples was between 0-6°C. Temp.:

NOTES on #4:

NOTE: Samples not between 0-6°C that are received at the laboratory on the day of sample collections do not require client notification.

- 6. Samples matched the Chain of Custody (COC).
- 7. Proper containers were used.
- 8. Samples were collected in White Water lab containers.
- 9. There is adequate sample volume for requested analyses and QC.
- 10. For water VOC samples, headspace is less than the size of a pea.
- 11. Samples are preserved to the proper pH. Sample bottles and preservation are noted in LIMS Sample Container Section.
- 12. The COC is signed. (either Sampler or Relinquished by)
- 13. Sub-sampling (SS) is required. Bottles created are noted in sample containers section of log-in form.
- 14. For Dissolved Analysis (when applicable), samples were filtered in the lab.
- 15. For soil VOCs, methanol preserved samples were received.
- 16. For Soil VOCs, samples were preserved with methanol in the lab.
- 17. Client contact is necessary. Provide documentation below.

COMMENTS/CORRECTIVE ACTION

CLIENT RESPONSE

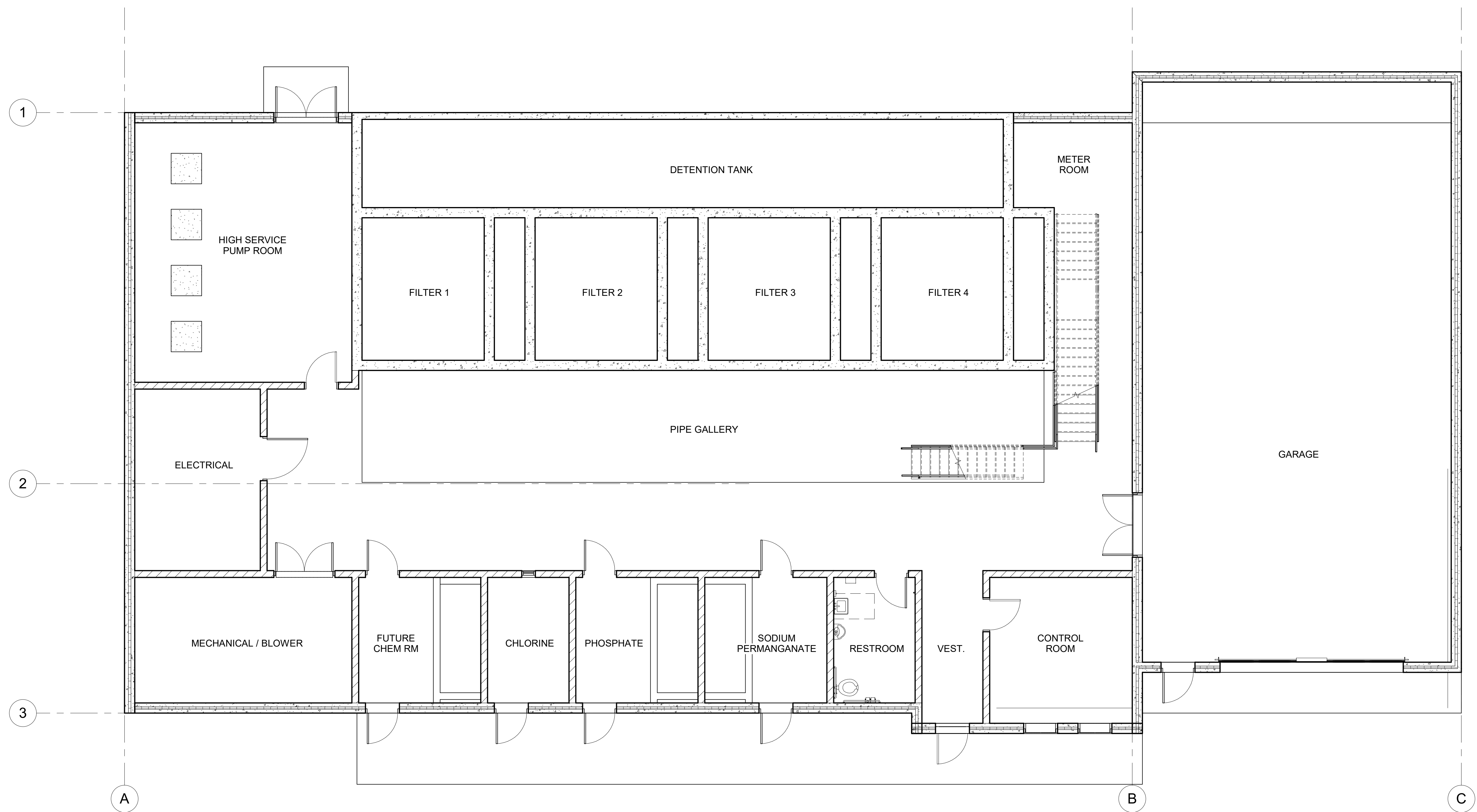
Note: If hold time, volume, and received on ice or temperature criteria are not met when required by the method, results may not be able to be used for regulatory purposes. Check with your reporting agency for more information.

Appendix C

Concrete Gravity Filter Treatment Plant Layouts

NOT FOR CONSTRUCTION

Project Owner



NORTH
1 FIRST LEVEL FLOOR PLAN
 P101

IRONWOOD CONCRETE GRAVITY LAYOUT
**WATER TREATMENT PLANT
 ALTERNATIVE #1**
 Enter address here

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SEH Project IRCTY 154251
 Checked By CTL
 Drawn By KAK

Project Status PRELIMINARY
 Issue Date 1/06/2020

Revision Issue		
Rev. #	Description	Date

PLAN VIEW

Project Owner

IRONWOOD CONCRETE GRAVITY LAYOUT
WATER TREATMENT PLANT
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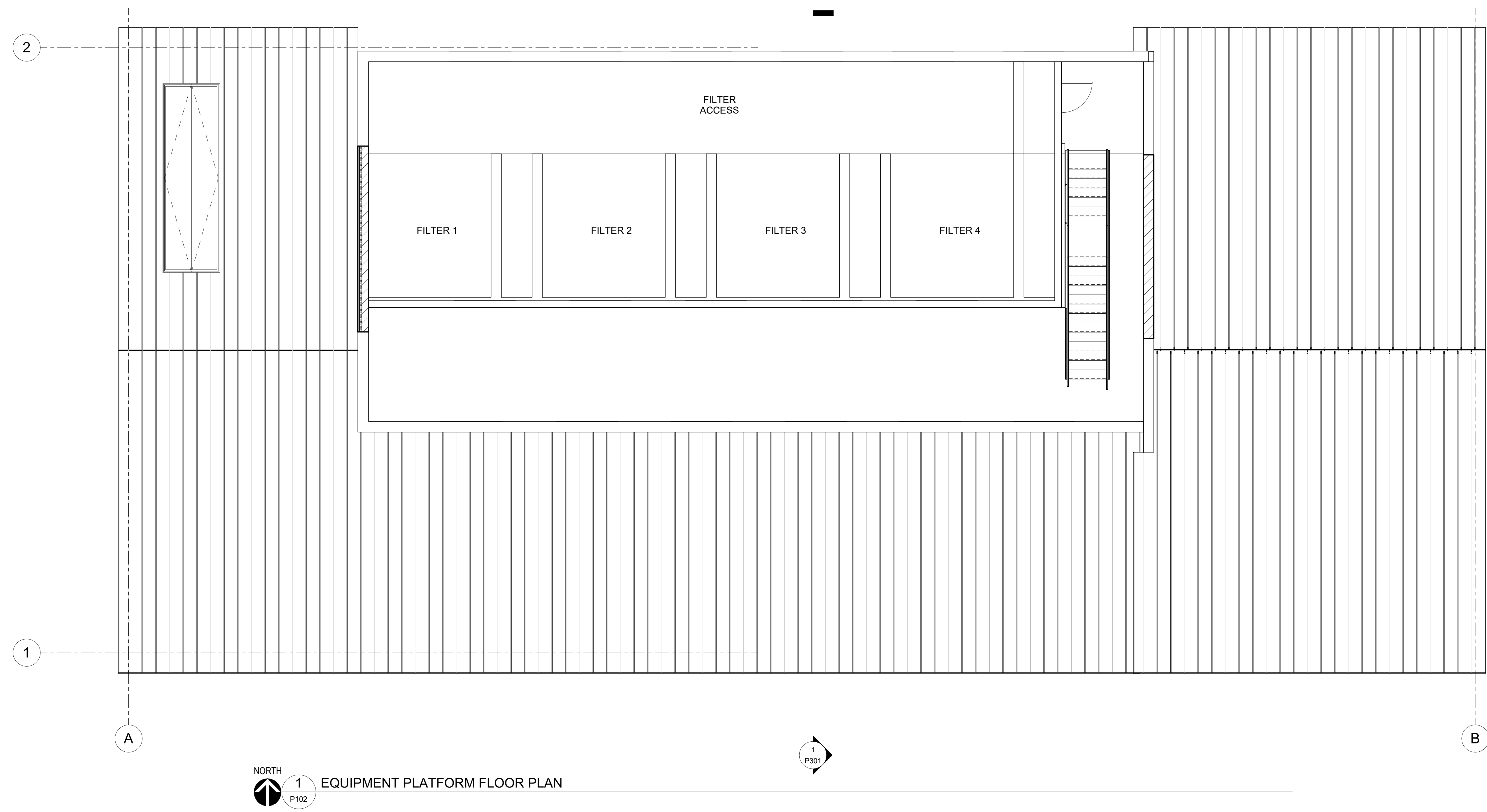
SEH Project Checked By Drawn By
 Project Number
 CTL
 KAK

Project Status
 PRELIMINARY
 Issue Date
 1/06/2020

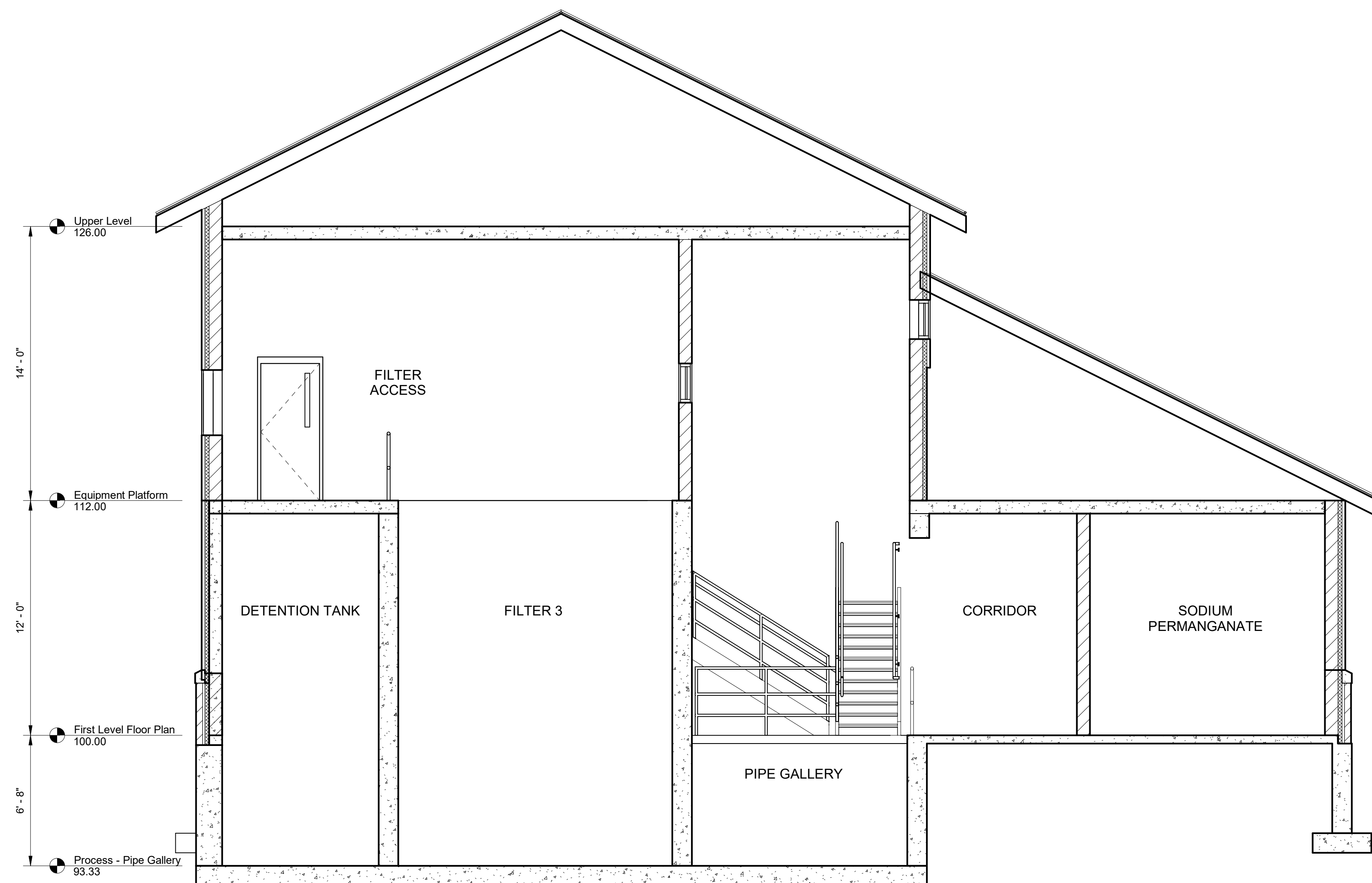
Revision Issue
 Rev. # Description Date

EQUIPMENT PLATFORM

P102



1 NORTH
 P102 **EQUIPMENT PLATFORM FLOOR PLAN**



1 BUILDING SECTION
P301

IRONWOOD CONCRETE GRAVITY LAYOUT
**WATER TREATMENT PLANT
ALTERNATIVE #1**
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Revision Issue		
Rev. #	Description	Date

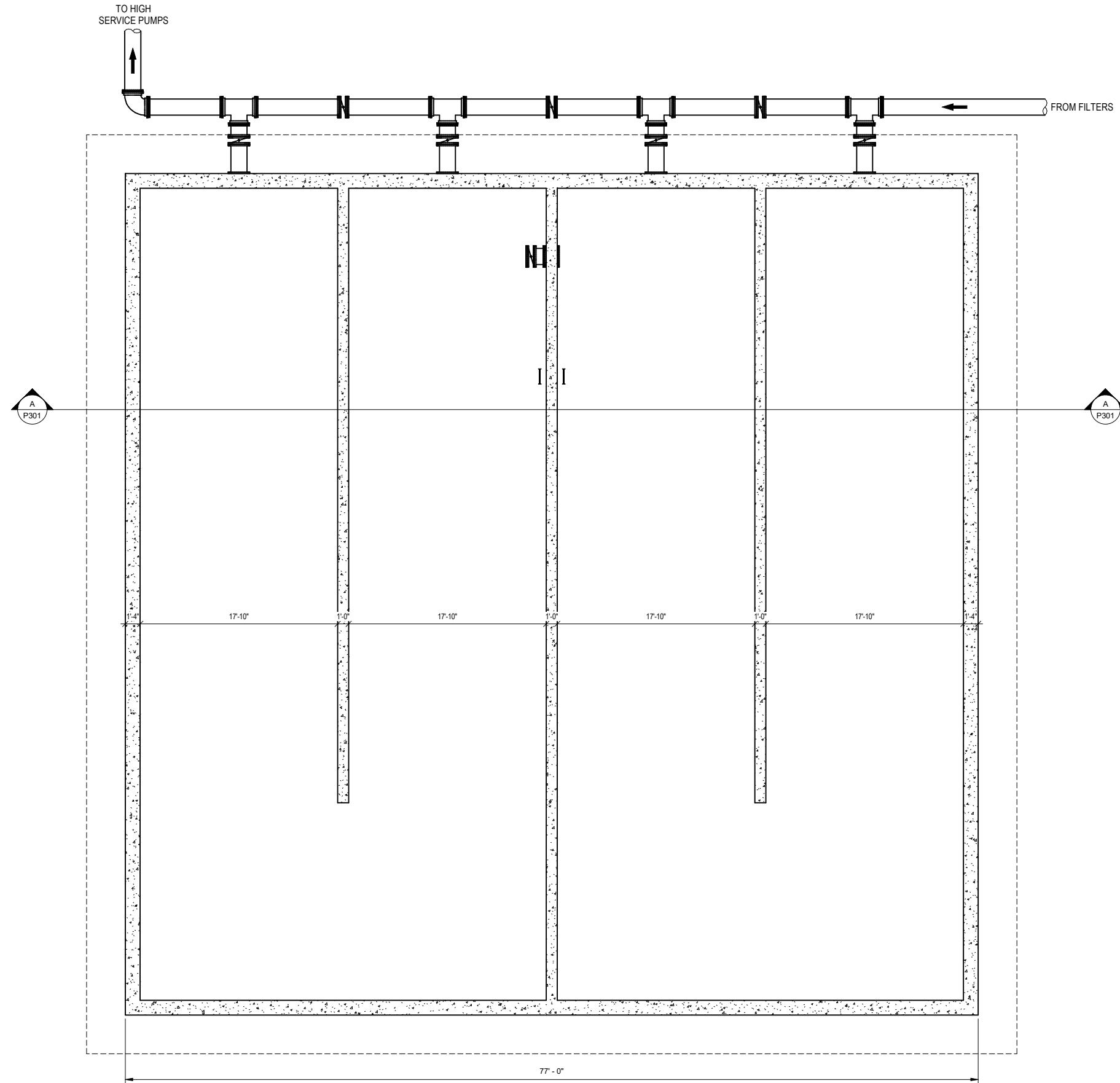
SECTIONS



I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MICHIGAN.

DATE: xx/xx/xxxx LICENSE NO. _____

Project Owner _____



CITY OF IRONWOOD
CLEARWELL

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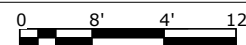
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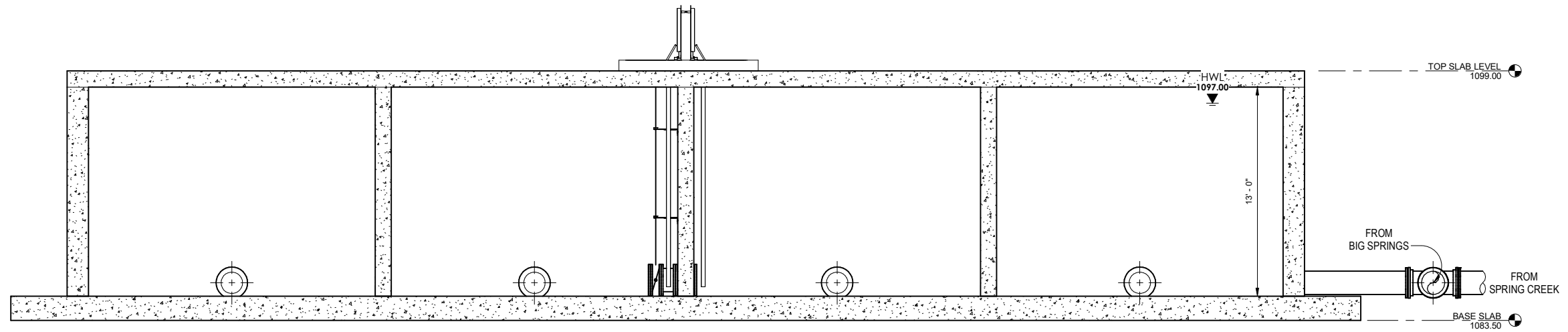
CLEARWELL PLAN

P101

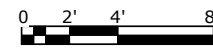
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 1 CLEARWELL PLAN VIEW
P101





A CLEARWELL SECTION
P301



CITY OF IRONWOOD
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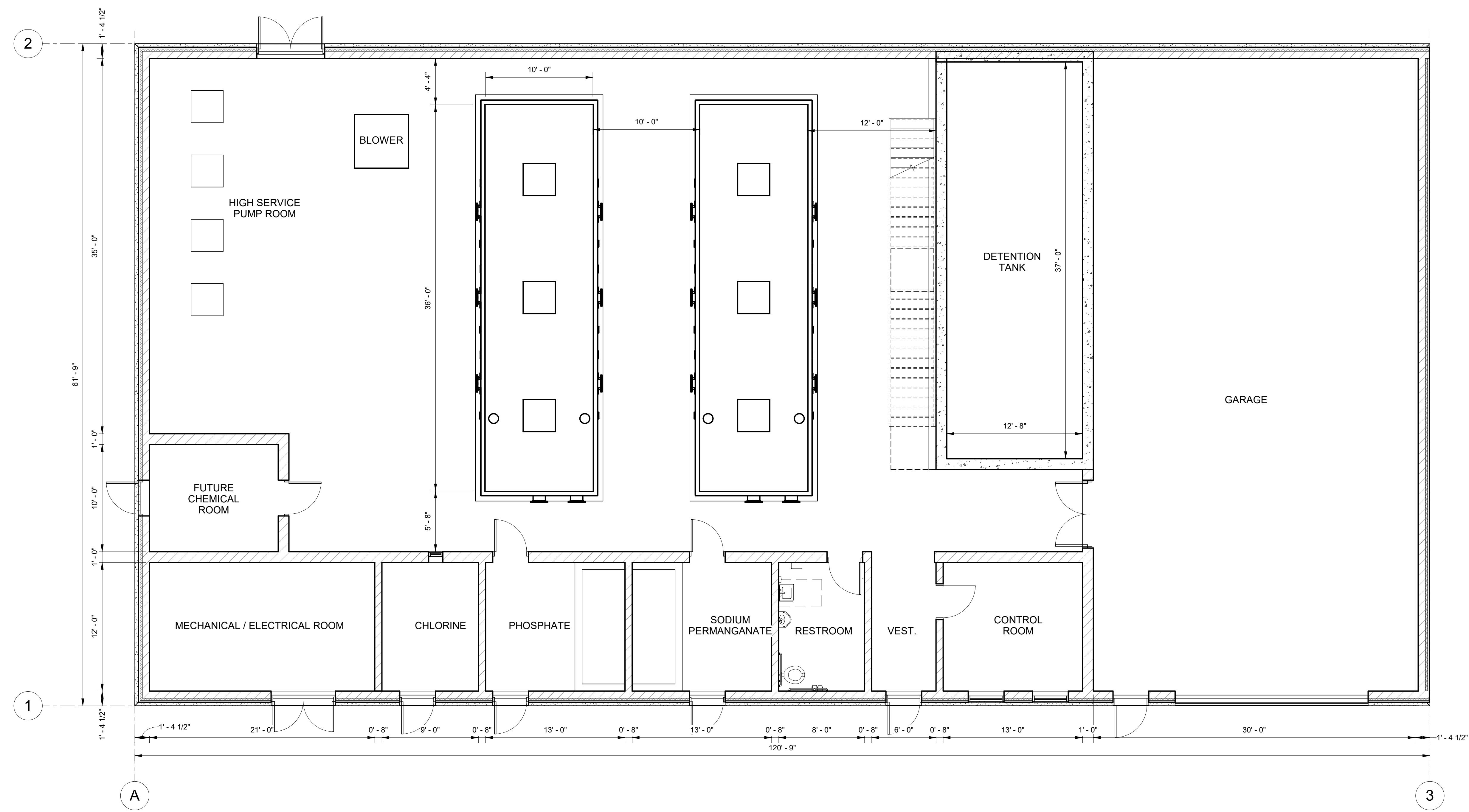
CLEARWELL SECTION

P301

Appendix D

Steel Gravity Filter Treatment Plant Layouts

Project Owner



NORTH
 1 FIRST LEVEL FLOOR PLAN
 P101

IRONWOOD CONCRETE GRAVITY LAYOUT
**WATER TREATMENT PLANT
 ALTERNATIVE #2**
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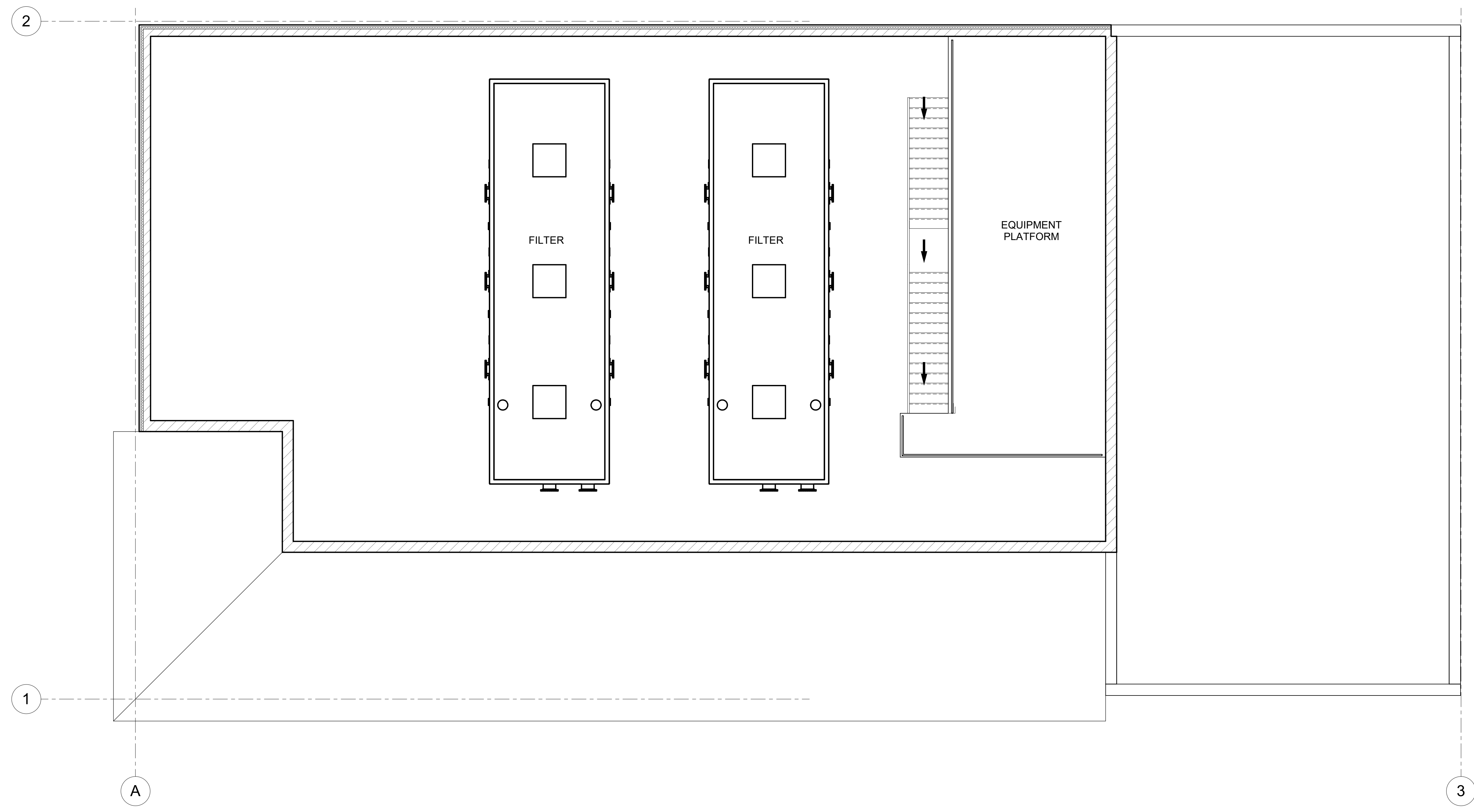
SEH Project Number: CTL
 Checked By: KAK
 Drawn By:

Project Status: PRELIMINARY
 Issue Date: 1/06/2020

Rev. #	Description	Date

FIRST LEVEL FLOOR PLAN

Project Owner



NORTH
 1 UPPER LEVEL PLAN
 P102

IRONWOOD CONCRETE GRAVITY LAYOUT
**WATER TREATMENT PLANT
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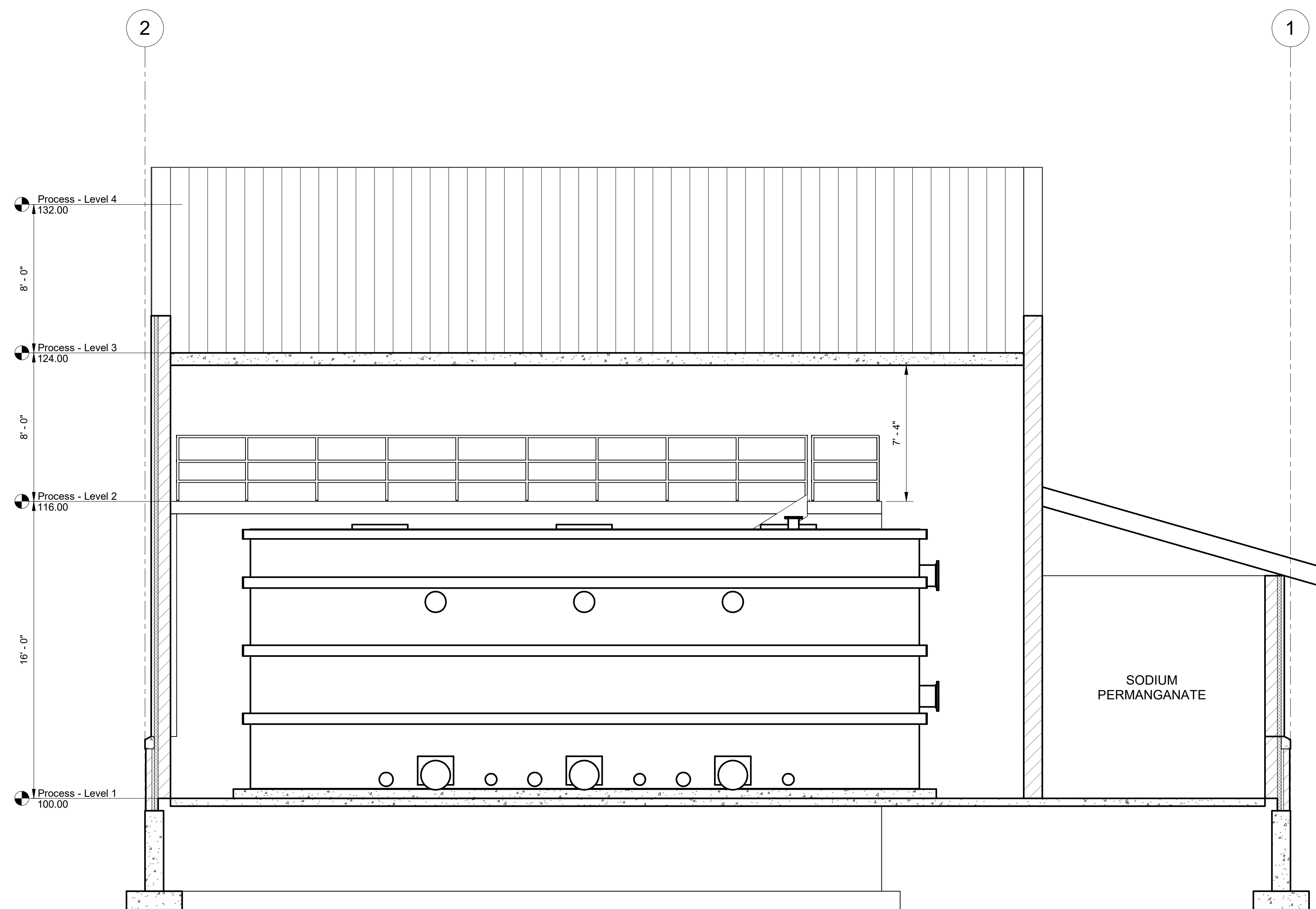
SEH Project Checked By Drawn By Project Number CTL KAK

Project Status PRELIMINARY Issue Date 1/06/2020

Rev. #	Description	Date

UPPER LEVEL PLAN

Project Owner



1 BUILDING SECTION
P301

IRONWOOD CONCRETE GRAVITY LAYOUT
WATER TREATMENT PLANT
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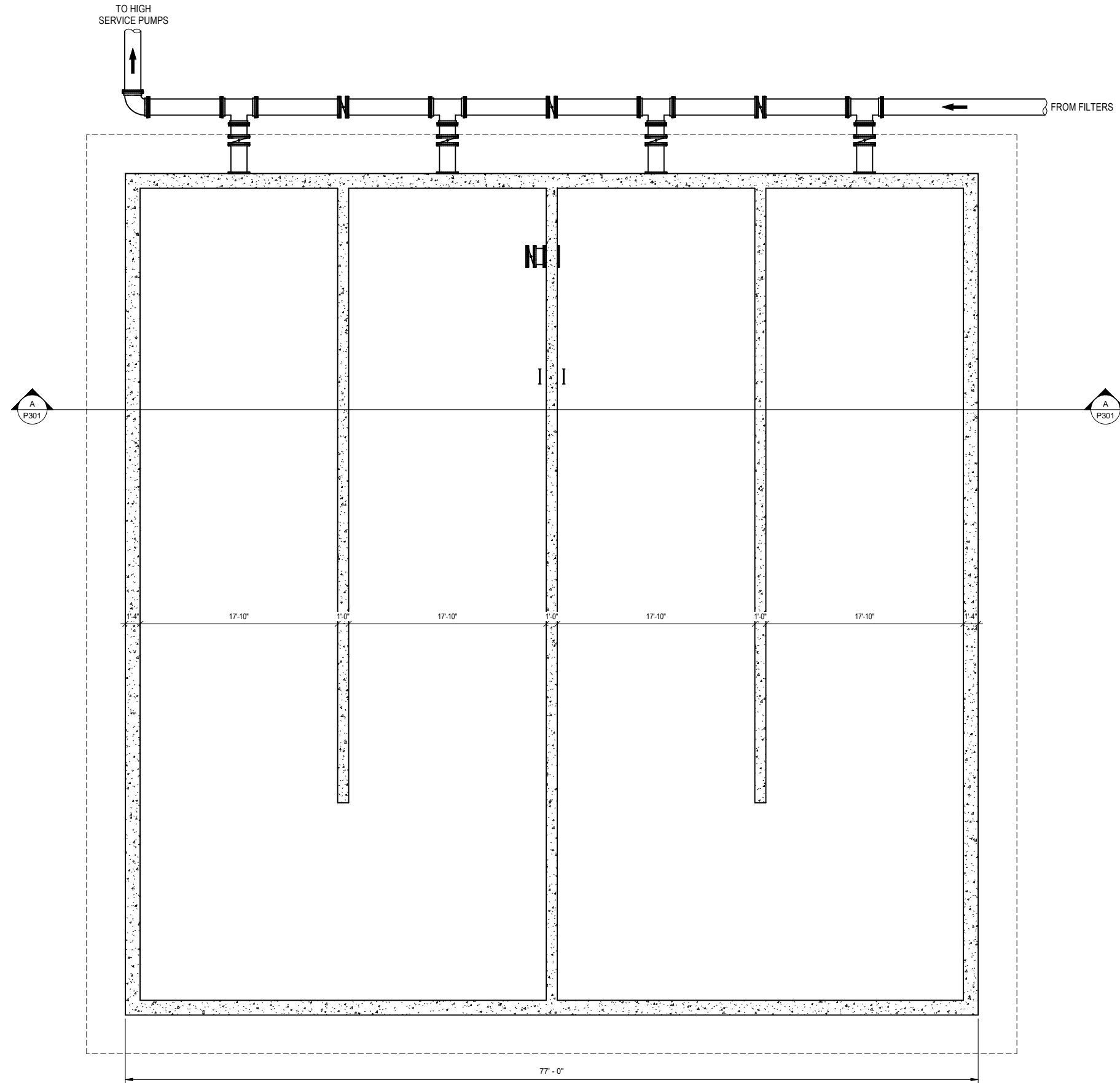
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Revision Issue		
Rev. #	Description	Date

SECTIONS

P301



CITY OF IRONWOOD
CLEARWELL

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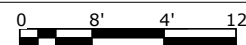
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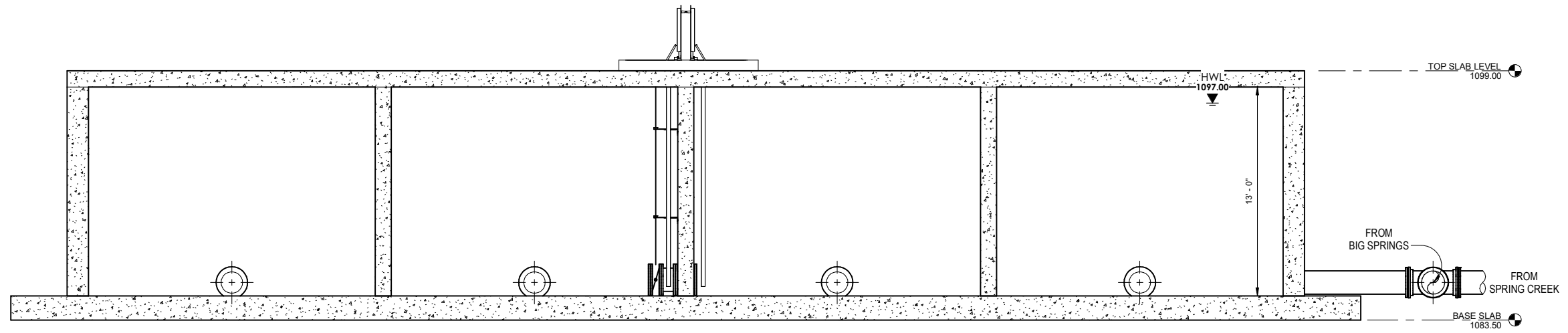
Revision Issue		
Rev. #	Description	Date

CLEARWELL PLAN

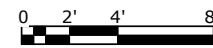
P101

1 CLEARWELL PLAN VIEW
P101





A CLEARWELL SECTION
P301



CITY OF IRONWOOD
CLEARWELL

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Rev. #	Description	Date

CLEARWELL SECTION

P301

Appendix E

Pilot Study

Pilot Study Report

Pilot Study for Removal of Manganese City of Ironwood, Michigan

SEH No. IRCTY 154251 4.00

May 28, 2020



Building a Better World
for All of Us®

Engineers | Architects | Planners | Scientists

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Letter of Transmittal
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Appendix A Pilot Study Figures

Pilot Study Report

Pilot Study for Removal of Manganese

Prepared for City of Ironwood, Michigan

1.0 Introduction

1.1 Background

SEH was contracted by the City of Ironwood to prepare a Water Preliminary Engineering Report (PER) to evaluate the existing aging water pumping station and develop solutions to reduce manganese. The PER will set the framework for a potential future water treatment plant (WTP) project. As part of the study, SEH conducted a pilot study to consider options for the removal manganese and iron from their water supply. Ironwood's average manganese levels exceed the United States Environmental Protection Agency (US EPA) Health Based Value (HBV) of 0.30 mg/L. In addition to exceeding the HBV for manganese, the water quality in Ironwoods wells exceeds the US EPA secondary standards for iron and manganese of 0.30 mg/L and 0.05 mg/L respectively.

1.2 Objectives

The objectives of the study were to evaluate treatment methods for the reduction of manganese below the secondary standard of 0.05 mg/L, and to then select treatment methods for the design of a Water Treatment Plant for the City of Ironwood.

The study included the following objectives:

1. Evaluate chemical selection for the removal of iron and manganese.
2. Evaluate filter run lengths.
3. Evaluate filter loading rates.
4. Evaluate the use of aeration and detention for the treatment process.



2.0 Existing Facilities

2.1 Wells

The City of Ironwood receives its water from six (6) wells, three (3) of which are located in the Spring Creek wellfield and three (3) of which are located in the Big Springs wellfield. All six (6) wells pump to a 140,000 gallon concrete clearwell located at the Spring Creek pump station site. The clearwell is piped to three (3) high-lift pumps located in the pump house. The high-lift pumps send the water from the pump station into the Ironwood distribution system and the 2.5 million gallon (MG) Mt. Zion reservoir.

**Table 2-1
Well Data**

Well No.	Year Constructed	Wellfield	Depth	Casing Size (in)	Capacity (gpm)	Pump Type
101	1974	Spring Creek Wellfield	140'	16"	600	Vertical Turbine
104	2004	Spring Creek Wellfield	98'	8"	180	Submersible
204	1999	Spring Creek Wellfield	141'	12"	620	Vertical Turbine
201	1998	Big Springs Wellfield	124'	12"	300	Submersible
202	1998	Big Springs Wellfield	117'	12"	195	Submersible
203	1998	Big Springs Wellfield	112'	12"	350	Submersible

2.2 Water Quality

The water supply for the pilot study was from the Spring Creek Wellfield Well No. 101. As such, the water was a single source and not a combination of all of the wells. The general water quality parameters between the wells are fairly similar, with exception to Well 104 having nearly absent iron, manganese, and ammonia.

The water quality of Well No. 101 during the time of the study had the characteristics listed in the table below. To provide high-quality drinking water and to protect against any water discoloration events, the City of Ironwood has set their own treatment goals for iron and manganese of 0.100 mg/L and 0.015 mg/L respectively.

**Table 2-2
Well No. 101 Raw Water Quality**

Parameter	Concentration			HBV ¹	Secondary Standard ²	Treatment Goal ³
	Min	Avg	Max			
Iron(mg/L)	0.180	0.260	0.310		0.300	0.100
Manganese (mg/L)	0.306	0.409	0.475	0.300	0.050	0.015
Ammonia-N (mg/L)	0.330	0.462	0.580			
pH	7.96	8.02	8.08			

Notes:

¹ – Health Based Values (HBVs) are legally enforceable standards.

² – Secondary standards are aesthetic standards and are not legally enforceable.

³ – Drinking water treatment goal set forth by the City of Ironwood.

3.0 Pilot Testing Processes and Equipment

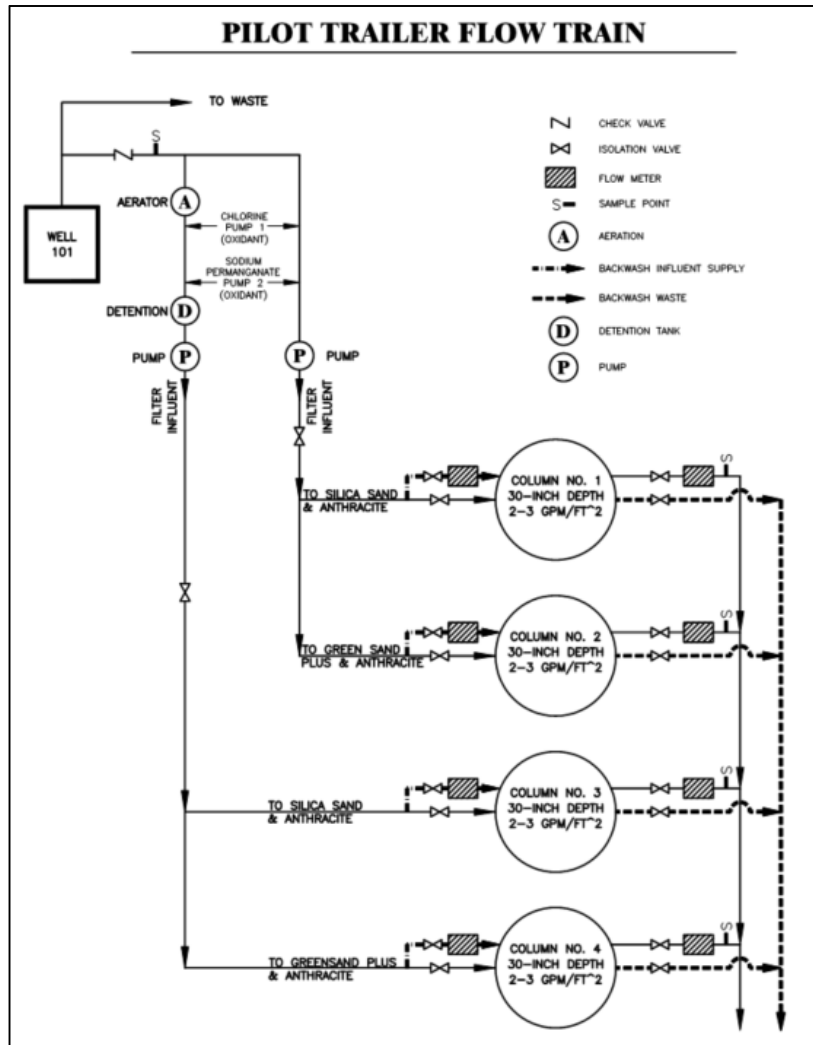
3.1 Pilot Testing Processes

Based on the concentrations of contaminants in the water and on prior experience, the processes selected for evaluation in the pilot study are listed below. These processes are described in more detail in Section 3.2.

- Aeration
 - 30 minutes of detention
- Chemical Feed
 - Chlorine, fed as sodium hypochlorite (bleach)
 - Sodium Permanganate
- Filtration with silica media and anthracite media
- Filtration with Greensand-Plus anthracite media

3.2 Pilot Testing Equipment

The pilot study was designed to mimic the full scale process being implemented. The following schematic lays out the pilot study procedure.



3.2.1 Aeration

An induced-draft aerator was used as part of the pilot process to observe the effects of additional oxidization of iron and manganese by aeration.

3.2.2 Detention

The detention tank used for the pilot study is constructed of PVC material and has a total volume of 150 gallons. When the tank was operated with a flow of 5 gpm, the approximate raw water detention time was 30 minutes. The tank is constructed with baffles that provide an over and under flow pattern to prevent short circuiting of the tank. The suction of the water transfer pump is constructed with a variable suction height that can allow a detention time of less than 30 minutes.

3.2.3 Chemical Feed System

The chemical feed systems used in the pilot study were Blue and White Peristaltic metering pumps capable of feeding a maximum of 2.3 gallons per day. The pumps were setup to feed less than 2.1 gallons per day for this study. The chemicals selected for the pilot study were:

- Chlorine, fed as sodium hypochlorite
- Sodium permanganate



3.2.3.1 Chemical Feed Points

- **Columns 1 and 2:** Chemical oxidants were added to the influent lines of the filters prior to filter columns. Chlorine was added 1 minute before the addition of permanganate, which went through a static mixer before entering the filters.
- **Columns 3 and 4:** Chemical oxidants were added to the influent line of the detention tank following aeration. Chlorine was added 3 minutes before the addition of permanganate, which went through a 1 minute rapid mix before entering the detention tank, which contained baffles to acquire adequate mixing before entering the filters.

3.2.3.2 Chemical Dosages

Chemical feed dosages were calculated as a unit of time and based on the flow to the individual treatment trains. The permanganate dosage was determined by doubling the dissolved manganese concentration in the raw water, at the start of the pilot study. The chlorine dosage was determined by the chlorine demand and the free chlorine residual desired in the effluent. The desired free chlorine into the distribution system was about 0.75 mg/L.

3.2.4 Filters

A total of four (4) filter columns, each with a diameter of 8 inches by 72 inches tall were used during the pilot testing. Each filter vessel has a 3/4-inch inlet, 1 1/2-inch backwash waste outlets under drain system, air release system, and rate of flow meters, sample taps, and filter media. The filter columns provide a total area of 0.35 ft² of surface area per column. When the filters are operated at 3-gpm/ft², each column has an equivalent flow rate of 1.05 GPM applied.



The filters were operated in a parallel flow pattern; two columns were bedded with 18 inches of greensand filter media, and 12 inches of anthracite (Columns 1 and 3). The other two filters were bedded with 18 inches of silica sand and 12 inches of anthracite media (Columns 2 and 4).

Pressure gauges were located on the inlet and outlet pipe of each filter column to obtain filter headloss across each column. Prior to starting the filter runs, each column was backwashed to remove fines and to clean the media.

The filter characteristics for the City of Ironwood pilot study of Well No. 101 are listed in the table below. Columns 1 and 2 were operated without aeration and detention, and Columns 3 and 4 were operated with aeration and detention to compare the effects of detention with two different charged media types.

**Table 3-1
Pilot Study Filter Characteristics**

Column No.	Media	Filtration Rate (gpm/ft ²)	Effective Size (mm)	Media Depth (in)
	Greensand	3	0.30-0.35	18
	Anthracite		0.9-1.0	12
	Silica Sand	3	0.45-0.55	18
	Anthracite		0.9-1.0	12
	Greensand	3	0.30-0.35	18
	Anthracite		0.9-1.0	12
	Silica Sand	3	0.45-0.55	18
	Anthracite		0.9-1.0	12

Notes: Columns 3 and 4 were operated with aeration and detention added in front of the filtration.

3.2.5 Sampling and Analysis

Sampling and analysis was completed by the onsite SEH plant operator. Field testing of the influent water to the pilot trailer iron and manganese were conducted using a Hach 890 Colorimeter, and was done for raw water and from the effluent of each filter. Testing for iron was conducted using the Hach Method 8147 (DR800 FerroZine Solution Pillow), which has a range of 0-1.3 mg/L iron (Fe), and an estimated detection limit of 0.011 mg/L Fe. Testing for manganese was conducted using the Hach Method 8149 (DR800 PAN), which has a range of 0-0.70 mg/L manganese (Mn), and an estimated detection limit of 0.020 mg/L Mn. Temperature and pH analyses were conducted using a Hach HQ 40 pH meter, and was done for the raw water. Samples for the analysis of chlorine were collected from the effluent of each filter and analyzed using the Hach DR/890 Portable Colorimeter.



pilot
for
the

The results of the sampling and subsequent analysis are presented in the remainder of this report.

4.0 Pilot Test Results

4.1 Chemical Feed Dosages

Chemical feed dosages were predetermined and fed into the system by the process described above. The following table summarizes the feed rates for Columns 1 and 2, which did not have detention before filtration. Column 1 was a silica sand media with anthracite cap. Column 2 was a green sand-plus with anthracite media. The average chlorine feed was 6.01 mg/l of 100 percent chlorine and a 0.47 mg/l of permanganate.

**Table 4-1
Chemical Dosage with Direct Filtration**

Chlorine (mg/L)			Permanganate (mg/L)		
Min	Avg	Max	Min	Avg	Max
5.01	6.01	6.20	0.44	0.47	0.47

The following table summarizes columns 3 and 4, which included 30 minutes of detention prior to filtration. These columns contained silica sand and greensand-plus with the same depths as the columns 1 and 2. The average chlorine dosage was 4.00 mg/l as 100 percent chlorine. Permanganate feed rate was 0.40 mg/l.

**Table 4-2
Chemical Dosage with Detention**

Chlorine (mg/L)			Permanganate (mg/L)		
Min	Avg	Max	Min	Avg	Max
1.95	4.00	5.03	0.37	0.40	0.43

4.2 Iron and Manganese Removal

The SEH pilot water plant was able to treat water from Well No. 101, on average, to levels that meet the EPA Secondary Standards, as well as HBV for manganese, with exception to Column 4, which is discussed below. Filter Column 1 was the only filter to achieve the City of Ironwood's treatment goal of 0.015 mg/L for manganese removal. After review of the data (see Figure 6 & Figure 8 in Appendix), it can be seen that towards the end of the Column 2 and Column 3 filter runs that particulate breakthrough may have been occurring for manganese. Prior to the assumed breakthrough, manganese removal was well below the City's treatment goal.

Another possibility for why the City's treatment goal for manganese wasn't achieved is due to the possibility of insufficient potassium permanganate dosed into the groundwater to promote the oxidation of all of the soluble manganese present prior to the water reaching the filters. To potentially increase the amount of manganese removed during filtration, the potassium permanganate dosage should increase.

As for iron, the columns were able to treat the water to levels that meet the EPA secondary standards of 0.30 mg/L, as well as successfully removing iron below the City of Ironwood's treatment goal of 0.10 mg/L. It should be noted that any iron found in the finished water is likely iron particulate due to the high rate of oxidation reactivity between soluble iron (present in the groundwater) and the strong oxidants employed (e.g., free chlorine and potassium permanganate). This pilot study did not measure finished water turbidity, which can be used

as an effective surrogate for identifying when breakthrough of particulate iron and/or manganese is occurring.

It should be noted that Column 4 saw a spike in manganese at the beginning of the filter run, which was nearly 3 times the HBV and only reduced to just above the HBV. This may mean Column 4 was malfunctioning or short-circuiting, however, this may be hard to prove since the iron levels showed to decrease at a comparable rate as the other columns. The manganese removal is very poor in the beginning of the test, but continually improves throughout the course of the filter run. This type of behavior is very indicative of a situation where the presence of soluble manganese and free chlorine is promoting the formation of a manganese oxide (MnOx(s)) coating on the filter media. It may have been possible that the water going to Column 4 just didn't receive nearly enough potassium permanganate on the front end of the filter to promote soluble manganese oxidation, but this is unlikely because Column 2 was fed with the same solution. Column 4 should not be used for this pilot study analysis, however this does not mean that this process train shouldn't be considered for removing manganese, as it is typically a successful method in all water qualities.

The following table summarizes the results from the four columns utilized in the pilot study. Complete column results can be found at the end of this report.

Table 4-3
Well No. 101 Finished Water Quality

Column Number	Iron (mg/L)			Manganese (mg/L)		
	Min.	Avg.	Max.	Min.	Avg.	Max.
1	nd	0.015	0.050	nd	nd	0.031
2	nd	0.020	0.130	nd	0.026	0.099
3	nd	0.025	0.090	nd	0.028	0.048
4	nd	0.022	0.090	0.126	0.216	0.422

Notes: nd = below method detection limit

4.3 Chlorine Residual

The level of free chlorine present during filtration is a crucial in full-scale operations since it will be that free chlorine that ultimately regenerates and maintains the soluble manganese uptake capacity of any greensand or MnOx(s)-coated media that is in the filters. The desired free chlorine into any system is about 0.75 mg/L. However, the City of Ironwood's system has long runs, which will require additional chlorine in their distribution. To achieve this, the finished water free chlorine had to be less than the total chlorine in order to produce chloramines, which remains in the system longer than chlorine, ensuring clean drinking water throughout the distribution system. As long as the system still has free ammonia present, taste and odor shouldn't be an issue.

The following table summarizes the chlorine results from the four columns utilized in the pilot study. Complete column results can be found at the end of this report.

Table 4-4
Well No. 101 Finished Water Chlorine Residual

Column Number	Total Chlorine (mg/L)			Free Chlorine (mg/L)		
	Min.	Avg.	Max.	Min.	Avg.	Max.
1	1.390	1.690	2.120	0.190	0.750	1.090
2	0.670	1.436	2.220	0.110	0.672	1.110
3	0.970	1.552	2.360	0.500	0.650	0.890
4	0.500	1.604	3.350	0.010	0.454	0.990

Notes: nd = below method detection limit

4.4 Headloss in Filter

The filter performance is assessed by filter run length and effluent water quality. The filter run length is typically determined by operating the filters to break through of iron or manganese or terminal headloss. Terminal headloss is defined as the accumulation of 5 PSI of headloss from the starting head condition. Break through is defined as sustained effluent water quality exceeding the secondary standards of iron and manganese.

Each column tested in the pilot study was capable of providing an excess of 40 hours of filter run time without reaching terminal headloss, indicating long filter run times should be possible regardless of the media used. In addition, all of the columns produced water of similar quality, further indicating the choice of filter media did not significantly impact filter performance.

The columns utilizing aerating and detention (Columns 3 and 4) appeared to generate head loss at a slightly faster rate as compared to the columns not utilizing aeration (Columns 1 and 2). After backwashing, the filters were run again for five (5) hours to observe how well backwashing restored the hydraulic properties of the filter(s) in terms of head loss accumulation. Results showed that all four columns were restored to a similar level and would hydraulically perform similarly.

Complete column headloss results can be found at the end of this report.

5.0 Conclusions

The SEH pilot water plant was able to treat water from Well No. 101 to concentrations below the EPA secondary standard for manganese in Columns 1, 2, and 3. Implementing either treatment trains at full-scale would allow the City of Ironwood to provide high-quality water as it relates to iron and manganese, as well as provide safe drinking water to the residents as it relates to manganese.

5.1 Media

The pilot study did demonstrate practical media configurations that could be employed to treat the City's groundwater sources. Both silica sand and greensand media types were effective in removing iron and manganese and successfully operated at a loading rate of 3.0 gpm/ft², but there wasn't a significant difference in effectiveness. The final design could utilize silica sand or greensand capped with anthracite media. However, due to the effectiveness of greensand at capturing iron particulate during filtration, it is recommended to implement greensand in the full-scale design. In addition to iron removal, greensand also comes with a MnO_x(s) surface coating, which promotes enhanced soluble manganese uptake and general particulate removal.

5.2 Chemicals used

The pilot study evaluated the use of chlorine and potassium permanganate as oxidants. Feed rates are within normal ranges for the type of water treated. It is recommended to use these chemicals for a full-scale design, although chlorine may be fed as sodium hypochlorite solution or gas chlorine, and potassium permanganate may be fed as sodium permanganate instead. As stated previously, chlorine dosages should be maintained in order to ensuring clean drinking water throughout the distribution system, and permanganate may need to be altered to get additional manganese removal. The free chlorine dosage point should be at least 45-60 seconds upstream of where the permanganate is added to help insure efficient breakpoint chlorination and iron oxidation will occur prior to permanganate addition. That will help insure that the permanganate dosage is focused solely on the oxidation of soluble manganese.

5.3 Aeration

Aeration of the water provided similar results in terms of iron removal compared to filtration without aeration. Based on the results and on previous experience, the use of an aerator may be preferred as it provides an additional layer in the removal of iron, and may also provide additional treatment benefits such as the removal of dissolved gases like hydrogen sulfide, which has been found in the source water.

5.4 Detention

The utilization of detention and aeration ahead of filtration did not show significant improvements to the filtered water quality, but it may allow for the potassium permanganate dosage to be lowered. Even though 30 minutes of detention did not demonstrate significant water quality improvements, it provides a flocculation zone where particles sizes can grow, and it provides an opportunity for particles to settle out and not need to be removed by the filters. The detention tank should implement a design that provides complete mixing and doesn't allow for any short circuiting of chemical additives.

Appendix A

Pilot Study Figures

Figure 1
City of Ironwood, MI
Raw Water Iron
Well No. 101

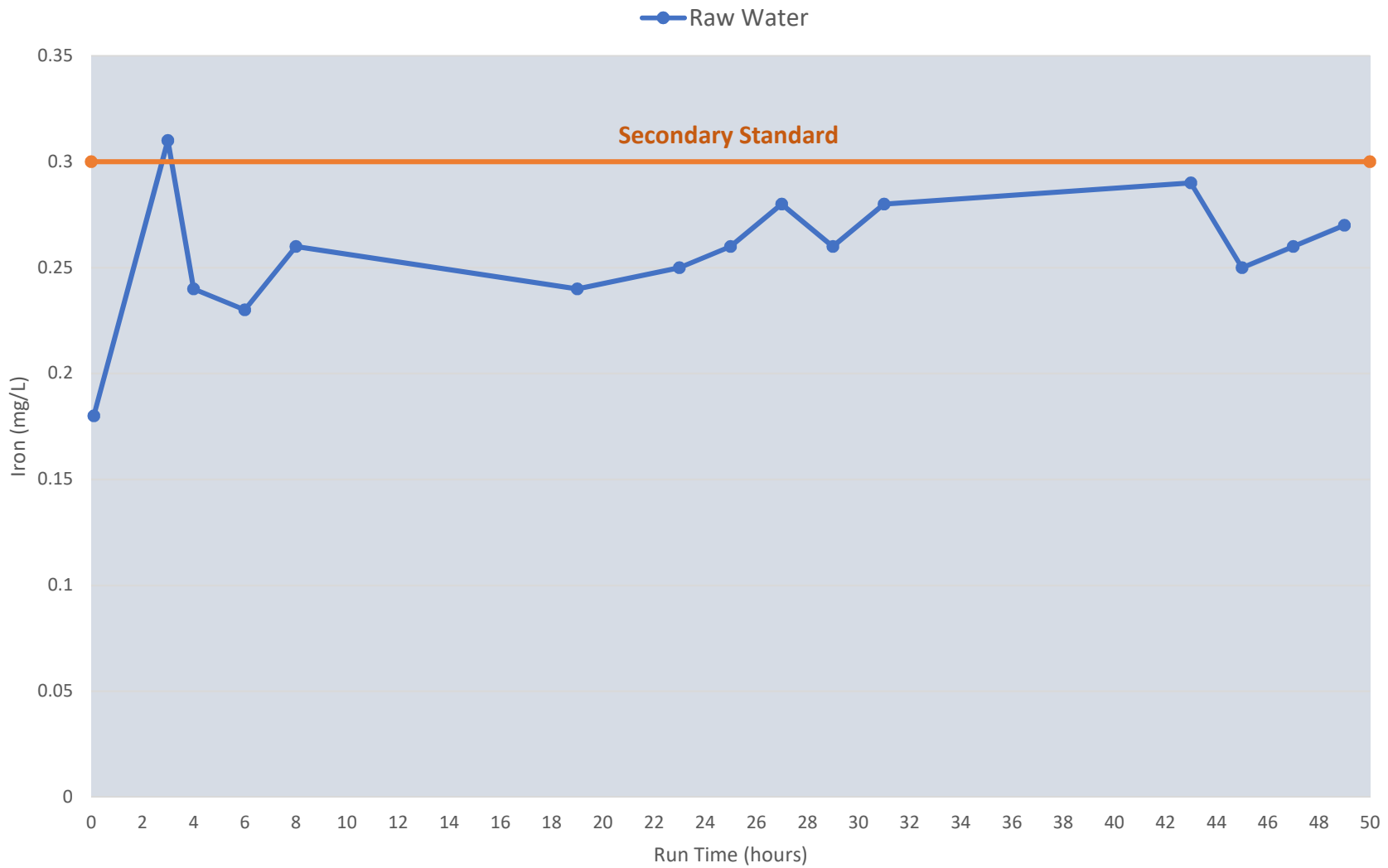


Figure 2
City of Ironwood, MI
Raw Water Manganese
Well No. 101

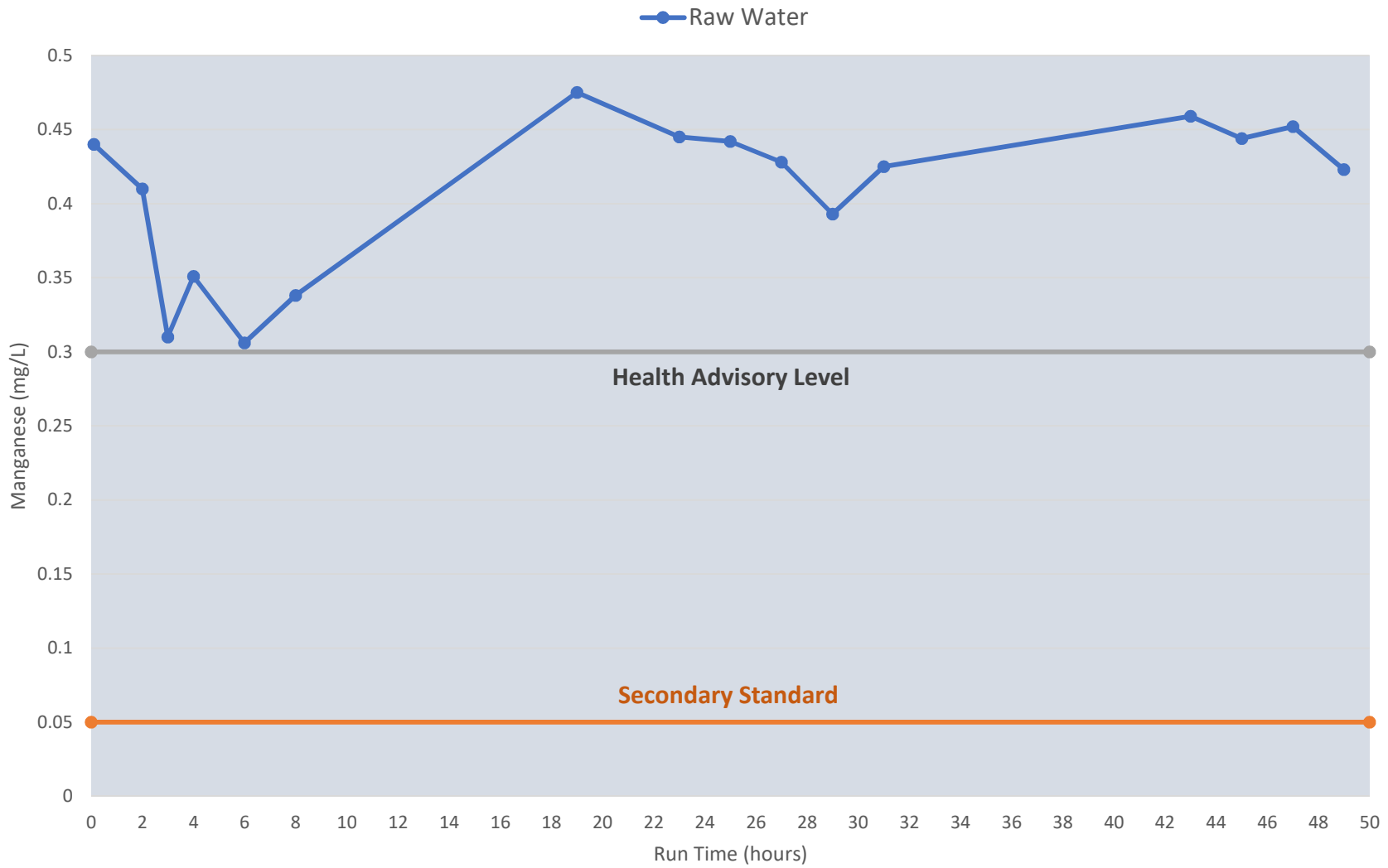


Figure 3
City of Ironwood, MI
Finished Iron Quality
Column 1 - Greensand/Anthracite Media

● Column 1 Effluent × Free Chlorine Residual

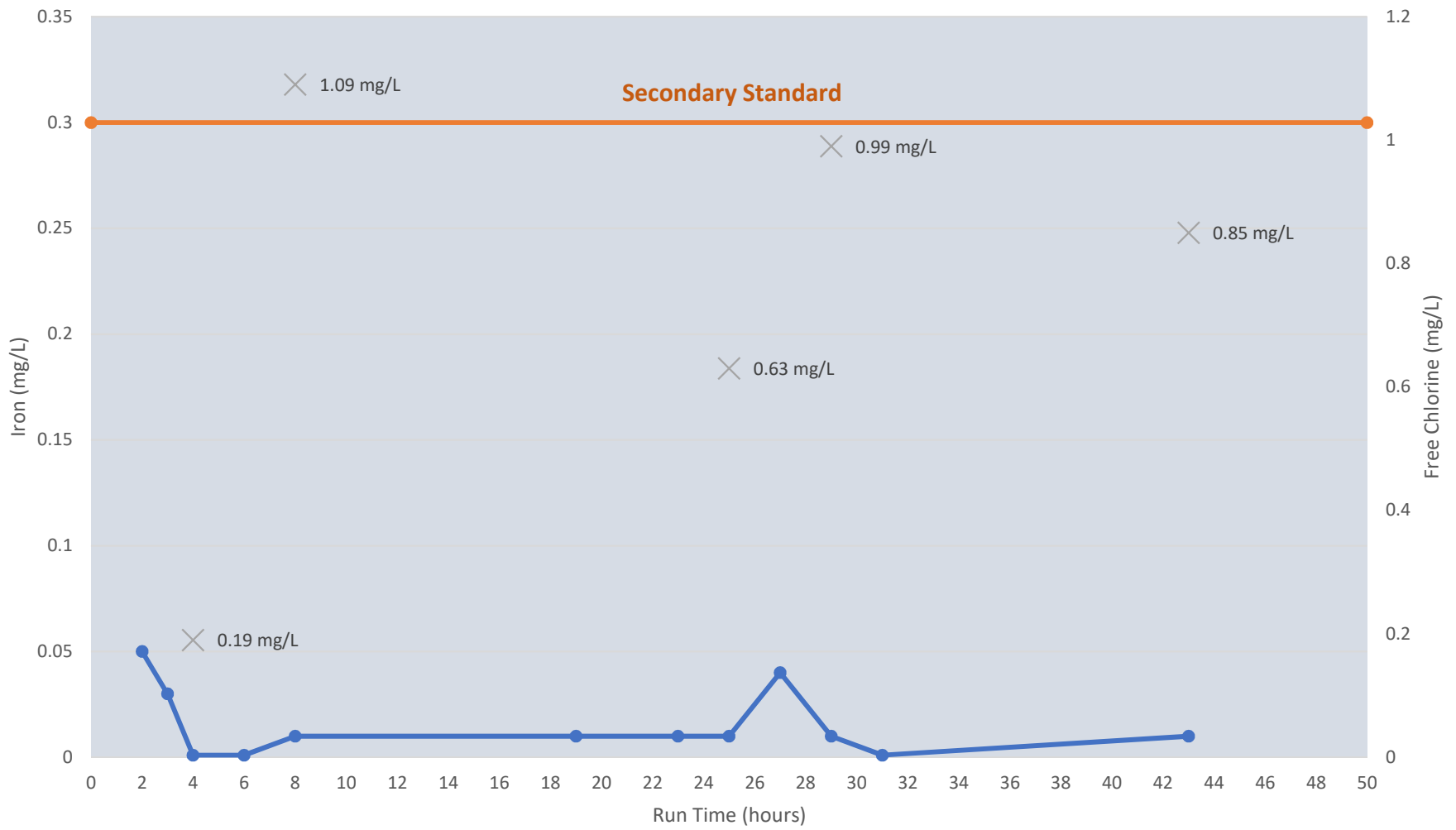


Figure 4
City of Ironwood, MI
Finished Manganese Quality
Column 1 - Greensand/Anthracite Media

● Column 1 Effluent × Free Chlorine Residual

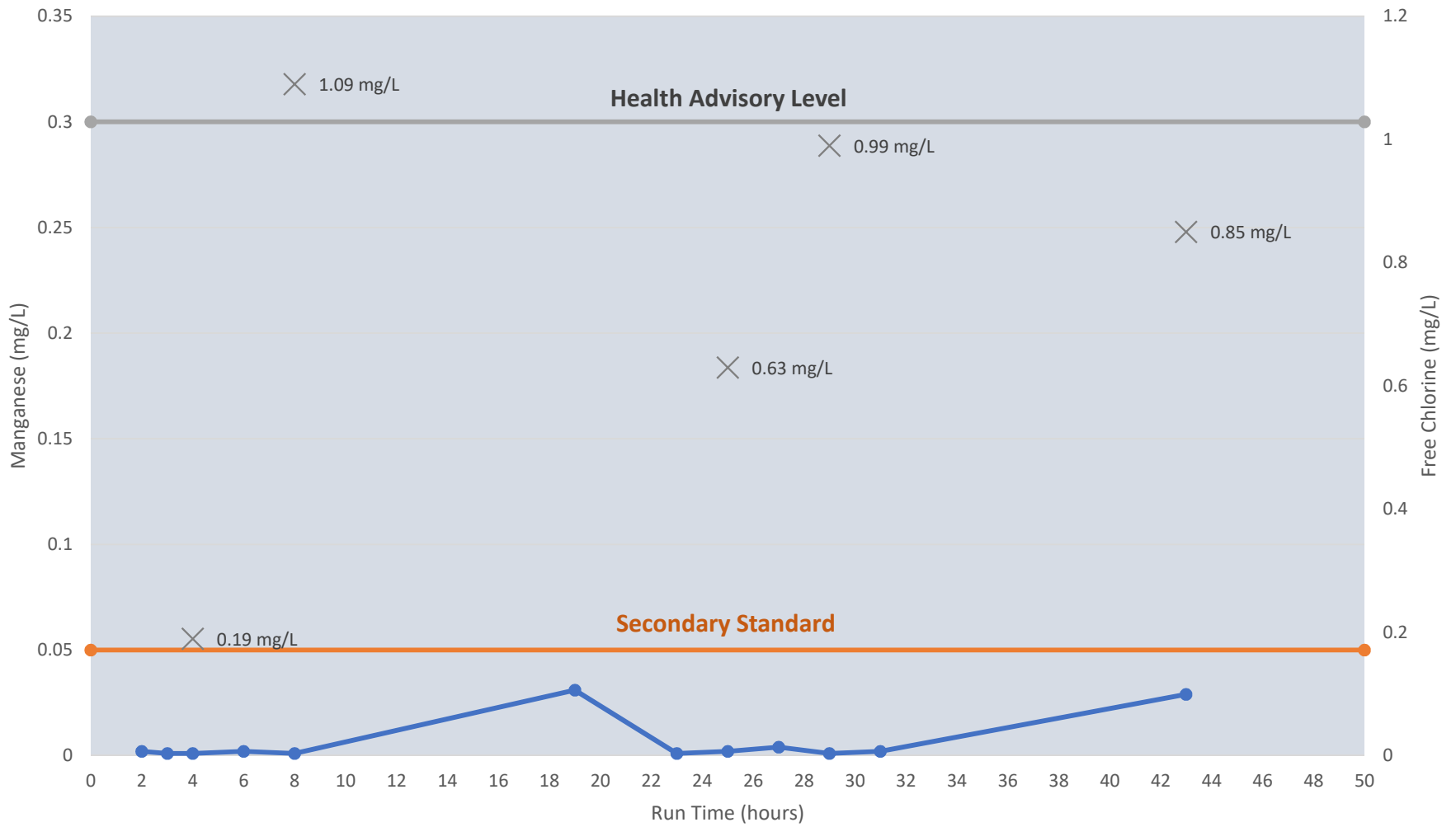


Figure 5
City of Ironwood, MI
Finished Iron Quality
Column 2 - Silica Sand/Anthracite Media

● Column 2 Effluent × Free Chlorine Residual

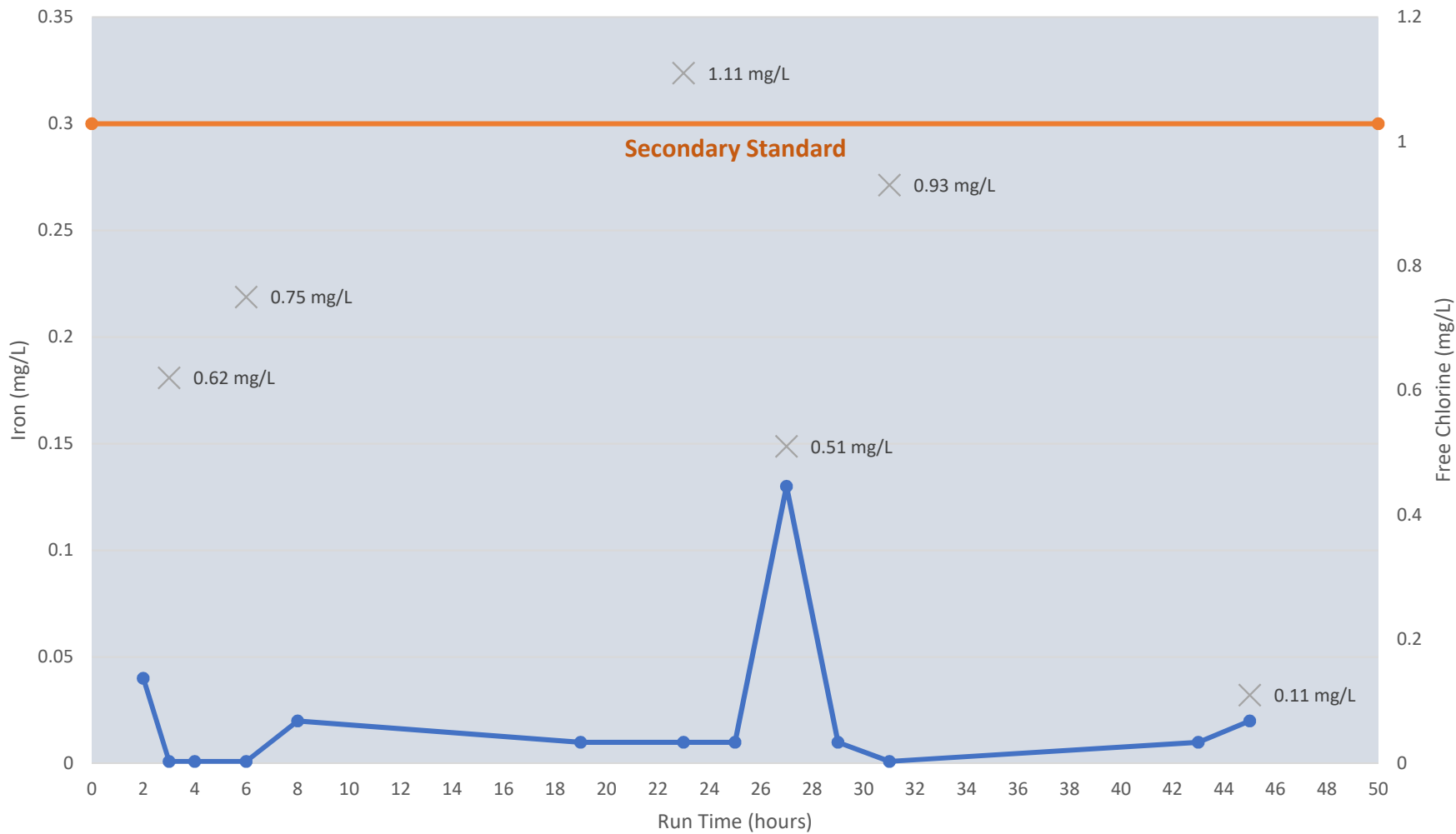


Figure 6
City of Ironwood, MI
Finished Manganese Quality
Column 2 - Silica Sand/Anthracite Media

● Column 2 Effluent × Free Chlorine Residual

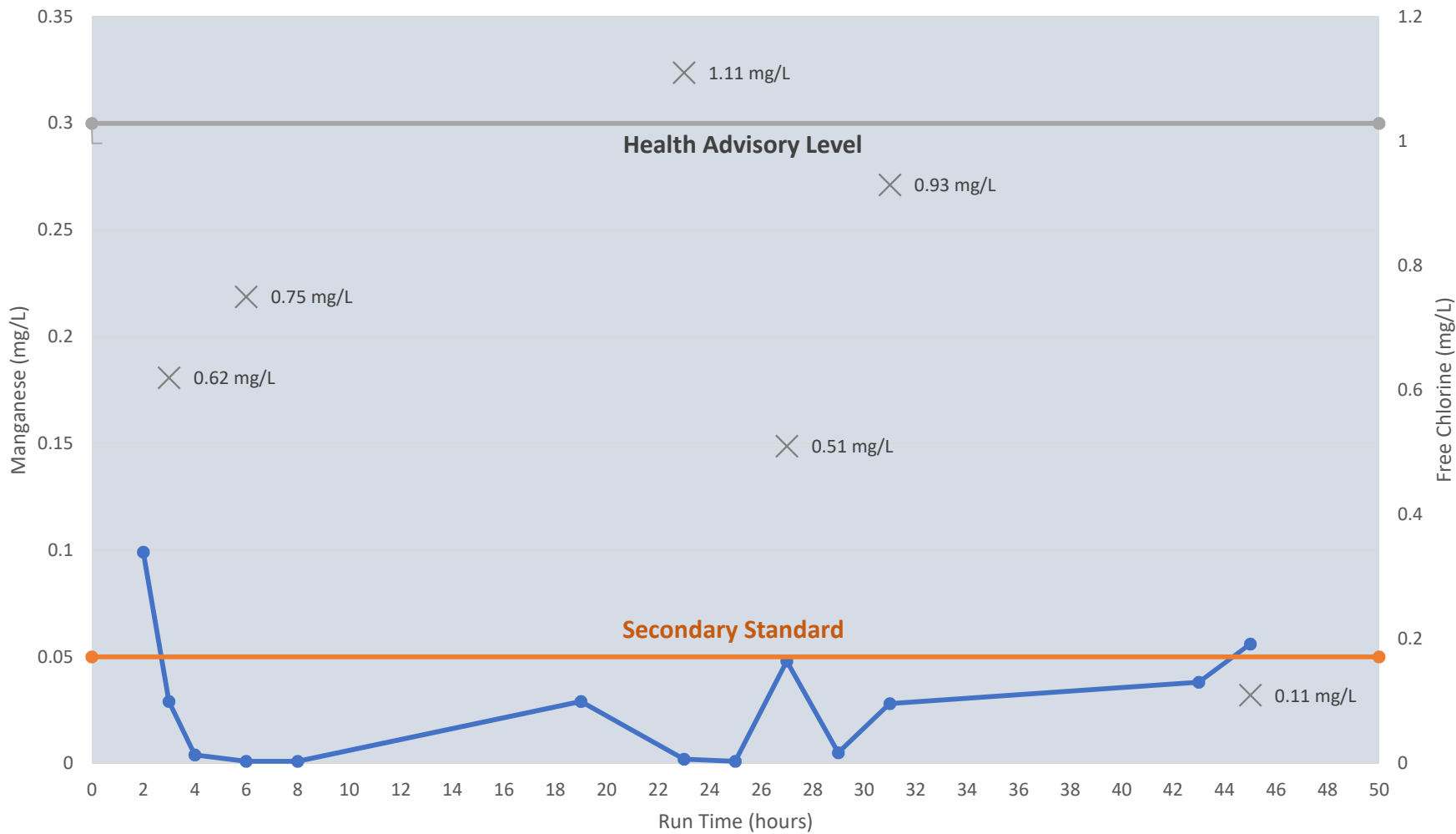


Figure 7
City of Ironwood, MI
Finished Iron Quality
Column 3 - Greensand/Anthracite Media
30 Minute Detention

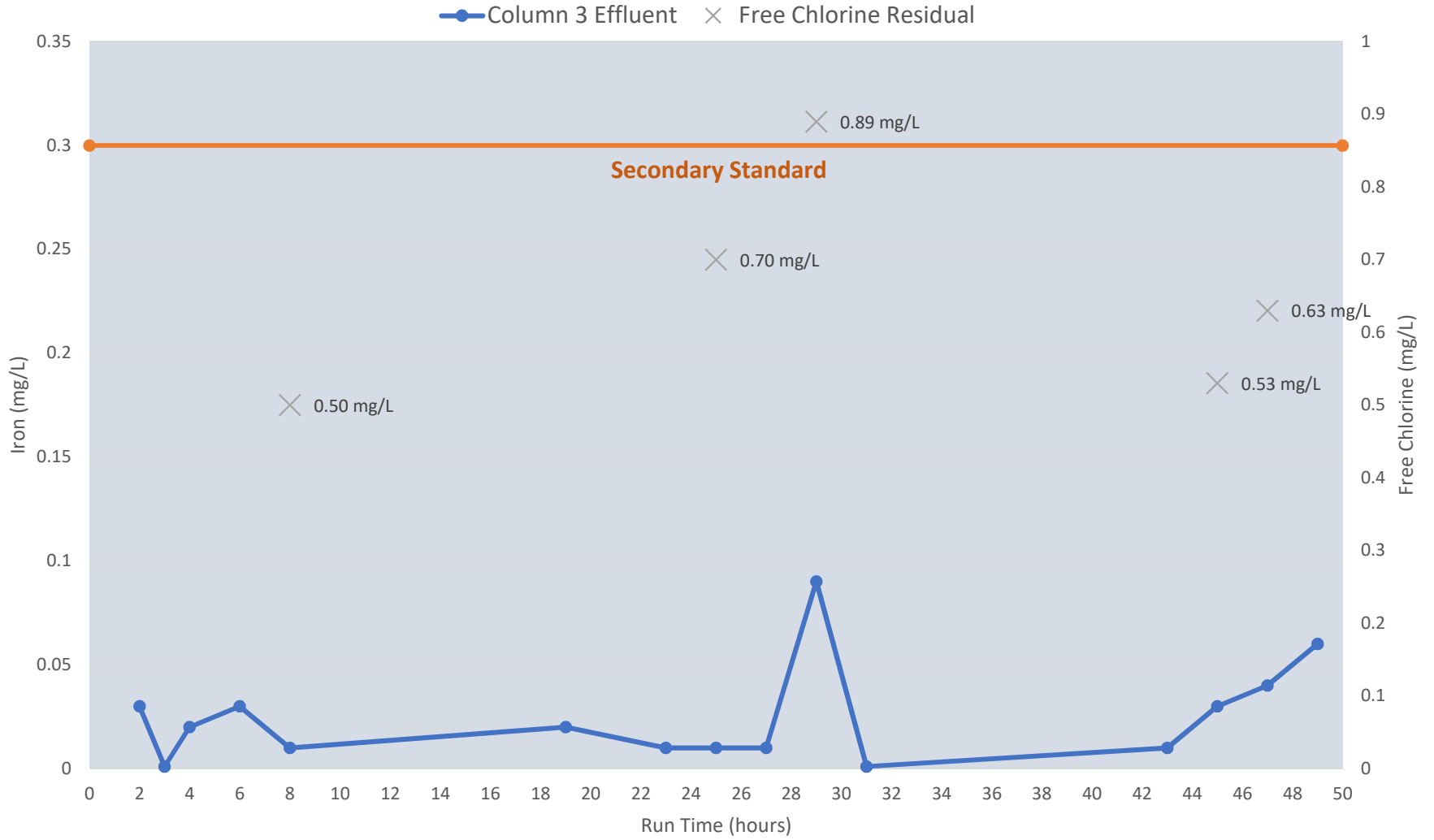


Figure 8
City of Ironwood, MI
Finished Manganese Quality
Column 3 - Greensand/Anthracite Media
30 Minute Detention

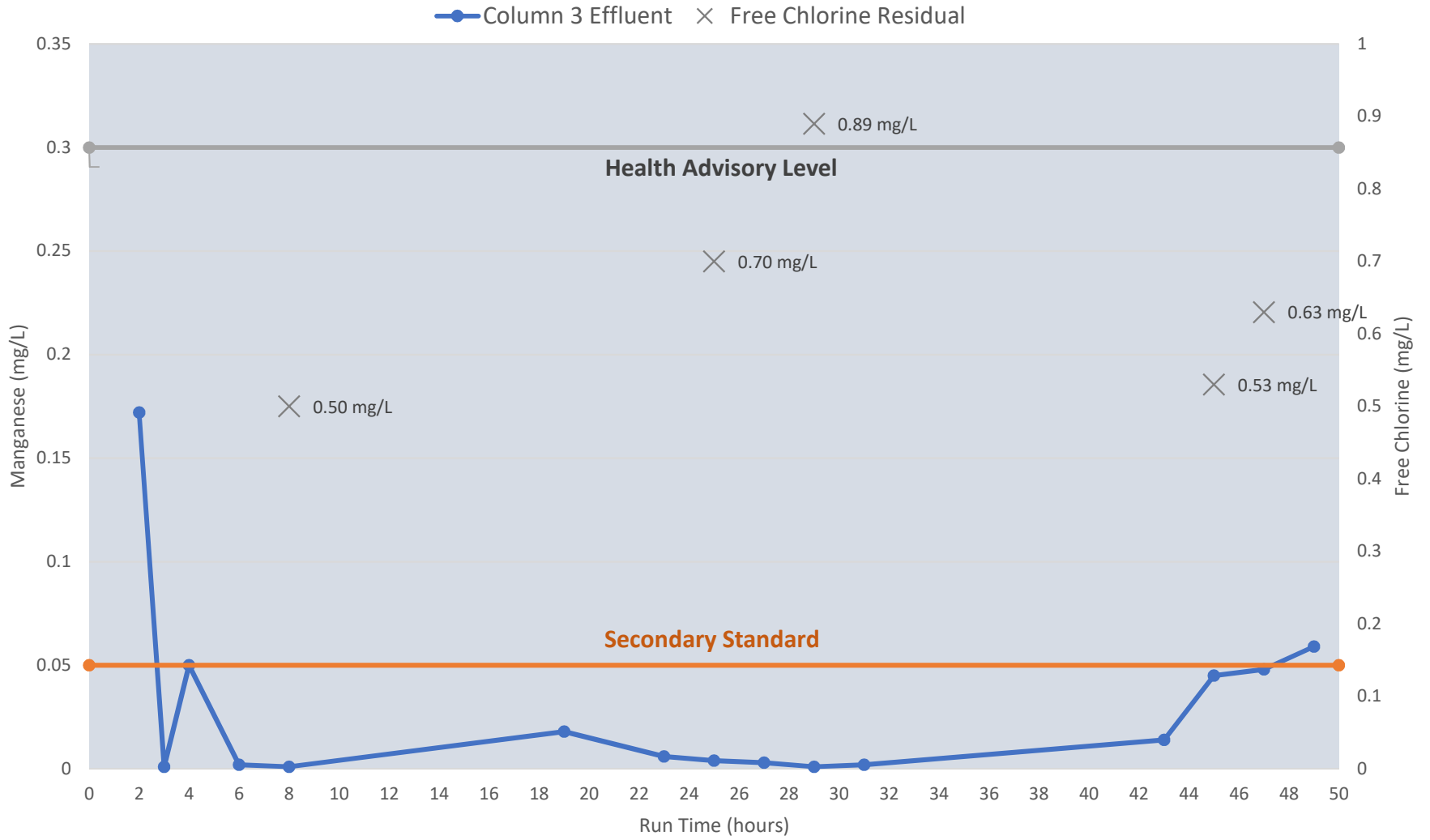


Figure 9
City of Ironwood, MI
Finished Iron Quality
Column 4 - Silica Sand/Anthracite Media
30 Minute Detention

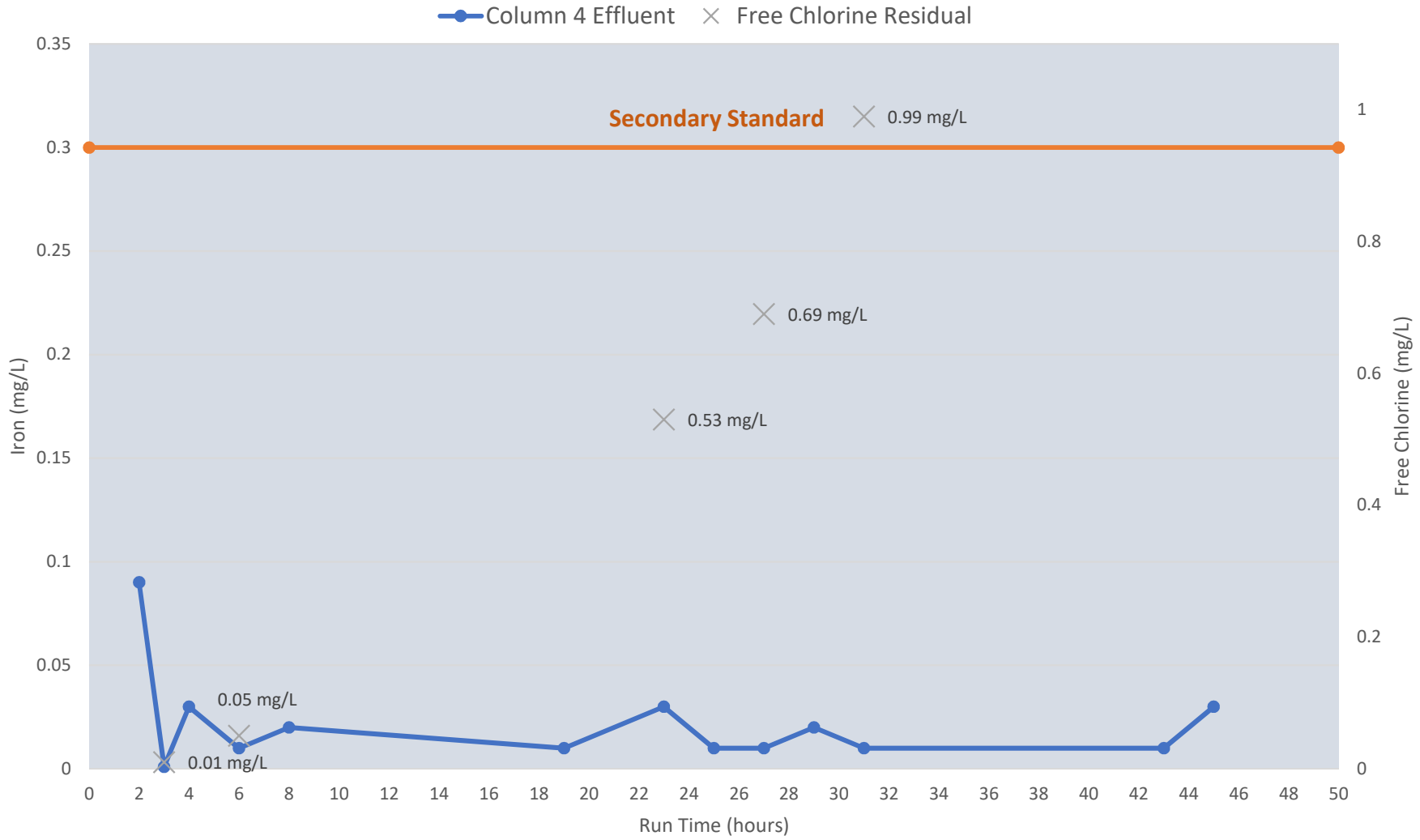


Figure 10
City of Ironwood, MI
Finished Manganese Quality
Column 4 - Silica Sand/Anthracite Media
30 Minute Detention

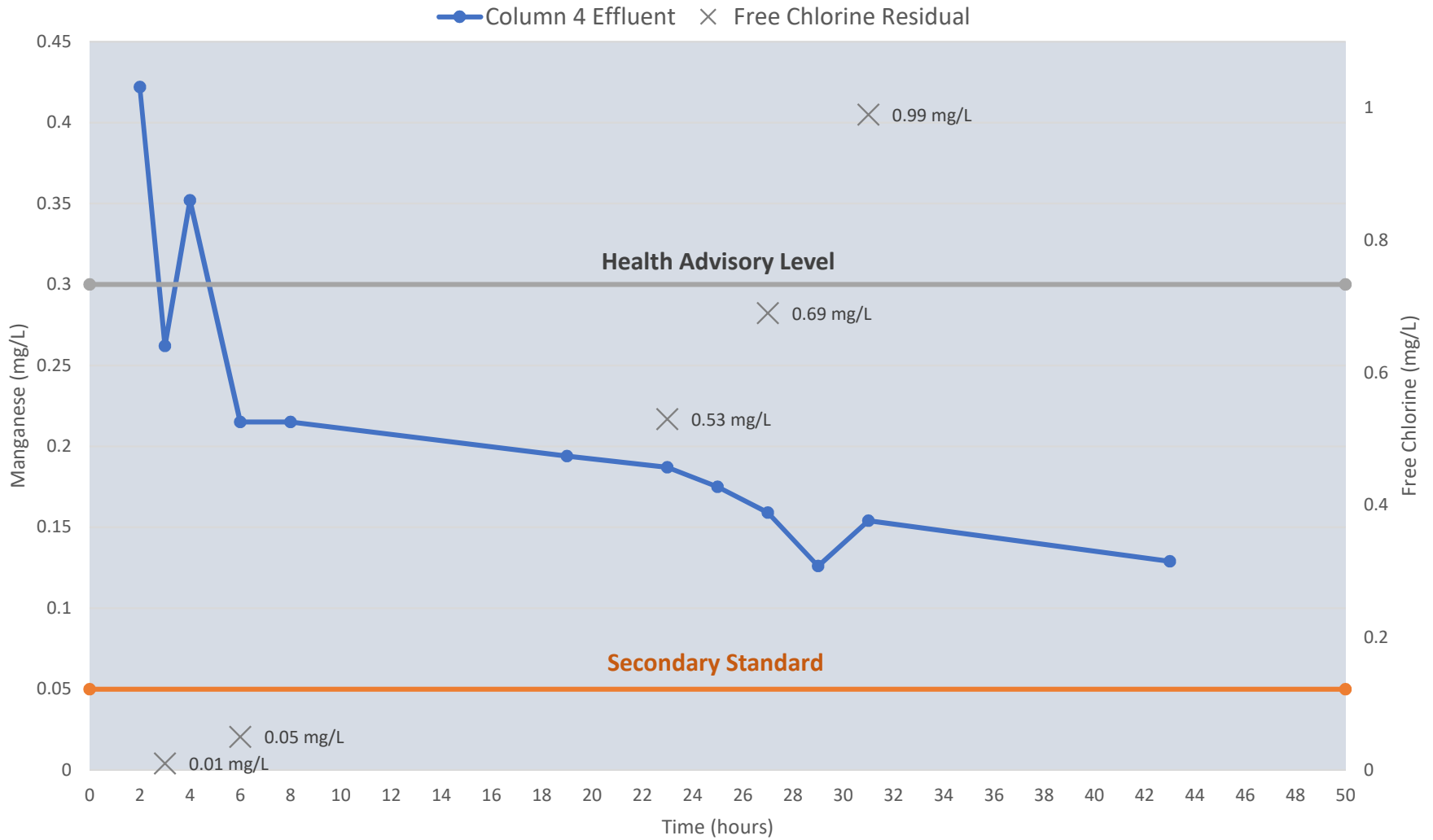


Figure 11
City of Ironwood, MI
Headloss in Column

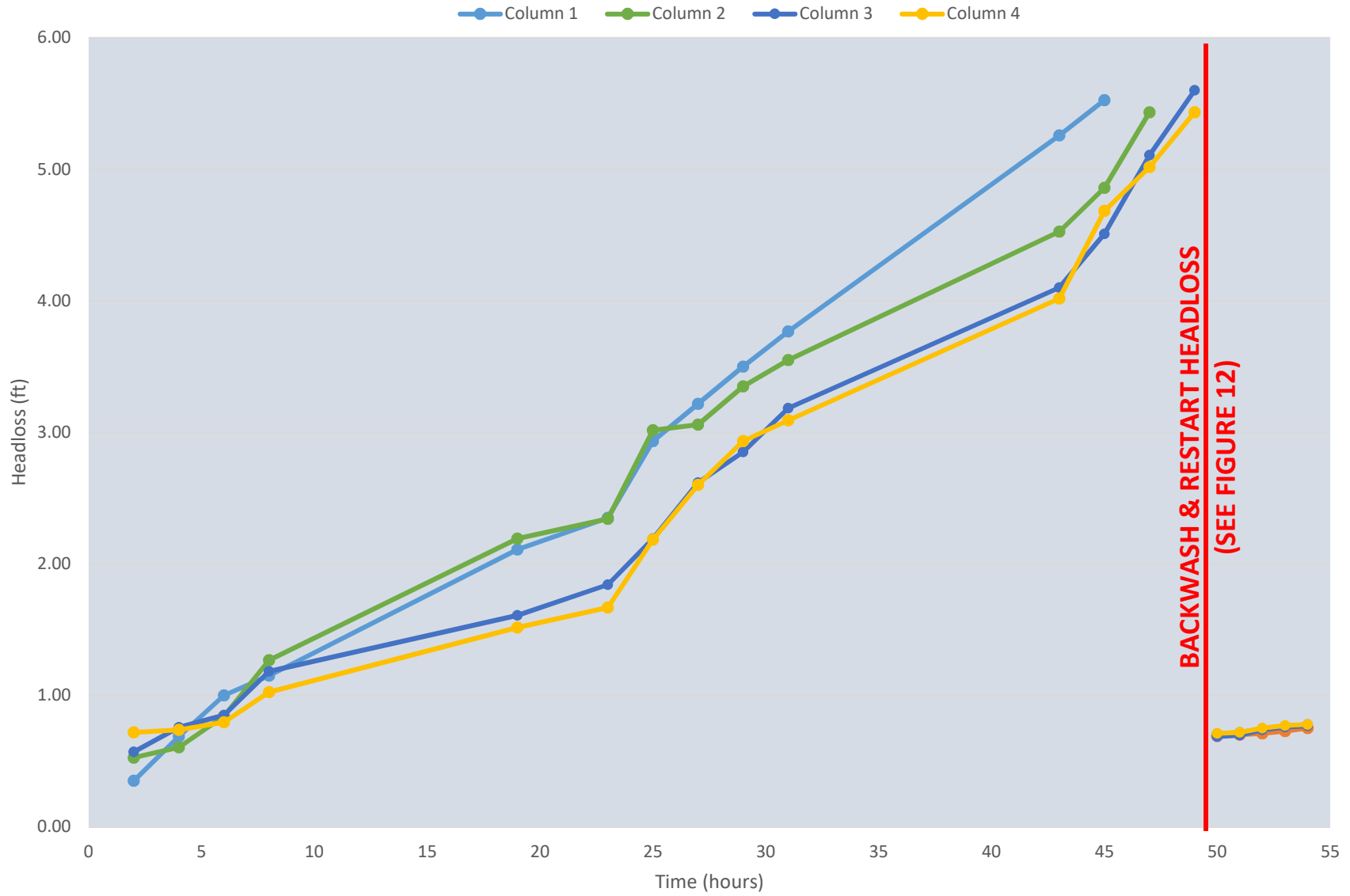
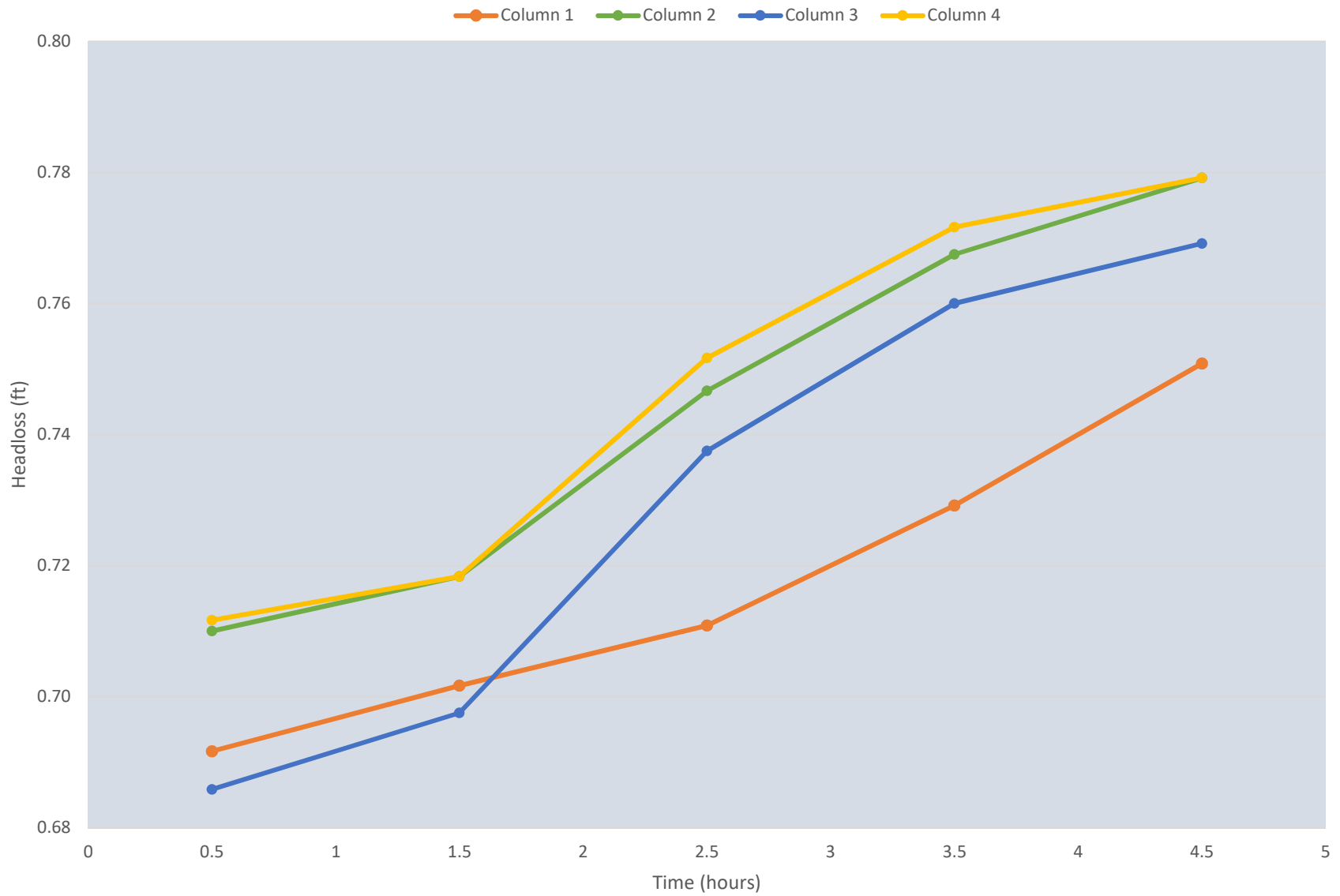


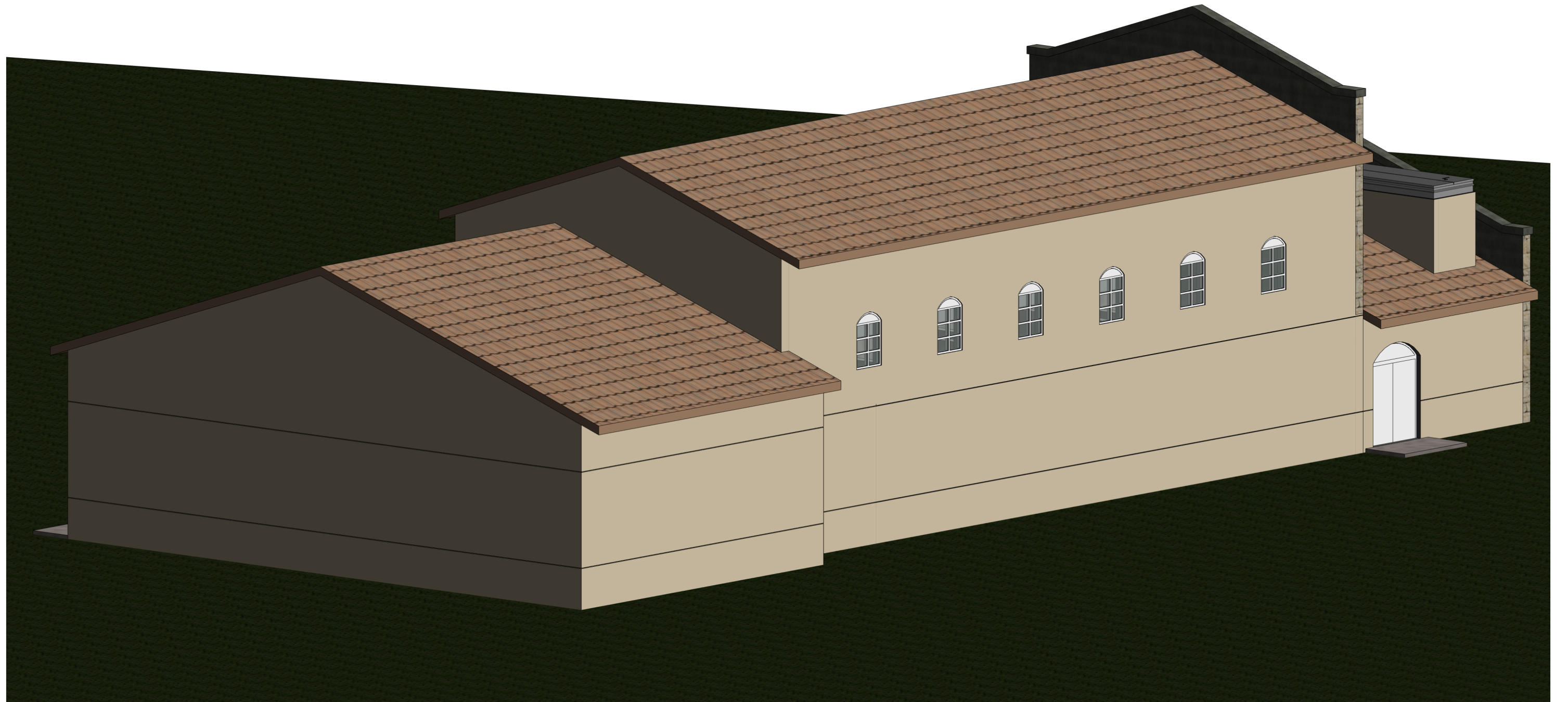
Figure 12
City of Ironwood, MI
Restart Headloss in Column



Appendix F

Architectural Rendering





Appendix G

Capital Cost Opinions



Project Name: Ironwood Water PER
 SEH Project No: 154251
 Date: June 12, 2020
 Estimator: CTL
 Description: Alternative 1 - Concrete Gravity WTP

DIVISION 1 - GENERAL REQUIREMENTS	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
GENERAL CONDITIONS	LUMP SUM	1	\$ 886,799.00	\$ 886,799.00
<i>SUBTOTAL DIVISION 0 AND 01</i>				<i>\$ 886,799.00</i>
DIVISION 2 - EXISTING CONDITIONS	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
CLEARWELL DEMO	LUMP SUM	1	\$ 5,500.00	\$ 5,500.00
<i>SUBTOTAL DIVISION 2</i>				<i>\$ 5,500.00</i>
DIVISION 3 - CONCRETE	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
CAST IN PLACE CONCRETE - WTP	CU YD	900	\$ 1,100.00	\$ 990,000.00
CAST IN PLACE CONCRETE - CLEARWELL	CU YD	1010	\$ 1,000.00	\$ 1,010,000.00
CAST IN PLACE CONCRETE - GARAGE	CU YD	80	\$ 700.00	\$ 56,000.00
PRECAST STRUCTURAL CONCRETE - 8" PLANK	SQ FT	3900	\$ 20.00	\$ 78,000.00
PRECAST STRUCTURAL CONCRETE - 12" PLANK	SQ FT	2500	\$ 25.00	\$ 62,500.00
ARCHITECTURAL PRECAST SILL	LF	325	\$ 50.00	\$ 16,250.00
<i>SUBTOTAL DIVISION 3</i>				<i>\$ 2,212,750.00</i>
DIVISION 4 - MASONRY	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
BRICK VENEER	SF	1500	\$ 35.00	\$ 52,500.00
CONCRETE UNIT MASONRY	SQ FT	9500	\$ 30.00	\$ 285,000.00
GARAGE MASONRY	SQ FT	1900	\$ 30.00	\$ 57,000.00
<i>SUBTOTAL DIVISION 4</i>				<i>\$ 337,500.00</i>
DIVISION 5 - METALS	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
METAL TRUSSES - WTP	LUMP SUM	1	\$ 45,000.00	\$ 45,000.00
METAL ROOF DECK - WTP	SQ FT	7700	\$ 4.00	\$ 30,800.00
METAL TRUSSES - GARAGE	LUMP SUM	1	\$ 15,000.00	\$ 15,000.00
METAL ROOF DECK - GARAGE	SQ FT	4400	\$ 4.00	\$ 17,600.00
STAIRS, ALUMINUM - WTP	LUMP SUM	1	\$ 26,400.00	\$ 26,400.00
RAILING, ALUMINUM - WTP	LIN FT	144	\$ 115.00	\$ 16,560.00
MISCELLANEOUS METALS - WTP	LUMP SUM	1	\$ 40,000.00	\$ 40,000.00
<i>SUBTOTAL DIVISION 5</i>				<i>\$ 191,360.00</i>
DIVISION 6 - WOOD, PLASTICS & COMPOSITES	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
PLASTIC FABRICATIONS - FRP LADDERS	EACH	5	\$ 3,000.00	\$ 15,000.00
GLASS MAT GYPSUM SHEATHING	SF	800	\$ 2.00	\$ 1,600.00
<i>SUBTOTAL DIVISION 6</i>				<i>\$ 16,600.00</i>
DIVISION 7 - THERMAL & MOISTURE PROTECTION	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
FOUNDATION INSULATION	SF	1200	\$ 2.25	\$ 2,700.00
BLOWN IN INSULATION (ATTIC)	SF	10000	\$ 2.25	\$ 22,500.00
RIGID INSULATION (WALLS)	SF	8500	\$ 2.25	\$ 19,125.00
DAMPPROOFING	SF	1500	\$ 2.00	\$ 3,000.00
JOINT SEALANTS	LF	10000	\$ 3.00	\$ 30,000.00
AIR BARRIER	LUMP SUM	1	\$ 20,000.00	\$ 20,000.00
METAL ROOF SYSTEM (PANEL, ICE-WATER SHIELD, DENSDECK) - WTP	LF	7000	\$ 30.00	\$ 210,000.00
METAL ROOF SYSTEM (PANEL, ICE-WATER SHIELD, DENSDECK) - GARAGE	LF	2400	\$ 30.00	\$ 72,000.00
GUTTERS / DOWNSPOUTS / SNOW GUARD	LF	450	\$ 15.00	\$ 6,750.00
METAL WALL PANEL	SF	4800	\$ 10.00	\$ 48,000.00
METAL WALL PANEL - GARAGE	SF	2000	\$ 10.00	\$ 20,000.00
METAL SOFFIT FASCIA & TRIM	LF	850	\$ 12.00	\$ 10,200.00
<i>SUBTOTAL DIVISION 7</i>				<i>\$ 464,275.00</i>
DIVISION 8 - OPENINGS	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
FRP DOORS (SINGLE LEAF)	EACH	17	\$ 3,300.00	\$ 56,100.00
FRP DOORS (DOUBLE LEAF)	EACH	2	\$ 6,600.00	\$ 13,200.00
OVERHEAD DOOR - GARAGE	EACH	1	\$ 17,500.00	\$ 17,500.00

KALWALL SKYLIGHT	LUMP SUM	1	\$ 13,000.00	\$ 13,000.00
ALUMINUM STOREFRONT	SF	266	\$ 60.00	\$ 15,960.00
FIRE RATED ALUM. FRAME AND GLASS	LUMP SUM	1	\$ 3,000.00	\$ 3,000.00
TANK HATCHES	UNIT	4	\$ 2,500.00	\$ 10,000.00
LOUVERS	LUMP SUM	1	\$ 9,000.00	\$ 9,000.00
<i>SUBTOTAL DIVISION 8</i>				<i>\$ 137,760.00</i>
DIVISION 9 - FINISHES	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
ACOUSTICAL CEILING	SF	340	\$ 6.00	\$ 2,040.00
EPOXY FLOOR COATING	SF	920	\$ 14.00	\$ 12,880.00
WALL & CEILING PAINTING	SF	22000	\$ 3.00	\$ 66,000.00
WALL & CEILING PAINTING - GARAGE	SF	5000	\$ 3.00	\$ 15,000.00
CONCRETE FLOOR SEALER	SF	4800	\$ 2.00	\$ 9,600.00
CONCRETE FLOOR SEALER - GARAGE	SF	1900	\$ 2.00	\$ 3,800.00
EQUIPMENT/PROCESS PIPING PAINTING	LUMP SUM	1	\$ 55,000.00	\$ 55,000.00
<i>SUBTOTAL DIVISION 9</i>				<i>\$ 164,320.00</i>
DIVISION 10 - SPECIALTIES	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
TOILET ACCESSORIES	LUMP SUM	1	\$ 1,500.00	\$ 1,500.00
FIRE EXTINGUISHERS	EACH	3	\$ 250.00	\$ 750.00
INTERIOR PANEL SIGNAGE	LUMP SUM	1	\$ 750.00	\$ 750.00
<i>SUBTOTAL DIVISION 10</i>				<i>\$ 3,000.00</i>
DIVISION 12 - FURNISHINGS	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
METAL CASEWORK - BASE AND UPPERS	LF	40	\$ 400.00	\$ 16,000.00
PLAM CASEWORK - BASE	LF	9	\$ 300.00	\$ 2,700.00
EPOXY RESIN COUNTERTOP	LF	31	\$ 150.00	\$ 4,650.00
PLAM COUNTERTOP	LF	9	\$ 40.00	\$ 360.00
WINDOW BLINDS	EACH	6	\$ 100.00	\$ 600.00
<i>SUBTOTAL DIVISION 12</i>				<i>\$ 24,310.00</i>
DIVISION 21 - FIRE SUPPRESSION	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
FIRE PROTECTION SYSTEM (WET)	LUMP SUM	1	\$ 22,000.00	\$ 22,000.00
<i>SUBTOTAL DIVISION 21</i>				<i>\$ 22,000.00</i>
DIVISION 22 - PLUMBING	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
PLUMBING	LUMP SUM	1	\$ 165,000.00	\$ 165,000.00
<i>SUBTOTAL DIVISION 22</i>				<i>\$ 165,000.00</i>
DIVISION 23 - HVAC	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
HVAC	LUMP SUM	1	\$ 265,000.00	\$ 265,000.00
<i>SUBTOTAL DIVISION 23</i>				<i>\$ 265,000.00</i>
DIVISION 26 - ELECTRICAL	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
ELECTRICAL	LUMP SUM	1	\$ 660,000.00	\$ 660,000.00
<i>SUBTOTAL DIVISION 26</i>				<i>\$ 660,000.00</i>
DIVISION 31 - EARTHWORK	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
CLEAR AND GRUB	ACRE	2.00	\$ 10,000.00	\$ 20,000.00
BUILDING EXCAVATION	CU YD	5330	\$ 10.00	\$ 53,300.00
CLEARWELL EXCAVATION	CU YD	4500	\$ 10.00	\$ 45,000.00
BACKWASH POND - EXCAVATION	CU YD	1600	\$ 10.00	\$ 16,000.00
HAULING EARTH	CU YD	4500	\$ 8.00	\$ 36,000.00
HAULING EARTH - CLEARWELL	CU YD	3000	\$ 8.00	\$ 24,000.00
BACKFILLING & COMPACTING	CU YD	1200	\$ 25.00	\$ 30,000.00
BACKFILLING & COMPACTING - CLEARWELL	CU YD	1500	\$ 25.00	\$ 37,500.00
EROSION CONTROL	EACH	1	\$ 5,000.00	\$ 5,000.00
<i>SUBTOTAL DIVISION 31</i>				<i>\$ 266,800.00</i>
DIVISION 32 - EXTERIOR IMPROVEMENTS	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
AGGREGATE BASE (CL 5)	CU YD	500	\$ 40.00	\$ 20,000.00
COMMON EXCAVATION	CU YD	700	\$ 12.00	\$ 8,400.00
BITUMINOUS PAVEMENT	TON	600	\$ 80.00	\$ 48,000.00
4" CONCRETE SIDEWALK	SQ FT	600	\$ 6.00	\$ 3,600.00
TOPSOIL BORROW (3" DEPTH)	CU YD	150	\$ 20.00	\$ 3,000.00

SEED AND MULCH	LUMP SUM	1.0	\$ 2,500.00	\$ 2,500.00
CHAIN LIKE FENCE	LIN FT	1200	\$ 90.00	\$ 108,000.00
FENCE GATE	EACH	2	\$ 2,500.00	\$ 5,000.00
<i>SUBTOTAL DIVISION 32</i>				<i>\$ 198,500.00</i>
DIVISION 33 - UTILITIES	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
16" WATERMAIN	LIN FT	500	\$ 120	\$ 60,000.00
HYDRANT	EACH	2	\$ 6,000	\$ 12,000.00
BIG SPRINGS HYDRANTS AND IMPROVEMENTS	LUMP SUM	1	\$ 110,000	\$ 110,000.00
16" GATE VALVE	EACH	6	\$ 4,500	\$ 27,000.00
4" SANITARY	LIN FT	200	\$ 30.00	\$ 6,000.00
SEPTIC SYSTEM	LUMP SUM	1	\$ 10,000.00	\$ 10,000.00
<i>SUBTOTAL DIVISION 33</i>				<i>\$ 225,000.00</i>
DIVISION 40 - PROCESS INTERCONNECTIONS	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
PROCESS PIPING	LUMP SUM	1	\$ 710,000.00	\$ 710,000.00
<i>SUBTOTAL DIVISION 40</i>				<i>\$ 710,000.00</i>
DIVISION 43 - PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQU	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
HIGH SERVICE VERTICAL TURBINE PUMPS	EACH	3	\$ 35,000.00	\$ 105,000.00
BACKWASH VERTICAL TURBINE PUMP	EACH	1	\$ 30,000.00	\$ 30,000.00
MAGNETIC FLOW METERS	LUMP SUM	1	\$ 70,000.00	\$ 70,000.00
<i>SUBTOTAL DIVISION 43</i>				<i>\$ 205,000.00</i>
DIVISION 44 - POLLUTION & CONTROL EQUIPMENT	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
COMPRESSED AIR SYSTEM	LUMP SUM	1	\$ 16,000.00	\$ 16,000.00
AIR SCOUR BLOWER	EACH	1	\$ 20,000.00	\$ 20,000.00
GRAVITY FILTER EQUIPMENT	LUMP SUM	1	\$ 365,000.00	\$ 365,000.00
GAS CHLORINATION SYSTEM	LUMP SUM	1	\$ 40,000.00	\$ 40,000.00
POLYPHOSPHATE FEED EQUIPMENT	LUMP SUM	1	\$ 15,000.00	\$ 15,000.00
SODIUM PERMANGANATE FEED EQUIPMENT	LUMP SUM	1	\$ 20,000.00	\$ 20,000.00
CHEMICAL FEED PIPING	LUMP SUM	1	\$ 20,000.00	\$ 20,000.00
				<i>\$ 496,000.00</i>
TOTAL CONSTRUCTION				\$ 7,657,474.00
CONTINGENCY			10%	\$ 765,526.00
ENGINEERING			15%	\$ 1,148,000.00
ADMIN/LEGAL			2%	\$ 153,000.00
TOTAL PROJECT				\$ 9,724,000.00



Project Name: Ironwood Water PER
 SEH Project No: _____
 Date: June 12, 2020
 Estimator: CTL
 Description: Alternative 2 - Steel Gravity WTP

DIVISION 1 - GENERAL REQUIREMENTS	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
GENERAL CONDITIONS	LUMP SUM	1	\$ 1,100,000.00	\$ 1,100,000.00
<i>SUBTOTAL DIVISION 0 AND 01</i>				<i>\$ 1,100,000.00</i>
DIVISION 2 - EXISTING CONDITIONS	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
CLEARWELL DEMO	LUMP SUM	1	\$ 5,500.00	\$ 5,500.00
<i>SUBTOTAL DIVISION 2</i>				<i>\$ 5,500.00</i>
DIVISION 3 - CONCRETE	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
CAST IN PLACE CONCRETE - WTP	CU YD	645	\$ 1,100.00	\$ 709,500.00
CAST IN PLACE CONCRETE - CLEARWELL	CU YD	1010	\$ 1,000.00	\$ 1,010,000.00
CAST IN PLACE CONCRETE - GARAGE	CU YD	80	\$ 700.00	\$ 56,000.00
PRECAST STRUCTURAL CONCRETE - 8" PLANK	SQ FT	1200	\$ 20.00	\$ 24,000.00
PRECAST STRUCTURAL CONCRETE - 12" PLANK	SQ FT	4500	\$ 25.00	\$ 112,500.00
ARCHITECTURAL PRECAST SILL	LF	325	\$ 50.00	\$ 16,250.00
<i>SUBTOTAL DIVISION 3</i>				<i>\$ 1,928,250.00</i>
DIVISION 4 - MASONRY	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
BRICK VENEER	SF	1500	\$ 35.00	\$ 52,500.00
CONCRETE UNIT MASONRY	SQ FT	9000	\$ 30.00	\$ 270,000.00
GARAGE MASONRY	SQ FT	1900	\$ 30.00	\$ 57,000.00
<i>SUBTOTAL DIVISION 4</i>				<i>\$ 322,500.00</i>
DIVISION 5 - METALS	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
METAL TRUSSES - WTP	LUMP SUM	1	\$ 45,000.00	\$ 45,000.00
METAL ROOF DECK - WTP	SQ FT	7700	\$ 4.00	\$ 30,800.00
METAL TRUSSES - GARAGE	LUMP SUM	1	\$ 15,000.00	\$ 15,000.00
METAL ROOF DECK - GARAGE	SQ FT	4400	\$ 4.00	\$ 17,600.00
STAIRS, ALUMINUM - WTP	LUMP SUM	1	\$ 26,400.00	\$ 26,400.00
RAILING, ALUMINUM - WTP	LIN FT	50	\$ 115.00	\$ 5,750.00
MISCELLANEOUS METALS - WTP	LUMP SUM	1	\$ 40,000.00	\$ 40,000.00
<i>SUBTOTAL DIVISION 5</i>				<i>\$ 180,550.00</i>
DIVISION 6 - WOOD, PLASTICS & COMPOSITES	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
PLASTIC FABRICATIONS - FRP LADDERS	EACH	3	\$ 3,000.00	\$ 9,000.00
GLASS MAT GYPSUM SHEATHING	SF	800	\$ 2.00	\$ 1,600.00
<i>SUBTOTAL DIVISION 6</i>				<i>\$ 10,600.00</i>
DIVISION 7 - THERMAL & MOISTURE PROTECTION	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
FOUNDATION INSULATION	SF	1200	\$ 2.25	\$ 2,700.00
BLOWN IN INSULATION (ATTIC)	SF	10000	\$ 2.25	\$ 22,500.00
RIGID INSULATION (WALLS)	SF	8500	\$ 2.25	\$ 19,125.00
DAMPPROOFING	SF	1500	\$ 2.00	\$ 3,000.00
JOINT SEALANTS	LF	10000	\$ 3.00	\$ 30,000.00
AIR BARRIER	LUMP SUM	1	\$ 20,000.00	\$ 20,000.00
METAL ROOF SYSTEM (PANEL, ICE-WATER SHIELD, DENSDECK) - WTP	LF	7000	\$ 30.00	\$ 210,000.00
METAL ROOF SYSTEM (PANEL, ICE-WATER SHIELD, DENSDECK) - GARAGE	LF	2400	\$ 30.00	\$ 72,000.00
GUTTERS / DOWNSPOUTS / SNOW GUARD	LF	450	\$ 15.00	\$ 6,750.00
METAL WALL PANEL	SF	4800	\$ 10.00	\$ 48,000.00
METAL WALL PANEL - GARAGE	SF	2000	\$ 10.00	\$ 20,000.00
METAL SOFFIT FASCIA & TRIM	LF	850	\$ 12.00	\$ 10,200.00
<i>SUBTOTAL DIVISION 7</i>				<i>\$ 464,275.00</i>
DIVISION 8 - OPENINGS	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
FRP DOORS (SINGLE LEAF)	EACH	13	\$ 3,300.00	\$ 42,900.00
FRP DOORS (DOUBLE LEAF)	EACH	3	\$ 6,600.00	\$ 19,800.00
OVERHEAD DOOR - GARAGE	EACH	1	\$ 17,500.00	\$ 17,500.00
KALWALL SKYLIGHT	LUMP SUM	1	\$ 13,000.00	\$ 13,000.00
ALUMINUM STOREFRONT	SF	266	\$ 60.00	\$ 15,960.00
FIRE RATED ALUM. FRAME AND GLASS	LUMP SUM	1	\$ 3,000.00	\$ 3,000.00
TANK HATCHES	UNIT	4	\$ 2,500.00	\$ 10,000.00
LOUVERS	LUMP SUM	1	\$ 9,000.00	\$ 9,000.00
<i>SUBTOTAL DIVISION 8</i>				<i>\$ 131,160.00</i>
DIVISION 9 - FINISHES	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
ACOUSTICAL CEILING	SF	340	\$ 6.00	\$ 2,040.00

EPOXY FLOOR COATING	SF	1000	\$ 14.00	\$ 14,000.00
WALL & CEILING PAINTING	SF	20000	\$ 3.00	\$ 60,000.00
WALL & CEILING PAINTING - GARAGE	SF	5000	\$ 3.00	\$ 15,000.00
CONCRETE FLOOR SEALER	SF	4400	\$ 2.00	\$ 8,800.00
CONCRETE FLOOR SEALER - GARAGE	SF	1900	\$ 2.00	\$ 3,800.00
EQUIPMENT/PROCESS PIPING PAINTING	LUMP SUM	1	\$ 100,000.00	\$ 100,000.00
<i>SUBTOTAL DIVISION 9</i>				<i>\$ 203,640.00</i>
DIVISION 10 - SPECIALTIES	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
TOILET ACCESSORIES	LUMP SUM	1	\$ 1,500.00	\$ 1,500.00
FIRE EXTINGUISHERS	EACH	3	\$ 250.00	\$ 750.00
INTERIOR PANEL SIGNAGE	LUMP SUM	1	\$ 500.00	\$ 500.00
<i>SUBTOTAL DIVISION 10</i>				<i>\$ 2,750.00</i>
DIVISION 12 - FURNISHINGS	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
METAL CASEWORK - BASE AND UPPERS	LF	40	\$ 400.00	\$ 16,000.00
PLAM CASEWORK - BASE	LF	9	\$ 300.00	\$ 2,700.00
EPOXY RESIN COUNTERTOP	LF	31	\$ 75.00	\$ 2,325.00
PLAM COUNTERTOP	LF	9	\$ 40.00	\$ 360.00
WINDOW BLINDS	EACH	6	\$ 100.00	\$ 600.00
<i>SUBTOTAL DIVISION 12</i>				<i>\$ 21,985.00</i>
DIVISION 21 - FIRE SUPPRESSION	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
FIRE PROTECTION SYSTEM (WET)	LUMP SUM	1	\$ 22,000.00	\$ 22,000.00
<i>SUBTOTAL DIVISION 21</i>				<i>\$ 22,000.00</i>
DIVISION 22 - PLUMBING	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
PLUMBING	LUMP SUM	1	\$ 165,000.00	\$ 165,000.00
<i>SUBTOTAL DIVISION 22</i>				<i>\$ 165,000.00</i>
DIVISION 23 - HVAC	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
HVAC	LUMP SUM	1	\$ 265,000.00	\$ 265,000.00
<i>SUBTOTAL DIVISION 23</i>				<i>\$ 265,000.00</i>
DIVISION 26 - ELECTRICAL	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
ELECTRICAL	LUMP SUM	1	\$ 700,000.00	\$ 700,000.00
<i>SUBTOTAL DIVISION 26</i>				<i>\$ 700,000.00</i>
DIVISION 31 - EARTHWORK	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
CLEAR AND GRUB	ACRE	2.00	\$ 10,000.00	\$ 20,000.00
BUILDING EXCAVATION	CU YD	4500	\$ 10.00	\$ 45,000.00
CLEARWELL EXCAVATION	CU YD	4500	\$ 10.00	\$ 45,000.00
BACKWASH POND - EXCAVATION	CU YD	1600	\$ 10.00	\$ 16,000.00
HAULING EARTH	CU YD	4500	\$ 8.00	\$ 36,000.00
HAULING EARTH - CLEARWELL	CU YD	3000	\$ 8.00	\$ 24,000.00
BACKFILLING & COMPACTING	CU YD	1200	\$ 25.00	\$ 30,000.00
BACKFILLING & COMPACTING - CLEARWELL	CU YD	1500	\$ 25.00	\$ 37,500.00
EROSION CONTROL	EACH	1	\$ 5,000.00	\$ 5,000.00
<i>SUBTOTAL DIVISION 31</i>				<i>\$ 258,500.00</i>
DIVISION 32 - EXTERIOR IMPROVEMENTS	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
AGGREGATE BASE (CL 5)	CU YD	500	\$ 40.00	\$ 20,000.00
COMMON EXCAVATION	CU YD	700	\$ 12.00	\$ 8,400.00
BITUMINOUS PAVEMENT	TON	600	\$ 80.00	\$ 48,000.00
4" CONCRETE SIDEWALK	SQ FT	600	\$ 6.00	\$ 3,600.00
TOPSOIL BORROW (3" DEPTH)	CU YD	150	\$ 20.00	\$ 3,000.00
SEED AND MULCH	LUMP SUM	1.0	\$ 2,500.00	\$ 2,500.00
CHAIN LIKE FENCE	LIN FT	1200	\$ 90.00	\$ 108,000.00
FENCE GATE	EACH	2	\$ 2,500.00	\$ 5,000.00
<i>SUBTOTAL DIVISION 32</i>				<i>\$ 198,500.00</i>
DIVISION 33 - UTILITIES	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
16" WATERMAIN	LIN FT	500	\$ 120	\$ 60,000.00
HYDRANT	EACH	2	\$ 6,000	\$ 12,000.00
BIG SPRINGS HYDRANTS AND IMPROVEMENTS	LUMP SUM	1	\$ 110,000	\$ 110,000.00
16" GATE VALVE	EACH	6	\$ 4,500	\$ 27,000.00
4" SANITARY	LIN FT	200	\$ 30.00	\$ 6,000.00
SEPTIC SYSTEM	LUMP SUM	1	\$ 10,000.00	\$ 10,000.00
<i>SUBTOTAL DIVISION 33</i>				<i>\$ 225,000.00</i>
DIVISION 40 - PROCESS INTERCONNECTIONS	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
PROCESS PIPING	LUMP SUM	1	\$ 750,000.00	\$ 750,000.00
<i>SUBTOTAL DIVISION 40</i>				<i>\$ 750,000.00</i>
DIVISION 43 - PROCESS GAS & LIQUID HANDLING, PURIFICATION & STORAGE EQUIPMENT	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT

HIGH SERVICE VERTICAL TURBINE PUMPS	EACH	3	\$ 35,000.00	\$ 105,000.00
BACKWASH VERTICAL TURBINE PUMP	EACH	1	\$ 30,000.00	\$ 30,000.00
MAGNETIC FLOW METERS	LUMP SUM	1	\$ 70,000.00	\$ 70,000.00
<i>SUBTOTAL DIVISION 43</i>				<i>\$ 205,000.00</i>
DIVISION 44 - POLLUTION & CONTROL EQUIPMENT	UNIT	EST. QUANTITY	UNIT PRICE	AMOUNT
COMPRESSED AIR SYSTEM	LUMP SUM	1	\$ 16,000.00	\$ 16,000.00
AIR SCOUR BLOWER	EACH	1	\$ 20,000.00	\$ 20,000.00
STEEL GRAVITY FILTERS	EACH	2	\$ 500,000.00	\$ 1,000,000.00
GAS CHLORINATION SYSTEM	LUMP SUM	1	\$ 40,000.00	\$ 40,000.00
POLYPHOSPHATE FEED EQUIPMENT	LUMP SUM	1	\$ 15,000.00	\$ 15,000.00
SODIUM PERMANGANATE FEED EQUIPMENT	LUMP SUM	1	\$ 20,000.00	\$ 20,000.00
CHEMICAL FEED PIPING	LUMP SUM	1	\$ 20,000.00	\$ 20,000.00
				<i>\$ 1,131,000.00</i>
SUB TOTAL				\$ 8,291,000.00
CONTINGENCY			10%	\$ 829,100.00
ENGINEERING			15%	\$ 1,243,000.00
ADMIN/LEGAL			2%	\$ 166,000.00
TOTAL PROJECT				\$ 10,529,000.00

Appendix H

Life Cycle Cost Opinions

**50 Year Life Cycle Cost Estimate
Alternative 1
Concrete Gravity Filter Water Treatment Plant, Ironwood, Minnesota**

Division	Item	Capital Cost		Annual Repair Costs	Capital Cost plus Admin, Eng, etc.	Useful Life	First Replacement PW	Second Replacement PW	Third Replacement PW	Salvage Value	Salvage Value PW	Total Materials & Equipment Replacement PW
1	General	\$886,799	11.58%	\$0	\$1,126,146	50	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
2	Existing Conditions	\$5,500	0.07%	\$0	\$6,984	50	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
3	Concrete	\$2,212,750	28.90%	\$0	\$2,809,971	75	\$0.00	\$0.00	\$0.00	\$936,657.08	(\$936,657.08)	(\$936,657.08)
4	Masonry	\$337,500	4.41%	\$0	\$428,591	50	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
5	Metals	\$191,360	2.50%	\$0	\$243,008	50	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
6	Wood & Plastics	\$16,600	0.22%	\$0	\$21,080	50	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
7	Thermal & Moisture	\$464,275	6.06%	\$5,000	\$589,583	30	\$589,582.82	\$0.00	\$0.00	\$196,527.61	(\$196,527.61)	\$393,055.22
8	Doors & Windows	\$137,760	1.80%	\$2,000	\$174,941	25	\$174,941.42	\$0.00	\$0.00	\$0.00	\$0.00	\$174,941.42
9	Finishes	\$164,320	2.15%	\$4,000	\$208,670	25	\$208,669.97	\$0.00	\$0.00	\$0.00	\$0.00	\$208,669.97
10	Specialties	\$3,000	0.04%	\$0	\$3,810	30	\$3,809.70	\$0.00	\$0.00	\$1,269.90	(\$1,269.90)	\$2,539.80
12	Furnishings	\$24,310	0.32%	\$0	\$30,871	25	\$30,871.27	\$0.00	\$0.00	\$0.00	\$0.00	\$30,871.27
21	Fire Suppression	\$22,000	0.29%	\$0	\$27,938	25	\$27,937.80	\$0.00	\$0.00	\$0.00	\$0.00	\$27,937.80
22	Plumbing	\$165,000	2.15%	\$0	\$209,534	40	\$209,533.50	\$0.00	\$0.00	\$157,150.13	(\$157,150.13)	\$52,383.38
23	HVAC	\$265,000	3.46%	\$2,500	\$336,524	25	\$336,523.50	\$0.00	\$0.00	\$0.00	\$0.00	\$336,523.50
26	Electrical	\$660,000	8.62%	\$10,000	\$838,134	25	\$838,134.00	\$0.00	\$0.00	\$0.00	\$0.00	\$838,134.00
31	Earthwork	\$266,800	3.48%	\$0	\$338,809	50	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
32	Exterior Improvements	\$198,500	2.59%	\$0	\$252,075	40	\$252,075.15	\$0.00	\$0.00	\$189,056.36	(\$189,056.36)	\$63,018.79
33	Utilities	\$225,000	2.94%	\$0	\$285,728	50	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
40	Process Piping	\$710,000	9.27%	\$2,500	\$901,629	25	\$901,629.00	\$0.00	\$0.00	\$0.00	\$0.00	\$901,629.00
43	Process Pumps/Meters	\$205,000	2.68%	\$10,000	\$260,330	30	\$260,329.50	\$0.00	\$0.00	\$86,776.50	(\$86,776.50)	\$173,553.00
44	Process Equipment	\$496,000	6.48%	\$10,000	\$629,870	25	\$629,870.40	\$0.00	\$0.00	\$0.00	\$0.00	\$629,870.40
TOTALS		\$7,657,474	100.00%	\$46,000	\$9,724,000							\$2,896,470

50 Year Life Cycle (Present Worth)

20 year Annual Costs

Inflation = 2.75%
Interest = 2.00%
Financing Years= 40

Capital Project Costs	\$9,724,000	Loan Payment	\$355,468
Equipment Replacement	\$2,896,470	Annual Equipment Replacement	\$92,175
Labor	\$4,718,835	Labor	\$80,000
Propane	\$589,854	Propane	\$10,000
Chemicals	\$2,949,272	Chemicals	\$50,000
Insurance	\$589,854	Insurance	\$10,000
Electricity	\$6,488,398	Electricity	\$110,000
Equip. Repair	\$2,713,330	Equip. Repair	\$46,000
		Assumes 59 lb/day Cl at \$1/lb, plus sodium permanganate and phosphate	
		Assumes 120kW 24/7 at \$0.10 per kWh	
TOTAL PW	\$30,670,000	TOTAL ANNUAL COST:	\$754,000

**50 Year Life Cycle Cost Estimate
Alternative 2
Steel Gravity Filter Water Treatment Plant, Ironwood, Minnesota**

Division	Item	Capital Cost		Annual Repair Costs	Capital Cost plus Contingency, Admin, Eng, etc.	Useful Life	First Replacement PW	Second Replacement PW	Third Replacement PW	Salvage Value	Salvage Value PW	Total Materials & Equipment Replacement PW
1	General	\$1,100,000	13.27%	\$0	\$1,396,890	50	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
2	Existing Conditions	\$5,500	0.07%	\$0	\$6,984	50	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
3	Concrete	\$1,928,250	23.26%	\$0	\$2,448,685	75	\$0.00	\$0.00	\$0.00	\$816,228.23	(\$816,228.23)	(\$816,228.23)
4	Masonry	\$322,500	3.89%	\$0	\$409,543	50	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
5	Metals	\$180,550	2.18%	\$0	\$229,280	50	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
6	Wood & Plastics	\$10,600	0.13%	\$0	\$13,461	50	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
7	Thermal & Moisture	\$464,275	5.60%	\$5,000	\$589,583	30	\$589,582.82	\$0.00	\$0.00	\$196,527.61	(\$196,527.61)	\$393,055.22
8	Doors & Windows	\$131,160	1.58%	\$2,000	\$166,560	25	\$166,560.08	\$0.00	\$0.00	\$0.00	\$0.00	\$166,560.08
9	Finishes	\$203,640	2.46%	\$6,000	\$258,602	25	\$258,602.44	\$0.00	\$0.00	\$0.00	\$0.00	\$258,602.44
10	Specialties	\$2,750	0.03%	\$0	\$3,492	30	\$3,492.23	\$0.00	\$0.00	\$1,164.08	(\$1,164.08)	\$2,328.15
12	Furnishings	\$21,985	0.27%	\$0	\$27,919	25	\$27,918.75	\$0.00	\$0.00	\$0.00	\$0.00	\$27,918.75
21	Fire Suppression	\$22,000	0.27%	\$0	\$27,938	25	\$27,937.80	\$0.00	\$0.00	\$0.00	\$0.00	\$27,937.80
22	Plumbing	\$165,000	1.99%	\$0	\$209,534	40	\$209,533.50	\$0.00	\$0.00	\$157,150.13	(\$157,150.13)	\$52,383.38
23	HVAC	\$265,000	3.20%	\$2,500	\$336,524	25	\$336,523.50	\$0.00	\$0.00	\$0.00	\$0.00	\$336,523.50
26	Electrical	\$700,000	8.44%	\$10,000	\$888,930	25	\$888,930.00	\$0.00	\$0.00	\$0.00	\$0.00	\$888,930.00
31	Earthwork	\$258,500	3.12%	\$0	\$328,269	50	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
32	Exterior Improvements	\$198,500	2.39%	\$0	\$252,075	40	\$252,075.15	\$0.00	\$0.00	\$189,056.36	(\$189,056.36)	\$63,018.79
33	Utilities	\$225,000	2.71%	\$0	\$285,728	50	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
40	Process Piping	\$750,000	9.05%	\$2,500	\$952,425	25	\$952,425.00	\$0.00	\$0.00	\$0.00	\$0.00	\$952,425.00
43	Process Pumps/Meters	\$205,000	2.47%	\$10,000	\$260,330	30	\$260,329.50	\$0.00	\$0.00	\$86,776.50	(\$86,776.50)	\$173,553.00
44	Process Equipment	\$1,131,000	13.64%	\$15,000	\$1,436,257	25	\$1,436,256.90	\$0.00	\$0.00	\$0.00	\$0.00	\$1,436,256.90
TOTALS		\$8,291,000	100.00%	\$53,000	\$10,529,000							\$3,963,265

50 Year Life Cycle (Present Worth)

20 year Annual Costs

Inflation = 2.75%
Interest = 2.00%
Financing Years= 40

Capital Project Costs	\$10,529,000	Loan Payment	\$384,895
Equipment Replacement	\$3,963,265	Annual Equipment Replacement	\$126,124
Labor	\$4,718,835	Labor	\$80,000
Propane	\$589,854	Propane	\$10,000
Chemicals	\$2,949,272	Chemicals	\$50,000
Insurance	\$589,854	Insurance	\$10,000
Electricity	\$6,488,398	Electricity	\$110,000
Equip. Repair	\$3,126,228	Equip. Repair	\$53,000
		Assumes 59 lb/day Cl at \$1/lb, plus sodium permanganate and phosphate	
		Assumes 120kW 24/7 at \$0.10 per kWh	
TOTAL PW	\$32,950,000	TOTAL ANNUAL COST:	\$824,000

Appendix I

Audit Excerpt

NOTES TO FINANCIAL STATEMENTS (CONTINUED)

NOTE F – CAPITAL ASSETS (CONTINUED)

Construction in Progress - Water and Sewer Utility Funds

The City's Phase 4 construction project that is currently in progress is shared between the Water Utility and Sewer Utility Funds. The project started during the year ended June 30, 2016, and had costs accumulated as of June 30, 2019, of \$2,658,776 in the Water Utility Fund and \$1,637,679 in the Sewer Utility Fund. The estimated cost of this project is \$4,386,000 and will be financed by loans and grants from Rural Development. \$2,959,414 of loan funds and \$1,203,149 of grant funds have been received as of June 30, 2019. The Phase 4 project is expected to be completed by June 30, 2020.

NOTE G – LONG-TERM DEBT

A summary of changes in long-term debt follows:

	Balance at July 1, <u>2018</u>	<u>Increase</u>	<u>Decrease</u>	Balance at June 30, <u>2019</u>	Amount Due Within <u>One Year</u>
PRIMARY GOVERNMENT					
<u>Governmental Activities</u>					
Direct borrowing and direct placements:					
Capital Improvement Street Bonds	\$ 455,000		\$ 110,000	\$ 345,000	\$ 110,000
Capital Improvement Bonds	1,120,000		150,000	970,000	153,000
Department of Transportation Loan	<u>89,217</u>		<u>16,805</u>	<u>72,412</u>	<u>17,309</u>
Total direct borrowing and direct placements	\$ 1,664,217		\$ 276,805	\$ 1,387,412	\$ 280,309
Compensated absences	<u>427,888</u>	\$ 17,690		<u>445,578</u>	
Total Governmental Activities	\$ 2,092,105	\$ 17,690	\$ 276,805	\$ 1,832,990	\$ 280,309
<u>Proprietary Activities</u>					
Direct borrowing and direct placements:					
Revenue and Refunding Bonds	\$ 14,602,000	\$ 477,414	\$ 414,000	\$ 14,665,414	\$ 367,000
Capital Improvement Bonds	<u>149,985</u>		<u>26,903</u>	<u>123,082</u>	<u>27,663</u>
Total direct borrowing and direct placements	\$ 14,751,985	\$ 477,414	\$ 440,903	\$ 14,788,496	\$ 394,663
Compensated absences	<u>151,366</u>		<u>13,643</u>	<u>137,723</u>	
Total Proprietary Activities	\$ 14,903,351	\$ 477,414	\$ 454,546	\$ 14,926,219	\$ 394,663
<u>Internal Service Fund</u>					
Direct borrowing and direct placements -					
Equipment contracts payable	\$ 96,053		\$ 47,908	\$ 48,145	\$ 48,145
Compensated absences	<u>92,554</u>	\$ 929		<u>93,483</u>	
Total Internal Service Fund	\$ 188,607	\$ 929	\$ 47,908	\$ 141,628	\$ 48,145
TOTAL PRIMARY GOVERNMENT	\$ 17,184,063	\$ 496,033	\$ 779,259	\$ 16,900,837	\$ 723,117
COMPONENT UNIT -					
Compensated absences	<u>14,718</u>	<u>1,056</u>		<u>15,774</u>	
	<u>\$ 17,198,781</u>	<u>\$ 497,089</u>	<u>\$ 779,259</u>	<u>\$ 16,916,611</u>	<u>\$ 723,117</u>

NOTES TO FINANCIAL STATEMENTS (CONTINUED)

NOTE G – LONG-TERM DEBT (CONTINUED)

The Capital Improvement Street and Department of Transportation Bonds are being paid through the Major and Local Street Funds with monies transferred from the General Fund. The Capital Improvement Bonds recorded in the governmental activities are paid by the Debt Service Fund with funds coming from a property tax levy. The revenue and refunding bonds and Capital Improvement bonds recorded in the proprietary activities are paid by users of the Water, Sewer and Pat O’Donnell Civic Center Funds according to various bond ordinances. The equipment contracts payable are paid by the Internal Service Fund. Compensated absences are paid by various funds as described in the compensated absences footnote below.

The aggregate amounts of long-term debt principal and interest maturities (excluding accumulated compensated absences) for the five years ending June 30, 2024, and in five-year increments thereafter until maturity are:

	<u>Direct Borrowing and Direct Placements</u>		
	<u>Principal</u>	<u>Interest</u>	<u>Total</u>
2020	\$ 723,117	\$ 328,062	\$ 1,051,179
2021	693,270	313,388	1,006,658
2022	640,612	296,749	937,361
2023	531,989	283,712	815,701
2024	500,651	271,840	772,491
2025-2029	1,903,000	1,224,776	3,127,776
2030-2034	1,912,000	1,043,854	2,955,854
2035-2039	2,114,000	845,902	2,959,902
2040-2044	2,341,000	626,623	2,967,623
2045-2049	2,525,000	383,596	2,908,596
2050-2054	2,094,000	146,871	2,240,871
2055-2058	<u>245,414</u>	<u>13,349</u>	<u>258,763</u>
	<u>\$ 16,224,053</u>	<u>\$ 5,778,722</u>	<u>\$ 22,002,775</u>

Compensated Absences

The City has reported a \$445,578, \$137,723 and \$93,483 liability for accumulated unpaid vacation, sick pay and personal leave and related fringe benefits in its governmental, proprietary and internal service activities, respectively at June 30, 2019. The City has reported a \$15,774 liability for compensated absences in its Component Unit at June 30, 2019.

The City reports the compensated absence liability for governmental fund employees in the governmental activities and proprietary fund employees as a liability in the business-type activities in the government-wide financial statements. Amounts expected to be paid to employees within sixty days of year end are recorded as a liability in the financial statements of the fund which will pay for the compensated absences in the fund-based financial statements.

NOTES TO FINANCIAL STATEMENTS (CONTINUED)

NOTE G – LONG-TERM DEBT (CONTINUED)

Compensated Absences (Continued)

Following is a summary of employment policies related to compensated absences:

General City Operations - For employees hired on or before July 1, 1994, sick leave is earned at 1 and 1/12 days per month, with 2,080 hours maximum accumulation. Upon death or retirement, employees receive all unused sick leave and are paid at their current rate of pay. Upon termination other than death or retirement, employees receive 50 percent of unused sick leave.

For employees hired after July 1, 1994, sick leave is earned at 1 and 1/12 days per month, with 800 hours maximum accumulation. Employees receive 50 percent of unused sick leave upon termination, including death or retirement.

Vacation leave is earned at varying rates, depending upon length of service. At termination, employees receive all unused vacation leave and are paid at their current rate of pay.

Public Safety Officers - For employees hired on or before April 1, 1995, sick leave is earned at 1 and 1/12 days per month, with 2,080 hours maximum accumulation. Upon termination after at least 10 years of service, retirement or death, employees are paid for all accumulated sick leave at their current rate of pay. For employees hired after April 1, 1995, sick leave is earned at 1 and 1/12 days per month, with 800 hours maximum accumulation. Upon termination, employees are paid for up to 800 hours of accumulated sick leave at 50 percent of their current rate of pay.

For several management employees, sick leave is earned at 1 and 1/12 days per month with maximum accumulation as specified in individual employment agreements. Upon termination, these employees receive no accumulated sick leave benefits.

Other Fringe Benefits - Included in compensated absences liability are the related social security and retirement costs.

NOTES TO FINANCIAL STATEMENTS (CONTINUED)

NOTE H – BONDS, NOTES AND EQUIPMENT PURCHASE CONTRACTS PAYABLE

2012 Capital Improvement Street Bonds

On July 13, 2012, the City issued \$1,055,000 of 2012 Capital Improvement Street Bonds, to finance street improvements. The bonds are limited tax general obligation bonds issued under provisions of Act 34, Public Acts of Michigan, 2001, as amended. The City has pledged its limited tax full faith and credit for the prompt payment of the bonds. Each year the City shall budget the amount of the debt service coming due in the next fiscal year on the principal of and interest on the bonds and shall advance as a first budget obligation from its general funds available therefor, or, if necessary, levy taxes upon all taxable property in the City subject to applicable constitutional, statutory and charter tax rate limitations, such sums as may be necessary to pay such debt service in said fiscal year. Interest on the bonds is payable on November 1 and May 1 of each year at rates varying from 1.9% to 2.7%. Principal payments are due each November 1 through the year ending June 30, 2021. All of the bonds were purchased by Gogebic Range Bank, Bessemer, Michigan, with the Bank acting as the paying agent. The outstanding amount payable on the bonds at June 30, 2019 totals \$345,000, with \$110,000 maturing during the year ending June 30, 2020. Annual principal and interest maturities are included in Note G.

2015 Capital Improvement Bonds

On May 14, 2015, the City issued \$1,557,000 of 2015 Capital Improvement Bonds, to finance capital projects. The bonds are limited tax general obligation bonds issued under provisions of Act 34, Public Acts of Michigan, 2001, as amended. The City has pledged its limited tax full faith and credit for the prompt payment of the bonds. Each year the City shall budget the amount of the debt service coming due in the next fiscal year on the principal of and interest on the bonds and shall advance as a first budget obligation from its general funds available therefor, or, if necessary, levy taxes upon all taxable property in the City subject to applicable constitutional, statutory and charter tax rate limitations, such sums as may be necessary to pay such debt service in said fiscal year. Interest on the bonds is payable on January 1 and July 1 of each year at rates varying from .75% to 3%. Principal payments are due each November 1 through the year ending June 30, 2025. All of the bonds were purchased by Gogebic Range Bank, Bessemer, Michigan, with the Bank acting as the paying agent. The outstanding amount payable on the bonds at June 30, 2019 totals \$970,000, with \$153,000 maturing during the year ending June 30, 2020. Annual principal and interest maturities are included in Note G.

2014 Michigan Department of Transportation Loan

On July 2, 2014, the City received a loan from the Michigan Department of Transportation (MDOT) in the amount of \$136,750 to finance upgrades to light poles, banner hangers, overhead power lines and sidewalks. Interest on the loan is payable on July 2 of each year at a rate of 3%. Principal payments are due each July 2 through the year ending June 30, 2023. If the City is in default of payments, MDOT will withhold Michigan Transportation Funds due City to cover unpaid loan payments. The outstanding amount payable on the loan at June 30, 2019 totaled \$72,412, with \$17,309 maturing during the year ending June 30, 2020. Annual principal and interest maturities are included in Note G.

NOTES TO FINANCIAL STATEMENTS (CONTINUED)

NOTE H – BONDS, NOTES AND EQUIPMENT PURCHASE CONTRACTS PAYABLE (CONTINUED)

1999 Water Supply System Revenue Bonds

On April 1, 1999, the City issued \$900,000 of Water Supply System Revenue Bonds to finance improvements to its water supply system. The bonds were payable solely from revenues generated by the Water Utility Fund and were paid off during the year ended June 30, 2019. The City was accounting for these bonds in the Water Utility Fund.

Water Supply System Revenue Refunding Bond, Series 2010B

On July 19, 2010, the City issued \$461,000 of Water Supply System Revenue Refunding Bonds, Series 2010B. Funding for the bonds is from United States of America Department of Agriculture Rural Development. The City accounts for these bonds in its Water Utility Fund. Interest on the bonds is payable on July 1 and January 1 of each year at a rate of 4%. Principal payments are due each July 1 through the year ending June 30, 2021. The outstanding amount payable on the bonds at June 30, 2019 totals \$107,000, with \$52,000 maturing during the year ending June 30, 2020. Annual principal and interest maturities are included in Note G.

Water Supply System Revenue Bond, Series 2010C

On August 17, 2010, the City issued \$1,203,000 of Water Supply System Revenue Bonds, Series 2010C to finance improvements to its water supply system in the Jessieville area of the City. Funding for the bonds is from United States of America Department of Agriculture Rural Development. The City accounts for these bonds in its Water Utility Fund. Interest on the bonds is payable on July 1 and January 1 of each year at a rate of 2.375%. Principal payments are due each January 1 through the year ending June 30, 2051. The outstanding amount payable on the bonds at June 30, 2019 totals \$1,055,000, with \$21,000 maturing during the year ending June 30, 2020. Annual principal and interest maturities are included in Note G.

Water Supply System Revenue Bond, Series 2014A

On May 15, 2014, the City issued \$1,410,000 of Water Supply System Revenue Bonds, Series 2014A to finance improvements to its water supply system. Funding for the bonds is from United States of America Department of Agriculture Rural Development. Interest on the bonds is payable on November 1 and May 1 of each year at a rate of 2%. Principal payments are due each November 1 through the year ending June 30, 2054. The outstanding amount payable on the bonds at June 30, 2019 totals \$1,289,000, with \$26,000 maturing during the year ending June 30, 2020. Annual principal and interest maturities are included in Note G.

NOTES TO FINANCIAL STATEMENTS (CONTINUED)

NOTE H – BONDS, NOTES AND EQUIPMENT PURCHASE CONTRACTS PAYABLE (CONTINUED)

Water Supply System Revenue Refunding Bond, Series 2014B

On May 15, 2014, the City issued \$1,396,000 of Water Supply System Revenue Bonds, Series 2014A. Funding for the bonds is from United States of America Department of Agriculture Rural Development. The City accounts for these bonds in its Water Utility Fund. Interest on the bonds is payable on November 1 and May 1 of each year at rate of 2%. Principal payments are due each November 1 through the year ending June 30, 2054. The outstanding amount payable on the bonds at June 30, 2019 totals \$1,275,000, with \$26,000 maturing during the year ending June 30, 2020. Annual principal and interest maturities are included in Note G.

Water Supply System Revenue Bond, Series 2014C

On May 15, 2014, the City issued \$2,932,000 of Water Supply System Revenue Bonds, Series 2014C to finance improvements to its water supply system. Funding for the bonds is from United States of America Department of Agriculture Rural Development. The city accounts for these bonds in its Water Utility Fund. Interest on the bonds is payable on November 1 and May 1 of each year at a rate of 2%. Principal payments are due each November 1 through the year ending June 30, 2049. The outstanding amount on the bonds at June 30, 2019 totals \$2,108,000, with \$54,000 maturing during the year June 30, 2020. Annual principal and interest maturities are included in Note G.

Water Supply System Revenue Bond, Series 2017

On July 11, 2017, the City issued \$2,701,000 of Water Supply System Revenue Bonds, Series 2017 to finance improvements to its water supply system. Funding for the bonds is from United States of America Department of Agriculture Rural Development. The city accounts for these bonds in its Water Utility Fund. Interest on the bonds is payable on November 1 and May 1 of each year at a rate of 1.625%. Principal payments are due each November 1 through the year ending June 30, 2058. The outstanding amount on the bonds at June 30, 2019 totals \$2,489,414, with \$49,000 maturing during the year June 30, 2020. There is a remaining amount of \$163,586 available for the City to borrow from these bonds. Annual principal and interest maturities are included in Note G based on the full amount of the bond issue.

Sewage Disposal System Revenue Refunding Bond, Series 2010B

On July 19, 2010, the City issued \$117,000 of Sewage Disposal System Revenue Refunding Bonds, Series 2010B. Funding for the bonds is from United States of America Department of Agriculture Rural Development. The City accounts for these bonds in its Sewer Utility Fund. Interest on the bonds is payable on July 1 and January 1 of each year at a rate of 4%. Principal payments are due each July 1 through the year ending June 30, 2021. The outstanding amount payable on the bonds at June 30, 2019 totals \$27,000, with \$13,000 maturing during the year June 30, 2020. Annual principal and interest maturities are included in Note G.

NOTES TO FINANCIAL STATEMENTS (CONTINUED)

NOTE H – BONDS, NOTES AND EQUIPMENT PURCHASE CONTRACTS PAYABLE (CONTINUED)

Sewage Disposal System Revenue Bond, Series 2010C

On August 17, 2010, the City issued \$930,000 of Sewage Disposal System Revenue Bonds, Series 2010C to finance improvements to its sewage disposal system in the Jessieville area of the City. Funding for the bonds is from United States of America Department of Agriculture Rural Development. The City accounts for these bonds in its Sewer Utility Fund. Interest on the bonds is payable on July 1 and January 1 of each year at a rate of 2.375%. Principal payments are due each January 1 through the year ending June 30, 2051. The outstanding amount payable on the bonds at June 30, 2019 totals \$815,000, with \$16,000 maturing during the year ending June 30, 2020. Annual principal and interest maturities are included in Note G.

Sewage Disposal System Revenue Bond, Series 2014A

On May 15, 2014, the City issued \$1,712,000 of Sewage Disposal System Revenue Bonds, Series 2014A to finance improvements to its sewage disposal system. Funding for the bonds is from United States of America Department of Agriculture Rural Development. Interest on the bonds is payable on November 1 and May 1 of each year at a rate of 2% and principal is due on November 1 of each year. The City accounts for these bonds in its Sewer Utility Fund. Principal payments are due through the year ending June 30, 2054. The outstanding amount payable on the bonds at June 30, 2019 totals \$1,565,000, with \$31,000 maturing during the year ending June 30, 2020. Annual principal and interest maturities are included in Note G.

Sewage Disposal System Revenue Refunding Bond, Series 2014B

On May 15, 2014, the City issued \$1,687,000 of Sewage Disposal System Revenue Bonds, Series 2014A. Funding for the bonds is from United States of America Department of Agriculture Rural Development. The City accounts for these bonds in its Sewer Utility Fund. Interest on the bonds is payable on November 1 and May 1 of each year at rate of 2%. Principal payments are due each November 1 through the year ending June 30, 2054. The outstanding amount payable on the bonds at June 30, 2019 totals \$1,542,000, with \$31,000 maturing during the year ending June 30, 2020. Annual principal and interest maturities are included in Note G.

Sewage Disposal System Revenue Bond, Series 2014C

On May 15, 2014, the City issued \$2,166,000 of Sewage Disposal System Revenue Bonds, Series 2014C to finance improvements to its sewage disposal system. Funding for the bonds is from United States of America Department of Agriculture Rural Development. The City accounts for these bonds in its Sewer Utility Fund. Interest on the bonds is payable on November 1 and May 1 at a rate of 2% and principal payments are due November 1 through the year ending June 30, 2054. The outstanding amount payable on the bonds at June 30, 2019 totals \$1,979,000, with \$40,000 maturing during the year ending June 30, 2020. Annual principal and interest maturities are included in Note G.

NOTES TO FINANCIAL STATEMENTS (CONTINUED)

NOTE H – BONDS, NOTES AND EQUIPMENT PURCHASE CONTRACTS PAYABLE
(CONTINUED)

Sewage Disposal System Revenue Bond, Series 2017

On July 11, 2017, the City issued \$422,000 of Sewage Disposal System Revenue Bonds, Series 2017 to finance improvements to its sewage disposal system. Funding for the bonds is from United States of America Department of Agriculture Rural Development. The City accounts for these bonds in its Sewer Utility Fund. Interest on the bonds is payable on November 1 and May 1 at a rate of 1.625% and principal payments are due November 1 through the year ending June 30, 2058. The outstanding amount payable on the bonds at June 30, 2019 totals \$414,000, with \$8,000 maturing during the year ending June 30, 2020. Annual principal and interest maturities are included in Note G.

Proprietary Activities Revenue and Refunding Bonds

The City has issued several revenue and refunding bonds in both the Water Supply System and Sewage Disposal System funds. All are funded from the United States of America Department of Agriculture Rural Development and payable solely from revenues generated by the Water Supply and Sewage Disposal Systems. If the City is in default the United States of America Department of Agriculture Rural Development has legal recourse to appoint a receiver to administer the System on its behalf. Interest on the bonds is due each six months and principal payments are due annually. The final bond payment is due in the year 2058. Annual principal and interest maturities are included in Note G. Information relative to the bond issues is as follows:

	Outstanding Balance at <u>June 30, 2019</u>	Maturing Within <u>One Year</u>	Interest <u>Rate</u>
Water Supply System Revenue and Refunding Bonds:			
Series 2010B	\$ 107,000	\$ 52,000	4.00%
Series 2010C	1,055,000	21,000	2.375%
Series 2014A	1,289,000	26,000	2.00%
Series 2014B	1,275,000	26,000	2.00%
Series 2014C	2,108,000	54,000	2.00%
Series 2017	<u>2,489,414</u>	<u>49,000</u>	1.625%
	\$ 8,323,414	\$ 228,000	
Sewage Disposal System Revenue and Refunding Bonds:			
Series 2010B	\$ 27,000	\$ 13,000	4.00%
Series 2010C	815,000	16,000	2.375%
Series 2014A	1,565,000	31,000	2.00%
Series 2014B	1,542,000	31,000	2.00%
Series 2014C	1,979,000	40,000	2.00%
Series 2017	<u>414,000</u>	<u>8,000</u>	1.625%
	<u>\$ 6,342,000</u>	<u>\$ 139,000</u>	
	<u>\$ 14,665,414</u>	<u>\$ 367,000</u>	

NOTES TO FINANCIAL STATEMENTS (CONTINUED)

NOTE H – BONDS, NOTES AND EQUIPMENT PURCHASE CONTRACTS PAYABLE (CONTINUED)

Equipment Contracts Payable

Equipment contracts payable included in liabilities in the Internal Service Fund consist of installment purchase contracts payable to banks at rates of interest varying from 1.75% to 4.5%, payable in monthly installments, including interest, with the final contract maturing during the year ending June 30, 2020. The obligations are collateralized by security interests in equipment. The City has pledged its limited tax full faith and credit for the prompt payment of the obligations. The outstanding amount payable on the equipment contracts at June 30, 2019 totals \$48,145, all maturing during the year ending June 30, 2020. Annual principal and interest maturities are included in Note G.

2013 Capital Improvement Bonds

On September 9, 2013 the City issued \$275,000 of 2013 Capital Improvement Bonds, to finance improvements to the Pat O'Donnell Civic Center. The bonds are limited tax general obligation bonds issued under provisions of Act 34, Public Acts of Michigan, 2001, as amended. The City has pledged its limited tax full faith and credit for the prompt payment of the bonds. Principal and interest payments are due each month through the year ending June 30, 2024. All of the bonds were purchased by Gogebic Range Bank, Bessemer, Michigan, with the Bank acting as the paying agent. The outstanding amount payable on the bonds at June 30, 2019 totals \$123,082, with \$27,663 maturing during the year ending June 30, 2020. Annual principal and interest maturities are included in Note G.

NOTE I – OPERATING LEASES

The City paid \$11,796 during the year ended June 30, 2019, for equipment rented under operating leases. There are no significant minimum future lease obligations under the terms of these leases. The City also rents equipment on a short-term basis as needed throughout the year.

The City is a lessor of building space in various buildings located within its boundaries. All leases are considered to be operating leases.

NOTE J – PROPERTY TAX ADMINISTRATION FEE

In accordance with Public Act 503 of 1982, the City has established a subsidiary ledger to separately account for costs incurred in the collection, assessment and review of property tax levies. For the year ended June 30, 2019, costs incurred totaled \$113,953 and revenues from charging the administrative fee were \$89,462. Cumulative costs since inception of the subsidiary ledger have exceeded cumulative fees.

Appendix J

Existing Fee Schedule

2019-2020 Water System Rate Schedule

Effective July 1, 2019

City Water Customers:

Meter Size	2019-20 Rate
5/8-inch	\$22.00/month
¾-inch	\$24.88/month
1-inch	\$45.21/month
1 ½-inch	\$113.03/month
2-inch	\$211.61/month
3-inch	\$482.88/month
4-inch	\$870.35/month
6-inch	\$1,964.37/month
City of Hurley	\$586.84/month

City of Ironwood Usage Rate: \$5.60/100 cubic feet = \$7.49/1,000 gallons (2018-19).

City of Hurley Usage Rate: \$3.02/100 cubic feet = \$4.04/1,000 gallons (2018-19).

City of Ironwood Usage Rate: \$5.76/100 cubic feet = \$7.70/1,000 gallons (2019-20).

City of Hurley Usage Rate: \$3.105/100 cubic feet = \$4.15/1,000 gallons (2019-20).

2018-2019 Water System Rate Schedule

Effective July 1, 2018

City Water Customers:

Meter Size	2018-19 Rate
5/8-inch	\$21.40/month
¾-inch	\$24.20/month
1-inch	\$43.98/month
1 ½-inch	\$109.95/month
2-inch	\$205.85/month
3-inch	\$469.73/month
4-inch	\$846.64/month
6-inch	\$1910.64/month
City of Hurley	\$570.84/month

City of Ironwood Usage Rate: \$5.60/100 cubic feet = \$7.49/1,000 gallons (2018-19).

City of Hurley Usage Rate: \$3.02/100 cubic feet = \$4.04/1,000 gallons (2018-19).

Appendix K

Michigan Guide 2, Attachment 1

CUSTOMER USER INFORMATION

1.) Rural Development uses some of the information from the PER, especially Sections 6(e) and (f), for underwriting purposes. Note that for income projection purposes, every effort should be made to identify actual data regarding water usage or wastewater generation. For metered systems, actual data should be used.

When financing construction of a new system or improvements to an existing system without any existing usage data, water use and wastewater generation approximation for income projection purposes should, if at all possible, be based on information from surrounding similar communities and systems. The source of data used should be documented in the PER.

The value of 100 GPCD shown in Section 6 is a general value and may not be appropriate for many rural systems finance with WWD funds. In the absence of reliable data, a value of **5,000 gallons per EDU per month** (approximately 67 GPCD or 167 GPD per EDU) should be used.

	Number of Existing Customers	Total Monthly Service Usage (in gallons)	Number of Users after Improvements	Projected Total Monthly Service Usage (in gallons)	EDU's Agency Use)
Residential Dwellings:	2,401	5,285,049	2,401	5,285,049	
Commercial Users:	305	5,654,922	305	5,654,922	
Total:	2,706	10,939,971	2,706	10,939,971	

Breakdown of Commercial Users	Number Existing Users	Number of User after project completion	Billed/Metered Monthly Total Service Usage
Large Commercial	20	20	952,975
Small Commercial	210	210	844,843
Industrial	24	24	140,821
Government	13	13	53,832
Churches	18	18	34,660
Apartment Buildings	14	14	455,564
Duplexes	0	0	0
Schools	4	4	140,945
City of Hurley	1	1	2,993,131
Ironwood Township	1	1	38,151

2.) Indicate (X) the applicant's proposed bonding (financing) method:

X	Revenue Bond (Act 94)		County Contract Bond		General Obligation Bond	
	Special Assessment Bond		Water/Sewer Authority Bond		Other:	

3.) The PER must have a copy of the existing rate schedule, if applicable. Applicant’s proposed operating budget, rates and charges must be in Preliminary Report as per Bulletin 1780-2, Preliminary Engineering Reports for Water and Waste Disposal Program, Section 2.8.

4.) Project Contacts:

Applicant Contact:	Mr. Scott Erickson, City Manager		
Address:	213 S Marquette St, Ironwood, MI 49938		
Email Address: ericksons@cityofironwood.org	Phone:	906-932-5050	
Engineer Contact:	Mr. Michael Foley, P.E., Coleman Engineering Company		
Address:	200 E. Ayer St, Ironwood, MI 49938		
Email Address: mfoley@coleman-engineering.com	Phone:	906-932-5048	
Bond Counsel Contact:	Mr. Steven M. Frank, Miller Canfield		
Address:	150 West Jefferson Ave., Suite 2500, Detroit, MI 48226		
Email Address: frank@millercanfield.com	Phone:	313-496-7503	
Legal Counsel Contact:	Tim Dean, City Attorney, Dean Law Office, P.C.		
Address:	204 N. Harrison St, Ironwood, MI 49938		
Email Address: tmdean@westernuplaw.com	Phone:	906-932-4010	
Financial Consultant Contact:	N/A		
Address:			
Email Address:	Phone:		

5.) Applicant’s Population Information by Race and Ethnicity for the proposed service area, if known:

	Asian	Black/African American	American Indian or Alaskan Native	Native Hawaiian or Pacific Islander	White	Multiple Races Selected	Other Race	Total Population
RACE	11	27	59	0	5,290	0	0	5,387
ETHNICITY	Hispanic or Latino		Not Hispanic or Latino			Total Population		
	65		5,322			5,387		

6.) Land Rights

	# of acres	# of acres to be leased	Purchase price of land	Market value of land
Land to be acquired:	0	0	0	0
Land now owned:	250	0	0	\$500,000

7.) Other system information

Public Water System (PWS) ID# MI 0003420.

If water is being purchase – cost per 1,000 gallons or per 100 cu. ft. \$.

NPDES Permit # MI 0020125 (Gogebic-Iron Wastewater Authority).

If wastewater treatment is by contract – cost per 1,000 gallons or per 100 cu. ft.

Appendix L

Operating Budget

WATER OPERATING BUDGET
Water Treatment Plant Project

Name City of Ironwood (Water Project)		Address: 213 S. Marquette St. Ironwood, Michigan		All Loan			
Applicant Fiscal Year From July 1 to June 30		County Gogebic		State (Including ZIP Code) 49938		1.75% Interest	
						First Full Year	
OPERATING INCOME							
1	User Charges Ironwood	See Attachment "A"				\$1,929,402.00	
2	Turn On/Off Fees	See Attachment "A"				\$35,000.00	
3	Utility Bill Penalties	See Attachment "A"				\$29,000.00	
4	Miscellaneous	See Attachment "A"				\$0.00	
5	User Charges Hurley	See Attachment "A"				\$188,194.00	
6	Less: Allowances and Deductions						
7	Total Operating Income (Add lines 1 through 6)					\$2,181,596.00	
OPERATING EXPENSES							
8	Repairs and Maintenance	See Attachment "B"				\$398,100.00	
10	Utilities	See Attachment "B"				\$143,600.00	
11	Salaries and Benefits	See Attachment "B"				\$532,600.00	
12	Admin/Financial	See Attachment "B"				\$94,900.00	
13	Professional Services	See Attachment "B"				\$34,000.00	
9	Lead Service Line Replacement	See Attachment "B"				\$146,685.00	
14	Interest RD Phase 2 - 2010C	See Attachment "C"				\$22,420.14	
15	Interest RD Phase 3 - 2014A	See Attachment "C"				\$23,660.00	
16	Interest RD Phase 3 - 2014B	See Attachment "C"				\$23,380.00	
17	Interest RD Phase 3 - 2014C	See Attachment "C"				\$49,100.00	
18	Interest RD Phase 4 - 2017	See Attachment "C"				\$39,398.10	
19	Interest RD - Water Treatment Plant	See Attachment "C"				\$170,170.00	
20	_____						
21	Depreciation	See Attachment "D"				\$40,317.00	
22	Total Operating Expense (Add lines 8 through 22)					\$1,718,330.24	
23	NET OPERATING INCOME (LOSS) (Line 7 less 22)					\$463,265.76	
NON-OPERATING INCOME							
24	_____						
25	_____						
26	Total Non-operating Income					\$0.00	
27	NET INCOME (LOSS) (Add lines 23 and 26) (Transfer to Line A Schedule 2)					\$463,265.76	

Budget and Cash Flow Approved by Governing Body

Attest: _____

Treasurer

Date

Mayor

Date

PROJECTED CASH FLOW

	FIRST FULL YEAR	
A. Line 27 from Schedule 1 Income (<i>Loss</i>)		\$463,265.76
Add		
B. Items in Operations no Requiring Cash:		
1. Depreciation	See Attachment "D"	\$40,317.00
2. Other: _____		
C. Cash Provided From:		
1. Proceeds from RD loan/grant		
2. Proceeds from others		
3. Increase (<i>Decrease</i>) in Accounts Payable, Accruals and other Current Liabilities		
4. Decrease (<i>Increase</i>) in Accounts Receivable, inventories and Other Current Assets <i>Exclude Cash</i>		
5. Other: _____		
6. _____		
D. Total all A, B and C Items		\$503,582.76
E. Less: Cash Expended for:		
1. All Construction, Equipment and New Capital Items (<i>Loan and grant funds</i>)		
2. Replacement and Additions to Existing Property, Plant and Equipment		
3. Principal RD Phase 2 - 2010C	See Attachment "C"	\$24,000.00
4. Principal RD Phase 3 - 2010A	See Attachment "C"	\$28,000.00
5. Principal RD Phase 3 - 2014B	See Attachment "C"	\$28,000.00
6. Principal RD Phase 3 - 2014C	See Attachment "C"	\$58,000.00
7. Principal RD Phase 4 - 2017	See Attachment "C"	\$53,000.00
8. Principal RD - Water Treatment Plant	See Attachment "C"	\$169,899.00
9. _____		
Add		\$360,899.00
F. Beginning Cash Balances		
G. Ending Cash Balances (<i>Total of D minus E plus F</i>)		\$142,683.76
Item G Cash Balances Composed of:		
Construction Account		
Revenue Account		
Debt Payment Account		
O&M Account		\$32,849.76
Reserve Account	See Attachment "C"	\$69,517.00
Funded Depreciation Account	See Attachment "D"	\$40,317.00
Others: _____		

City of Ironwood
Proposed Water Treatment Plant
Appendix L - Attachment A - Proposed Project Revenue
Proposed Rate Schedule with No Grant

Fixed Meter Charge

Size	# of Meters	Rate	Monthly Income
5/8 "	2584	\$28.09	\$ 72,584.56
3/4"	58	\$31.90	\$ 1,850.20
1"	39	\$58.00	\$ 2,262.00
1.5"	15	\$144.50	\$ 2,167.50
2"	17	\$270.50	\$ 4,598.50
3"	4	\$615.38	\$ 2,461.52
4"	0	\$1,109.10	\$ -
6" (Hurley)	1	\$717.80	\$ 717.80
		Total	\$ 86,642.08

Commodity Charge

	1000 Gallons	\$/1,000 Gallons	Monthly Income
Ironwood	7946.84	\$ 9.42	\$ 74,859
Hurley	2993	\$ 5.00	\$ 14,965

Proposed Monthly Income

Monthly Income from Ironwood	\$ 160,784
Monthly Income from Hurley	\$ 15,683

Total Annual Income from Water Sales - City of Ironwood	\$ 1,929,402
Total Annual Income from Turn On/Turn Off Fees	\$ 35,000
Total Annual Income from Utility Bill Penalties	\$ 29,000
Total Annual Income from Water Sales - City of Hurley	\$ 188,194
Total Annual Income	\$ 2,181,596

**Budget Report for City of Ironwood (FY Ending June 2020)
Attachment B**

ESTIMATED REVENUES

	Existing FY 2019-20	Projected WTP Additional Expenses	Proposed FY 2023-24
Dept 000.000 - REVENUE			
675-000.000-532.000 STATE GRANTS	\$ 105,000		
675-000.000-602.000 WATER CHARGES-USAGE	\$ 1,719,000		
675-000.000-613.000 TURN ON/OFF FEES	\$ 35,000		
675-000.000-615.000 UTILITY BILL PENALTIES	\$ 29,000		
675-000.000-616.000 NSF FEE	\$ 1,000		
675-000.000-618.000 GARBAGE CHARGES	\$ 370,000		
r	\$ 500		
675-000.000-620.000 GARBAGE TAGS	\$ 500		
Totals for dept 000.000 - REVENUE	<u>\$ 2,260,000</u>		
TOTAL ESTIMATED REVENUES	<u>\$ 2,260,000</u>		

APPROPRIATIONS

Dept 521.000 - GARBAGE COLLECTION

675-521.000-702.000 SALARIES AND WAGES	\$ 100		\$ 100
675-521.000-703.000 OVERTIME WAGES	\$ 200		\$ 200
675-521.000-718.000 RETIREMENT	\$ 100		\$ 100
675-521.000-718.002 RETIREE HEALTH CARE	\$ 100		\$ 100
675-521.000-801.000 CONTRACTUAL SERVICES	\$ 370,000		\$ 370,000
Totals for dept 521.000 - GARBAGE COLLECTION	<u>\$ 370,500</u>		<u>\$ 370,500</u>

Dept 537.000 - MDEQ GRANT - DISTRIBUTION INVENTORY

675-537.000-702.000 SALARIES AND WAGES	\$ 23,000		\$ 23,000
675-537.000-715.000 SOCIAL SECURITY	\$ 2,000		\$ 2,000
675-537.000-943.000 EQUIPMENT RENTAL DPW	\$ 10,000		\$ 10,000
Totals for dept 537.000 - MDEQ GRANT - DISTRIBUTION INVENTORY	<u>\$ 35,000</u>		<u>\$ 35,000</u>

Dept 537.001 - MDEQ GRANT - ASSET MANAGEMENT PROGRAM

675-537.001-801.000	CONTRACTUAL SERVICES	\$	20,000	\$	20,000
Totals for dept 537.001 - MDEQ GRANT - ASSET MANAGEME		\$	20,000	\$	20,000

Dept 537.002 - MDEQ GRANT - SERVICE LINE CONSTRUCTION

675-537.002-801.000	CONTRACTUAL SERVICES	\$	45,000	\$	45,000
Totals for dept 537.002 - MDEQ GRANT - SERVICE LINE C		\$	45,000	\$	45,000

Dept 550.000 - WELLS

675-550.000-798.000	WELLHEAD PROTECTION GRANT	\$	1,700	\$	1,700
Totals for dept 550.000 - WELLS		\$	1,700	\$	1,700

		Existing FY 2019-20	Projected WTP Additional Expenses	Proposed FY 2023-24		
Dept 551.000 - PUMPING						
675-551.000-702.000	SALARIES AND WAGES	\$	63,000	\$	63,000	"S"
675-551.000-703.000	OVERTIME WAGES	\$	10,000	\$	10,000	"S"
675-551.000-706.000	EDUCATION AND TRAINING	\$	2,000	\$	2,000	"A"
675-551.000-715.000	SOCIAL SECURITY	\$	5,600	\$	5,600	"S"
675-551.000-718.000	RETIREMENT	\$	16,000	\$	16,000	"S"
675-551.000-718.002	RETIREE HEALTH CARE	\$	200	\$	200	"S"
675-551.000-719.000	OTHER FRINGE BENEFITS	\$	200	\$	200	"S"
675-551.000-728.000	OPERATING SUPPLIES	\$	35,000	\$	50,000	"R"
675-551.000-730.000	POSTAGE	\$	900	\$	900	"A"
675-551.000-751.000	GAS - OIL - DIESEL FUEL	\$	4,000	\$	4,000	"U"
NEW	PROPANE	\$	-	\$	10,000	"U"
675-551.000-765.000	TEST AND TESTING SUPPLIES	\$	6,000	\$	6,000	"R"
675-551.000-766.000	TOOLS AND SUPPLIES	\$	1,000	\$	1,000	"R"
675-551.000-801.000	CONTRACTUAL SERVICES	\$	17,100	\$	17,100	"R"
675-551.000-853.000	TELEPHONE/COMMUNICATIONS	\$	4,000	\$	4,000	"U"
675-551.000-920.000	PUBLIC UTILITIES	\$	120,000	\$	120,000	"U"

675-551.000-930.000	MAINTENANCE STRUCTURES	\$	10,000		\$	10,000	"R"
675-551.000-933.000	MAINTENANCE EQUIPMENT	\$	50,500	\$ (50,500)	\$	-	"R"
675-551.000-943.000	EQUIPMENT RENTAL DPW	\$	25,000		\$	25,000	"R"
675-551.000-977.000	NEW EQUIPMENT	\$	40,000	\$ (40,000)	\$	-	"R"
Totals for dept 551.000 - PUMPING		\$	410,500	\$ (65,500)	\$	345,000	

Dept 553.000 - TRANSMISSION AND DISTRIBUTION

675-553.000-702.000	SALARIES AND WAGES	\$	105,000		\$	105,000	"S"
675-553.000-703.000	OVERTIME WAGES	\$	5,000		\$	5,000	"S"
675-553.000-706.000	EDUCATION AND TRAINING	\$	3,000		\$	3,000	"A"
675-553.000-715.000	SOCIAL SECURITY	\$	8,500		\$	8,500	"S"
675-553.000-718.000	RETIREMENT	\$	26,700		\$	26,700	"S"
675-553.000-718.002	RETIREE HEALTH CARE	\$	2,000		\$	2,000	"S"
675-553.000-719.000	OTHER FRINGE BENEFITS	\$	500		\$	500	"S"
675-553.000-728.000	OPERATING SUPPLIES	\$	50,000		\$	50,000	"R"
675-553.000-766.000	TOOLS AND SUPPLIES	\$	8,000		\$	8,000	"R"
675-553.000-768.000	UNIFORMS AND MAINTENANCE	\$	1,000		\$	1,000	"R"
675-553.000-801.000	CONTRACTUAL SERVICES	\$	64,000		\$	64,000	"R"
675-553.000-802.000	PROFESSIONAL SERVICES	\$	25,000		\$	25,000	"P"
675-553.000-853.000	TELEPHONE/COMMUNICATIONS	\$	1,500		\$	1,500	"U"
675-553.000-920.000	PUBLIC UTILITIES	\$	2,400		\$	2,400	"U"
675-553.000-933.000	MAINTENANCE EQUIPMENT	\$	1,000		\$	1,000	"R"
675-553.000-943.000	EQUIPMENT RENTAL DPW	\$	60,000		\$	60,000	"R"
675-553.000-977.000	NEW EQUIPMENT	\$	2,000		\$	2,000	"R"
NEW	NEW Lead Service Line Replacement	\$	-	\$ 146,685	\$	146,685	"L"
Totals for dept 553.000 - TRANSMISSION AND DISTRIBUTI		\$	365,600	\$ 146,685	\$	512,285	

Dept 553.001 - TRANSMISSION AND DIST - WATER BREAKS

675-553.001-702.000	SALARIES AND WAGES	\$	8,000		\$	8,000	"S"
675-553.001-703.000	OVERTIME WAGES	\$	3,000		\$	3,000	"S"
675-553.001-715.000	SOCIAL SECURITY	\$	700		\$	700	"S"
675-553.001-718.000	RETIREMENT	\$	2,100		\$	2,100	"S"
675-553.001-718.002	RETIREE HEALTH CARE	\$	300		\$	300	"S"

675-553.001-943.000	EQUIPMENT RENTAL DPW	\$	27,000	\$	27,000	"R"
Totals for dept 553.001 - TRANSMISSION AND DIST - WATER BREAKES		\$	41,100	\$	41,100	

Dept 554.000 - METER SETS, REMOVALS & REPAIRS

675-554.000-702.000	SALARIES AND WAGES	\$	22,000	\$	22,000	"S"
675-554.000-715.000	SOCIAL SECURITY	\$	1,700	\$	1,700	"S"
675-554.000-718.000	RETIREMENT	\$	6,000	\$	6,000	"S"
675-554.000-718.002	RETIREE HEALTH CARE	\$	4,500	\$	4,500	"S"
675-554.000-719.000	OTHER FRINGE BENEFITS	\$	100	\$	100	"S"
675-554.000-728.000	OPERATING SUPPLIES	\$	25,000	\$	25,000	"R"
675-554.000-801.000	CONTRACTUAL SERVICES	\$	16,000	\$	16,000	"R"
675-554.000-943.000	EQUIPMENT RENTAL DPW	\$	11,000	\$	11,000	"R"
675-554.000-977.000	NEW EQUIPMENT	\$	1,000	\$	1,000	"R"
Totals for dept 554.000 - METER SETS, REMOVALS & REPA		\$	87,300	\$	87,300	

Dept 556.000 - CUSTOMER ACCOUNTING & COLLECT

675-556.000-702.000	SALARIES AND WAGES	\$	54,000	\$	54,000	"S"
675-556.000-706.000	EDUCATION AND TRAINING	\$	1,000	\$	1,000	"A"
675-556.000-715.000	SOCIAL SECURITY	\$	4,200	\$	4,200	"S"
675-556.000-718.000	RETIREMENT	\$	15,200	\$	15,200	"S"
675-556.000-718.002	RETIREE HEALTH CARE	\$	4,300	\$	4,300	"S"
675-556.000-719.000	OTHER FRINGE BENEFITS	\$	100	\$	100	"S"
675-556.000-727.000	OFFICE SUPPLIES	\$	1,000	\$	1,000	"A"
675-556.000-728.000	OPERATING SUPPLIES	\$	1,500	\$	1,500	"A"
675-556.000-730.000	POSTAGE	\$	7,000	\$	7,000	"A"
675-556.000-853.000	TELEPHONE/COMMUNICATIONS	\$	200	\$	200	"U"
675-556.000-940.000	RENTALS OTHER	\$	1,500	\$	1,500	"A"
675-556.000-956.003	TAX CHARGEBACKS	\$	1,000	\$	1,000	"A"
Totals for dept 556.000 - CUSTOMER ACCOUNTING & COLLECT		\$	91,000	\$	91,000	

Dept 557.000 - ADMINISTRATION & OVERHEAD

675-557.000-702.000	SALARIES AND WAGES	\$	22,000	\$	22,000	"S"
675-557.000-706.000	EDUCATION AND TRAINING	\$	3,000	\$	3,000	"A"

675-557.000-708.000	ADMINISTRATION	\$	36,000		\$	36,000	"A"
675-557.000-715.000	SOCIAL SECURITY	\$	1,700		\$	1,700	"S"
675-557.000-716.000	HOSPITALIZATION	\$	78,800		\$	78,800	"S"
675-557.000-716.004	DEDUCTIBLE REIMBURSEMENTS	\$	15,000		\$	15,000	"S"
675-557.000-716.005	FLEX SPENDING ACCT	\$	800		\$	800	"S"
675-557.000-716.006	ADMIN HEALTHCARE	\$	1,500		\$	1,500	"S"
675-557.000-717.000	LIFE INSURANCE	\$	400		\$	400	"S"
675-557.000-718.000	RETIREMENT	\$	6,000		\$	6,000	"S"
675-557.000-719.000	OTHER FRINGE BENEFITS	\$	1,200		\$	1,200	"S"
675-557.000-720.000	PENSION EXPENSE	\$	20,000		\$	20,000	"A"
675-557.000-728.000	OPERATING SUPPLIES	\$	500		\$	500	"R"
675-557.000-729.000	LICENSES/FEES	\$	3,100		\$	3,100	"A"
675-557.000-801.000	CONTRACTUAL SERVICES	\$	4,900		\$	4,900	"A"
675-557.000-802.000	PROFESSIONAL SERVICES	\$	9,000		\$	9,000	"P"
675-557.000-851.000	ADVERTISING AND PROMOTION	\$	4,000		\$	4,000	"A"
675-557.000-853.000	TELEPHONE/COMMUNICATIONS	\$	1,500		\$	1,500	"U"
675-557.000-910.000	INSURANCE AND BONDS	\$	12,000	\$ 10,000	\$	22,000	"S"
675-557.000-917.000	WORKERS COMPENSATION	\$	5,000		\$	5,000	"S"
675-557.000-940.000	RENTALS OTHER	\$	22,500		\$	22,500	"R"
675-557.000-958.000	MEMBERSHIP AND DUES	\$	5,000		\$	5,000	"A"
675-557.000-993.000	INTEREST EXPENSE	\$	174,100		\$	174,100	"N/A"
675-557.000-994.000	DISCOUNT AMORTIZATION	\$	2,000		\$	2,000	"N/A"
Totals for dept 557.000 - ADMINISTRATION & OVERHEAD		\$	430,000	\$ 10,000	\$	440,000	

Dept 557.172 - ADM/CM

675-557.172-702.000	SALARIES AND WAGES	\$	7,000		\$	7,000	"S"
675-557.172-715.000	SOCIAL SECURITY	\$	600		\$	600	"S"
675-557.172-718.000	RETIREMENT	\$	1,700		\$	1,700	"S"
Totals for dept 557.172 - ADM/ CM		\$	9,300		\$	9,300	

Dept 896.000 - DEPRECIATION

675-896.000-959.000	DEPRECIATION EXPENSE	\$	353,000		\$	353,000	"N/A"
Totals for dept 896.000 - DEPRECIATION		\$	353,000		\$	353,000	

TOTAL APPROPRIATIONS

\$ 2,260,000 \$ 91,185 \$ 2,351,185

NET OF REVENUES/APPROPRIATIONS - FUND 675

BEGINNING FUND BALANCE

ENDING FUND BALANCE

*NOTE: Values in the Proposed WTP Additional Costs column have been updated to reflect the additional costs associated with the proposed Water Treatment Plant project

Budget Summary

Category		2019-2020 Budget	Proposed FY 2023-24
"R"	Repairs and Maintenance =	\$ 473,600	\$ 398,100
"U"	Utilities =	\$ 133,600	\$ 143,600
"S"	Salaries and Benefits =	\$ 522,600	\$ 532,600
"A"	Admin / Financial =	\$ 94,900	\$ 94,900
"P"	Professional Services =	\$ 34,000	\$ 34,000
	Subtotal =	\$ 1,258,700	\$ 1,203,200
"L"	Lead Service Line Replacement =	\$ -	\$ 146,685
	Subtotal Expenses =	\$ 1,258,700	\$ 1,349,885
	Repair, Replacement and Improvements Fund =	\$ 30,100	\$ 40,317
	Total Expense =	\$ 1,288,800	\$ 1,390,202

Bond Name	Principal	Interest	** Reserve	Year
RD Phase 2 - 2010C	\$ 24,000.00	\$ 22,420.14	\$ 5,050.00	2023-2024
RD Phase 3 - 2014A	\$ 28,000.00	\$ 23,660.00	\$ 21,160.00	2023-2024
RD Phase 3 - 2014B	\$ 28,000.00	\$ 23,380.00		2023-2024
RD Phase 3 - 2014C	\$ 58,000.00	\$ 49,100.00		2023-2024
RD Phase 4 - 2017	\$ 53,000.00	\$ 39,398.10	\$ 9,300.00	2023-2024
RD Phase 5 - WTP	\$ 169,899.00	\$ 170,170.00	\$ 34,007.00	2023-2024
Totals =	\$ 360,899.00	\$ 328,128.24	\$ 69,517.00	

** Amount for reserves obtained from the respective bond ordinances. See Attachment E.

Dated: 8/17/2010

A.Y.L. Verification Report

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Delivered: 8/17/2010

CITY OF IRONWOOD

MSRB 30/360 SEMI 4/3

WATER/PHASE II

RURAL DEVELOPMENT

Period	Coupon Date	Principal Payment	Coupon Rate	Interest Payment	Cred. Enh./ Sinking Fund Adj	Periodic Debt Service	Present Value Factor	Discounted Debt Service
1	01/01/11	17,000.00	2.375	10,634.92	-	27,634.92	0.9912500	27,393.11
2	07/01/11			14,083.85	-	14,083.85	0.9796167	13,796.77
3	01/01/12	17,000.00	2.375	14,083.85	-	31,083.85	0.9681199	30,092.89
4	07/01/12			13,881.97	-	13,881.97	0.9567580	13,281.69
5	01/01/13	18,000.00	2.375	13,881.97	-	31,881.97	0.9455295	30,145.34
6	07/01/13			13,668.22	-	13,668.22	0.9344327	12,772.03
7	01/01/14	18,000.00	2.375	13,668.22	-	31,668.22	0.9234662	29,244.53
8	07/01/14			13,454.47	-	13,454.47	0.9126284	12,278.93
9	01/01/15	19,000.00	2.375	13,454.47	-	32,454.47	0.9019178	29,271.26
10	07/01/15			13,228.84	-	13,228.84	0.8913329	11,791.30
11	01/01/16	19,000.00	2.375	13,228.84	-	32,228.84	0.8808722	28,389.49
12	07/01/16			13,003.21	-	13,003.21	0.8705342	11,319.74
13	01/01/17	20,000.00	2.375	13,003.21	-	33,003.21	0.8603176	28,393.24
14	07/01/17			12,765.71	-	12,765.71	0.8502209	10,853.67
15	01/01/18	20,000.00	2.375	12,765.71	-	32,765.71	0.8402427	27,531.15
16	07/01/18			12,528.21	-	12,528.21	0.8303816	10,403.20
17	01/01/19	21,000.00	2.375	12,528.21	-	33,528.21	0.8206362	27,514.46
18	07/01/19			12,278.83	-	12,278.83	0.8110052	9,958.20
19	01/01/20	22,000.00	2.375	12,278.83	-	34,278.83	0.8014872	27,474.05
20	07/01/20			12,017.58	-	12,017.58	0.7920810	9,518.90
21	01/01/21	22,000.00	2.375	12,017.58	-	34,017.58	0.7827851	26,628.45
22	07/01/21			11,756.33	-	11,756.33	0.7735983	9,094.68
23	01/01/22	23,000.00	2.375	11,756.33	-	34,756.33	0.7645194	26,571.89
24	07/01/22			11,483.20	-	11,483.20	0.7555469	8,676.10
25	01/01/23	23,000.00	2.375	11,483.20	-	34,483.20	0.7466798	25,747.91
26	07/01/23			11,210.07	-	11,210.07	0.7379168	8,272.10
27	01/01/24	24,000.00	2.375	11,210.07	-	35,210.07	0.7292566	25,677.18
28	07/01/24			10,925.07	-	10,925.07	0.7206980	7,873.68
29	01/01/25	25,000.00	2.375	10,925.07	-	35,925.07	0.7122399	25,587.27
30	07/01/25			10,628.19	-	10,628.19	0.7038810	7,480.98
31	01/01/26	25,000.00	2.375	10,628.19	-	35,628.19	0.6956203	24,783.69
32	07/01/26			10,331.31	-	10,331.31	0.6874564	7,102.33
33	01/01/27	26,000.00	2.375	10,331.31	-	36,331.31	0.6793884	24,683.07
34	07/01/27			10,022.56	-	10,022.56	0.6714151	6,729.30
35	01/01/28	27,000.00	2.375	10,022.56	-	37,022.56	0.6635354	24,565.78
36	07/01/28			9,701.93	-	9,701.93	0.6557481	6,362.02
37	01/01/29	27,000.00	2.375	9,701.93	-	36,701.93	0.6480523	23,784.77
38	07/01/29			9,381.30	-	9,381.30	0.6404467	6,008.22
39	01/01/30	28,000.00	2.375	9,381.30	-	37,381.30	0.6329304	23,659.76
40	07/01/30			9,048.80	-	9,048.80	0.6255023	5,660.05
41	01/01/31	29,000.00	2.375	9,048.80	-	38,048.80	0.6181614	23,520.30
42	07/01/31			8,704.42	-	8,704.42	0.6109067	5,317.59
43	01/01/32	30,000.00	2.375	8,704.42	-	38,704.42	0.6037370	23,367.29

Prepared by: Miller Canfield Paddock and Stone

:Ann-EaseMainDb

Prepared on: 1/25/2012 16:47 14.66 Rpt 01b

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IRONWOOD-2010-F

Dated: 8/17/2010

A.Y.L. Verification Report

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Delivered: 8/17/2010

CITY OF IRONWOOD

MSRB 30/360 SEMI 4/3

WATER/PHASE II

RURAL DEVELOPMENT

Period	Coupon Date	Principal Payment	Coupon Rate	Interest Payment	Cred. Enb./ Sinking Fund Adj	Periodic Debt Service	Present Value Factor	Discounted Debt Service
44	07/01/32			8,348.17	-	8,348.17	0.5966516	4,980.95
45	01/01/33	31,000.00	2.375	8,348.17	-	39,348.17	0.5896493	23,201.62
46	07/01/33			7,980.04	-	7,980.04	0.5827291	4,650.20
47	01/01/34	31,000.00	2.375	7,980.04	-	38,980.04	0.5758902	22,448.22
48	07/01/34			7,611.91	-	7,611.91	0.5691316	4,332.18
49	01/01/35	32,000.00	2.375	7,611.91	-	39,611.91	0.5624522	22,279.81
50	07/01/35			7,231.91	-	7,231.91	0.5558513	4,019.87
51	01/01/36	33,000.00	2.375	7,231.91	-	40,231.91	0.5493278	22,100.51
52	07/01/36			6,840.03	-	6,840.03	0.5428809	3,713.32
53	01/01/37	34,000.00	2.375	6,840.03	-	40,840.03	0.5365096	21,911.07
54	07/01/37			6,436.28	-	6,436.28	0.5302131	3,412.60
55	01/01/38	35,000.00	2.375	6,436.28	-	41,436.28	0.5239905	21,712.22
56	07/01/38			6,020.65	-	6,020.65	0.5178410	3,117.74
57	01/01/39	36,000.00	2.375	6,020.65	-	42,020.65	0.5117636	21,504.64
58	07/01/39			5,593.15	-	5,593.15	0.5057575	2,828.78
59	01/01/40	37,000.00	2.375	5,593.15	-	42,593.15	0.4998219	21,288.99
60	07/01/40			5,153.77	-	5,153.77	0.4939560	2,545.74
61	01/01/41	38,000.00	2.375	5,153.77	-	43,153.77	0.4881589	21,065.90
62	07/01/41			4,702.52	-	4,702.52	0.4824299	2,268.64
63	01/01/42	39,000.00	2.375	4,702.52	-	43,702.52	0.4767681	20,835.97
64	07/01/42			4,239.39	-	4,239.39	0.4711727	1,997.48
65	01/01/43	40,000.00	2.375	4,239.39	-	44,239.39	0.4656430	20,599.76
66	07/01/43			3,764.39	-	3,764.39	0.4601782	1,732.29
67	01/01/44	41,000.00	2.375	3,764.39	-	44,764.39	0.4547776	20,357.84
68	07/01/44			3,277.51	-	3,277.51	0.4494403	1,473.05
69	01/01/45	42,000.00	2.375	3,277.51	-	45,277.51	0.4441657	20,110.71
70	07/01/45			2,778.76	-	2,778.76	0.4389529	1,219.74
71	01/01/46	44,000.00	2.375	2,778.76	-	46,778.76	0.4338014	20,292.69
72	07/01/46			2,256.26	-	2,256.26	0.4287103	967.28
73	01/01/47	45,000.00	2.375	2,256.26	-	47,256.26	0.4236789	20,021.48
74	07/01/47			1,721.88	-	1,721.88	0.4187066	720.96
75	01/01/48	46,000.00	2.375	1,721.88	-	47,721.88	0.4137927	19,746.96
76	07/01/48			1,175.63	-	1,175.63	0.4089364	480.76
77	01/01/49	47,000.00	2.375	1,175.63	-	48,175.63	0.4041371	19,469.56
78	07/01/49			617.50	-	617.50	0.3993941	246.63
79	01/01/50	52,000.00	2.375	617.50	-	52,617.50	0.3947068	20,768.49

Prepared by: Miller Canfield Paddock and Stone

:Ann-EaseMainDb

Prepared on: 1/25/2012 16:47 14.66 Rpt 01b

- 2 -

IRONWOOD-2010-F

Dated: 8/17/2010
 Delivered: 8/17/2010

A.Y.L. Verification Report
 CITY OF IRONWOOD
 WATER/PHASE II

3
 MSRB 30/360 SEMI 4/3
 RURAL DEVELOPMENT

Coupon Period	Coupon Date	Principal Payment	Coupon Rate	Interest Payment	Cred. Enh./ Sinking Fund Adj	Periodic Debt Service	Present Value Factor	Discounted Debt Service
		1,203,000.00		670,342.56	0.00	1,873,342.56		1,203,002.98

True Interest Cost (TIC).....	2.3750777
Net Interest Cost (NIC).....	2.3750000
Arbitrage Yield Limit (AYL).....	2.3750777
Arbitrage Net Interest Cost (ANIC).....	2.3750000

Face value of bond Issue.....	\$1,203,000.00
Accrued interest (+).....	
Original issue premium/discount (+).....	\$0.00
Bond surety fee (-).....	\$0.00
Lump-sum credit enhancements (-).....	\$0.00
Other AYL costs (-).....	
= AYL Target.....	\$1,203,000.00

City of Ironwood
Water System Series A
Debt Service Schedule
\$ 1,410,000.00

Dated: 05/23/2014
Delivered: 05/23/2014
No Calls

<i>Fiscal Yr</i>	<i>Coupon Date</i>	<i>Cusip #</i>	<i>Principal Payment</i>	<i>Coupon Rate</i>	<i>Interest Payment</i>	<i>Periodic Debt Service</i>	<i>Fiscal Debt Service</i>	<i>Outstanding Debt</i>
2015	11/01/2014				12,376.67	12,376.67	-	1,410,000.00
	05/01/2015		23,000.00	2.000	14,100.00	37,100.00	49,476.67	1,387,000.00
2016	11/01/2015				13,870.00	13,870.00	-	1,387,000.00
	05/01/2016		24,000.00	2.000	13,870.00	37,870.00	51,740.00	1,363,000.00
2017	11/01/2016				13,630.00	13,630.00	-	1,363,000.00
	05/01/2017		24,000.00	2.000	13,630.00	37,630.00	51,260.00	1,339,000.00
2018	11/01/2017				13,390.00	13,390.00	-	1,339,000.00
	05/01/2018		25,000.00	2.000	13,390.00	38,390.00	51,780.00	1,314,000.00
2019	11/01/2018				13,140.00	13,140.00	-	1,314,000.00
	05/01/2019		25,000.00	2.000	13,140.00	38,140.00	51,280.00	1,289,000.00
2020	11/01/2019				12,890.00	12,890.00	-	1,289,000.00
	05/01/2020		26,000.00	2.000	12,890.00	38,890.00	51,780.00	1,263,000.00
2021	11/01/2020				12,630.00	12,630.00	-	1,263,000.00
	05/01/2021		26,000.00	2.000	12,630.00	38,630.00	51,260.00	1,237,000.00
2022	11/01/2021				12,370.00	12,370.00	-	1,237,000.00
	05/01/2022		27,000.00	2.000	12,370.00	39,370.00	51,740.00	1,210,000.00
2023	11/01/2022				12,100.00	12,100.00	-	1,210,000.00
	05/01/2023		27,000.00	2.000	12,100.00	39,100.00	51,200.00	1,183,000.00
2024	11/01/2023				11,830.00	11,830.00	-	1,183,000.00
	05/01/2024		28,000.00	2.000	11,830.00	39,830.00	51,660.00	1,155,000.00
2025	11/01/2024				11,550.00	11,550.00	-	1,155,000.00
	05/01/2025		28,000.00	2.000	11,550.00	39,550.00	51,100.00	1,127,000.00
2026	11/01/2025				11,270.00	11,270.00	-	1,127,000.00
	05/01/2026		29,000.00	2.000	11,270.00	40,270.00	51,540.00	1,098,000.00
2027	11/01/2026				10,980.00	10,980.00	-	1,098,000.00
	05/01/2027		30,000.00	2.000	10,980.00	40,980.00	51,960.00	1,068,000.00
2028	11/01/2027				10,680.00	10,680.00	-	1,068,000.00
	05/01/2028		30,000.00	2.000	10,680.00	40,680.00	51,360.00	1,038,000.00
2029	11/01/2028				10,380.00	10,380.00	-	1,038,000.00
	05/01/2029		31,000.00	2.000	10,380.00	41,380.00	51,760.00	1,007,000.00
2030	11/01/2029				10,070.00	10,070.00	-	1,007,000.00
	05/01/2030		31,000.00	2.000	10,070.00	41,070.00	51,140.00	976,000.00
2031	11/01/2030				9,760.00	9,760.00	-	976,000.00
	05/01/2031		32,000.00	2.000	9,760.00	41,760.00	51,520.00	944,000.00
2032	11/01/2031				9,440.00	9,440.00	-	944,000.00
	05/01/2032		33,000.00	2.000	9,440.00	42,440.00	51,880.00	911,000.00
2033	11/01/2032				9,110.00	9,110.00	-	911,000.00
	05/01/2033		33,000.00	2.000	9,110.00	42,110.00	51,220.00	878,000.00
2034	11/01/2033				8,780.00	8,780.00	-	878,000.00
	05/01/2034		34,000.00	2.000	8,780.00	42,780.00	51,560.00	844,000.00
2035	11/01/2034				8,440.00	8,440.00	-	844,000.00
	05/01/2035		35,000.00	2.000	8,440.00	43,440.00	51,880.00	809,000.00
2036	11/01/2035				8,090.00	8,090.00	-	809,000.00
	05/01/2036		35,000.00	2.000	8,090.00	43,090.00	51,180.00	774,000.00
2037	11/01/2036				7,740.00	7,740.00	-	774,000.00
	05/01/2037		36,000.00	2.000	7,740.00	43,740.00	51,480.00	738,000.00
2038	11/01/2037				7,380.00	7,380.00	-	738,000.00
	05/01/2038		37,000.00	2.000	7,380.00	44,380.00	51,760.00	701,000.00
2039	11/01/2038				7,010.00	7,010.00	-	701,000.00

IRONWOOD-2014-D | FY: 7 | Mun-EaseElevateMainDb | 16.75 EDB | 05/26/2016 | 8:26 | Rpt24c

Click on the UserOps speed button t
Click on the UserOps speed button to initialize info about user

City of Ironwood
Water System Series A
Debt Service Schedule

Dated: 05/23/2014
Delivered: 05/23/2014
No Calls

\$ 1,410,000.00

<i>Fiscal Yr</i>	<i>Coupon Date</i>	<i>Cusip #</i>	<i>Principal Payment</i>	<i>Coupon Rate</i>	<i>Interest Payment</i>	<i>Periodic Debt Service</i>	<i>Fiscal Debt Service</i>	<i>Outstanding Debt</i>
	05/01/2039		38,000.00	2.000	7,010.00	45,010.00	52,020.00	663,000.00
2040	11/01/2039				6,630.00	6,630.00	-	663,000.00
	05/01/2040		38,000.00	2.000	6,630.00	44,630.00	51,260.00	625,000.00
2041	11/01/2040				6,250.00	6,250.00	-	625,000.00
	05/01/2041		39,000.00	2.000	6,250.00	45,250.00	51,500.00	586,000.00
2042	11/01/2041				5,860.00	5,860.00	-	586,000.00
	05/01/2042		40,000.00	2.000	5,860.00	45,860.00	51,720.00	546,000.00
2043	11/01/2042				5,460.00	5,460.00	-	546,000.00
	05/01/2043		41,000.00	2.000	5,460.00	46,460.00	51,920.00	505,000.00
2044	11/01/2043				5,050.00	5,050.00	-	505,000.00
	05/01/2044		41,000.00	2.000	5,050.00	46,050.00	51,100.00	464,000.00
2045	11/01/2044				4,640.00	4,640.00	-	464,000.00
	05/01/2045		42,000.00	2.000	4,640.00	46,640.00	51,280.00	422,000.00
2046	11/01/2045				4,220.00	4,220.00	-	422,000.00
	05/01/2046		43,000.00	2.000	4,220.00	47,220.00	51,440.00	379,000.00
2047	11/01/2046				3,790.00	3,790.00	-	379,000.00
	05/01/2047		44,000.00	2.000	3,790.00	47,790.00	51,580.00	335,000.00
2048	11/01/2047				3,350.00	3,350.00	-	335,000.00
	05/01/2048		45,000.00	2.000	3,350.00	48,350.00	51,700.00	290,000.00
2049	11/01/2048				2,900.00	2,900.00	-	290,000.00
	05/01/2049		46,000.00	2.000	2,900.00	48,900.00	51,800.00	244,000.00
2050	11/01/2049				2,440.00	2,440.00	-	244,000.00
	05/01/2050		47,000.00	2.000	2,440.00	49,440.00	51,880.00	197,000.00
2051	11/01/2050				1,970.00	1,970.00	-	197,000.00
	05/01/2051		48,000.00	2.000	1,970.00	49,970.00	51,940.00	149,000.00
2052	11/01/2051				1,490.00	1,490.00	-	149,000.00
	05/01/2052		49,000.00	2.000	1,490.00	50,490.00	51,980.00	100,000.00
2053	11/01/2052				1,000.00	1,000.00	-	100,000.00
	05/01/2053		50,000.00	2.000	1,000.00	51,000.00	52,000.00	50,000.00
2054	11/01/2053				500.00	500.00	-	50,000.00
	05/01/2054		50,000.00	2.000	500.00	50,500.00	51,000.00	
			1,410,000.00		650,636.67	2,060,636.67		

City of Ironwood
Water System Series B
Debt Service Schedule
\$ 1,396,000.00

Dated: 05/23/2014
Delivered: 05/23/2014
No Calls

<i>Fiscal Yr</i>	<i>Coupon Date</i>	<i>Cusip #</i>	<i>Principal Payment</i>	<i>Coupon Rate</i>	<i>Interest Payment</i>	<i>Periodic Debt Service</i>	<i>Fiscal Debt Service</i>	<i>Outstanding Debt</i>
2015	11/01/2014				12,253.77	12,253.77	-	1,396,000.00
	05/01/2015		23,000.00	2.000	13,960.00	36,960.00	49,213.77	1,373,000.00
2016	11/01/2015				13,730.00	13,730.00	-	1,373,000.00
	05/01/2016		24,000.00	2.000	13,730.00	37,730.00	51,460.00	1,349,000.00
2017	11/01/2016				13,490.00	13,490.00	-	1,349,000.00
	05/01/2017		24,000.00	2.000	13,490.00	37,490.00	50,980.00	1,325,000.00
2018	11/01/2017				13,250.00	13,250.00	-	1,325,000.00
	05/01/2018		25,000.00	2.000	13,250.00	38,250.00	51,500.00	1,300,000.00
2019	11/01/2018				13,000.00	13,000.00	-	1,300,000.00
	05/01/2019		25,000.00	2.000	13,000.00	38,000.00	51,000.00	1,275,000.00
2020	11/01/2019				12,750.00	12,750.00	-	1,275,000.00
	05/01/2020		26,000.00	2.000	12,750.00	38,750.00	51,500.00	1,249,000.00
2021	11/01/2020				12,490.00	12,490.00	-	1,249,000.00
	05/01/2021		26,000.00	2.000	12,490.00	38,490.00	50,980.00	1,223,000.00
2022	11/01/2021				12,230.00	12,230.00	-	1,223,000.00
	05/01/2022		27,000.00	2.000	12,230.00	39,230.00	51,460.00	1,196,000.00
2023	11/01/2022				11,960.00	11,960.00	-	1,196,000.00
	05/01/2023		27,000.00	2.000	11,960.00	38,960.00	50,920.00	1,169,000.00
2024	11/01/2023				11,690.00	11,690.00	-	1,169,000.00
	05/01/2024		28,000.00	2.000	11,690.00	39,690.00	51,380.00	1,141,000.00
2025	11/01/2024				11,410.00	11,410.00	-	1,141,000.00
	05/01/2025		28,000.00	2.000	11,410.00	39,410.00	50,820.00	1,113,000.00
2026	11/01/2025				11,130.00	11,130.00	-	1,113,000.00
	05/01/2026		29,000.00	2.000	11,130.00	40,130.00	51,260.00	1,084,000.00
2027	11/01/2026				10,840.00	10,840.00	-	1,084,000.00
	05/01/2027		29,000.00	2.000	10,840.00	39,840.00	50,680.00	1,055,000.00
2028	11/01/2027				10,550.00	10,550.00	-	1,055,000.00
	05/01/2028		30,000.00	2.000	10,550.00	40,550.00	51,100.00	1,025,000.00
2029	11/01/2028				10,250.00	10,250.00	-	1,025,000.00
	05/01/2029		31,000.00	2.000	10,250.00	41,250.00	51,500.00	994,000.00
2030	11/01/2029				9,940.00	9,940.00	-	994,000.00
	05/01/2030		31,000.00	2.000	9,940.00	40,940.00	50,880.00	963,000.00
2031	11/01/2030				9,630.00	9,630.00	-	963,000.00
	05/01/2031		32,000.00	2.000	9,630.00	41,630.00	51,260.00	931,000.00
2032	11/01/2031				9,310.00	9,310.00	-	931,000.00
	05/01/2032		32,000.00	2.000	9,310.00	41,310.00	50,620.00	899,000.00
2033	11/01/2032				8,990.00	8,990.00	-	899,000.00
	05/01/2033		33,000.00	2.000	8,990.00	41,990.00	50,980.00	866,000.00
2034	11/01/2033				8,660.00	8,660.00	-	866,000.00
	05/01/2034		34,000.00	2.000	8,660.00	42,660.00	51,320.00	832,000.00
2035	11/01/2034				8,320.00	8,320.00	-	832,000.00
	05/01/2035		34,000.00	2.000	8,320.00	42,320.00	50,640.00	798,000.00
2036	11/01/2035				7,980.00	7,980.00	-	798,000.00
	05/01/2036		35,000.00	2.000	7,980.00	42,980.00	50,960.00	763,000.00
2037	11/01/2036				7,630.00	7,630.00	-	763,000.00
	05/01/2037		36,000.00	2.000	7,630.00	43,630.00	51,260.00	727,000.00
2038	11/01/2037				7,270.00	7,270.00	-	727,000.00
	05/01/2038		36,000.00	2.000	7,270.00	43,270.00	50,540.00	691,000.00
2039	11/01/2038				6,910.00	6,910.00	-	691,000.00

City of Ironwood
Water System Series B
Debt Service Schedule

Dated: 05/23/2014

Delivered: 05/23/2014

No Calls

\$ 1,396,000.00

<i>Fiscal Yr</i>	<i>Coupon Date</i>	<i>Cusip #</i>	<i>Principal Payment</i>	<i>Coupon Rate</i>	<i>Interest Payment</i>	<i>Periodic Debt Service</i>	<i>Fiscal Debt Service</i>	<i>Outstanding Debt</i>
	05/01/2039		37,000.00	2.000	6,910.00	43,910.00	50,820.00	654,000.00
2040	11/01/2039				6,540.00	6,540.00	-	654,000.00
	05/01/2040		38,000.00	2.000	6,540.00	44,540.00	51,080.00	616,000.00
2041	11/01/2040				6,160.00	6,160.00	-	616,000.00
	05/01/2041		39,000.00	2.000	6,160.00	45,160.00	51,320.00	577,000.00
2042	11/01/2041				5,770.00	5,770.00	-	577,000.00
	05/01/2042		39,000.00	2.000	5,770.00	44,770.00	50,540.00	538,000.00
2043	11/01/2042				5,380.00	5,380.00	-	538,000.00
	05/01/2043		40,000.00	2.000	5,380.00	45,380.00	50,760.00	498,000.00
2044	11/01/2043				4,980.00	4,980.00	-	498,000.00
	05/01/2044		41,000.00	2.000	4,980.00	45,980.00	50,960.00	457,000.00
2045	11/01/2044				4,570.00	4,570.00	-	457,000.00
	05/01/2045		42,000.00	2.000	4,570.00	46,570.00	51,140.00	415,000.00
2046	11/01/2045				4,150.00	4,150.00	-	415,000.00
	05/01/2046		43,000.00	2.000	4,150.00	47,150.00	51,300.00	372,000.00
2047	11/01/2046				3,720.00	3,720.00	-	372,000.00
	05/01/2047		44,000.00	2.000	3,720.00	47,720.00	51,440.00	328,000.00
2048	11/01/2047				3,280.00	3,280.00	-	328,000.00
	05/01/2048		44,000.00	2.000	3,280.00	47,280.00	50,560.00	284,000.00
2049	11/01/2048				2,840.00	2,840.00	-	284,000.00
	05/01/2049		45,000.00	2.000	2,840.00	47,840.00	50,680.00	239,000.00
2050	11/01/2049				2,390.00	2,390.00	-	239,000.00
	05/01/2050		46,000.00	2.000	2,390.00	48,390.00	50,780.00	193,000.00
2051	11/01/2050				1,930.00	1,930.00	-	193,000.00
	05/01/2051		47,000.00	2.000	1,930.00	48,930.00	50,860.00	146,000.00
2052	11/01/2051				1,460.00	1,460.00	-	146,000.00
	05/01/2052		48,000.00	2.000	1,460.00	49,460.00	50,920.00	98,000.00
2053	11/01/2052				980.00	980.00	-	98,000.00
	05/01/2053		49,000.00	2.000	980.00	49,980.00	50,960.00	49,000.00
2054	11/01/2053				490.00	490.00	-	49,000.00
	05/01/2054		49,000.00	2.000	490.00	49,490.00	49,980.00	
			1,396,000.00		642,313.77	2,038,313.77		

City of Ironwood
Water System Series C
Debt Service Schedule

Dated: 05/23/2014
Delivered: 05/23/2014
No Calls

\$ 2,932,000.00

<i>Fiscal Yr</i>	<i>Coupon Date</i>	<i>Cusip #</i>	<i>Principal Payment</i>	<i>Coupon Rate</i>	<i>Interest Payment</i>	<i>Periodic Debt Service</i>	<i>Fiscal Debt Service</i>	<i>Outstanding Debt</i>
2015	11/01/2014				25,736.46	25,736.46	-	2,932,000.00
	05/01/2015		49,000.00	2.000	29,320.00	78,320.00	104,056.46	2,883,000.00
2016	11/01/2015				28,830.00	28,830.00	-	2,883,000.00
	05/01/2016		50,000.00	2.000	28,830.00	78,830.00	107,660.00	2,833,000.00
2017	11/01/2016				28,330.00	28,330.00	-	2,833,000.00
	05/01/2017		51,000.00	2.000	28,330.00	79,330.00	107,660.00	2,782,000.00
2018	11/01/2017				27,820.00	27,820.00	-	2,782,000.00
	05/01/2018		52,000.00	2.000	27,820.00	79,820.00	107,640.00	2,730,000.00
2019	11/01/2018				27,300.00	27,300.00	-	2,730,000.00
	05/01/2019		53,000.00	2.000	27,300.00	80,300.00	107,600.00	2,677,000.00
2020	11/01/2019				26,770.00	26,770.00	-	2,677,000.00
	05/01/2020		54,000.00	2.000	26,770.00	80,770.00	107,540.00	2,623,000.00
2021	11/01/2020				26,230.00	26,230.00	-	2,623,000.00
	05/01/2021		55,000.00	2.000	26,230.00	81,230.00	107,460.00	2,568,000.00
2022	11/01/2021				25,680.00	25,680.00	-	2,568,000.00
	05/01/2022		56,000.00	2.000	25,680.00	81,680.00	107,360.00	2,512,000.00
2023	11/01/2022				25,120.00	25,120.00	-	2,512,000.00
	05/01/2023		57,000.00	2.000	25,120.00	82,120.00	107,240.00	2,455,000.00
2024	11/01/2023				24,550.00	24,550.00	-	2,455,000.00
	05/01/2024		58,000.00	2.000	24,550.00	82,550.00	107,100.00	2,397,000.00
2025	11/01/2024				23,970.00	23,970.00	-	2,397,000.00
	05/01/2025		59,000.00	2.000	23,970.00	82,970.00	106,940.00	2,338,000.00
2026	11/01/2025				23,380.00	23,380.00	-	2,338,000.00
	05/01/2026		60,000.00	2.000	23,380.00	83,380.00	106,760.00	2,278,000.00
2027	11/01/2026				22,780.00	22,780.00	-	2,278,000.00
	05/01/2027		62,000.00	2.000	22,780.00	84,780.00	107,560.00	2,216,000.00
2028	11/01/2027				22,160.00	22,160.00	-	2,216,000.00
	05/01/2028		63,000.00	2.000	22,160.00	85,160.00	107,320.00	2,153,000.00
2029	11/01/2028				21,530.00	21,530.00	-	2,153,000.00
	05/01/2029		64,000.00	2.000	21,530.00	85,530.00	107,060.00	2,089,000.00
2030	11/01/2029				20,890.00	20,890.00	-	2,089,000.00
	05/01/2030		65,000.00	2.000	20,890.00	85,890.00	106,780.00	2,024,000.00
2031	11/01/2030				20,240.00	20,240.00	-	2,024,000.00
	05/01/2031		67,000.00	2.000	20,240.00	87,240.00	107,480.00	1,957,000.00
2032	11/01/2031				19,570.00	19,570.00	-	1,957,000.00
	05/01/2032		68,000.00	2.000	19,570.00	87,570.00	107,140.00	1,889,000.00
2033	11/01/2032				18,890.00	18,890.00	-	1,889,000.00
	05/01/2033		69,000.00	2.000	18,890.00	87,890.00	106,780.00	1,820,000.00
2034	11/01/2033				18,200.00	18,200.00	-	1,820,000.00
	05/01/2034		71,000.00	2.000	18,200.00	89,200.00	107,400.00	1,749,000.00
2035	11/01/2034				17,490.00	17,490.00	-	1,749,000.00
	05/01/2035		72,000.00	2.000	17,490.00	89,490.00	106,980.00	1,677,000.00
2036	11/01/2035				16,770.00	16,770.00	-	1,677,000.00
	05/01/2036		74,000.00	2.000	16,770.00	90,770.00	107,540.00	1,603,000.00
2037	11/01/2036				16,030.00	16,030.00	-	1,603,000.00
	05/01/2037		75,000.00	2.000	16,030.00	91,030.00	107,060.00	1,528,000.00
2038	11/01/2037				15,280.00	15,280.00	-	1,528,000.00
	05/01/2038		77,000.00	2.000	15,280.00	92,280.00	107,560.00	1,451,000.00
2039	11/01/2038				14,510.00	14,510.00	-	1,451,000.00

City of Ironwood
Water System Series C
Debt Service Schedule

Dated: 05/23/2014

Delivered: 05/23/2014

No Calls

\$ 2,932,000.00

<i>Fiscal Yr</i>	<i>Coupon Date</i>	<i>Cusip #</i>	<i>Principal Payment</i>	<i>Coupon Rate</i>	<i>Interest Payment</i>	<i>Periodic Debt Service</i>	<i>Fiscal Debt Service</i>	<i>Outstanding Debt</i>
	05/01/2039		78,000.00	2.000	14,510.00	92,510.00	107,020.00	1,373,000.00
2040	11/01/2039				13,730.00	13,730.00	-	1,373,000.00
	05/01/2040		80,000.00	2.000	13,730.00	93,730.00	107,460.00	1,293,000.00
2041	11/01/2040				12,930.00	12,930.00	-	1,293,000.00
	05/01/2041		81,000.00	2.000	12,930.00	93,930.00	106,860.00	1,212,000.00
2042	11/01/2041				12,120.00	12,120.00	-	1,212,000.00
	05/01/2042		83,000.00	2.000	12,120.00	95,120.00	107,240.00	1,129,000.00
2043	11/01/2042				11,290.00	11,290.00	-	1,129,000.00
	05/01/2043		85,000.00	2.000	11,290.00	96,290.00	107,580.00	1,044,000.00
2044	11/01/2043				10,440.00	10,440.00	-	1,044,000.00
	05/01/2044		86,000.00	2.000	10,440.00	96,440.00	106,880.00	958,000.00
2045	11/01/2044				9,580.00	9,580.00	-	958,000.00
	05/01/2045		88,000.00	2.000	9,580.00	97,580.00	107,160.00	870,000.00
2046	11/01/2045				8,700.00	8,700.00	-	870,000.00
	05/01/2046		90,000.00	2.000	8,700.00	98,700.00	107,400.00	780,000.00
2047	11/01/2046				7,800.00	7,800.00	-	780,000.00
	05/01/2047		92,000.00	2.000	7,800.00	99,800.00	107,600.00	688,000.00
2048	11/01/2047				6,880.00	6,880.00	-	688,000.00
	05/01/2048		93,000.00	2.000	6,880.00	99,880.00	106,760.00	595,000.00
2049	11/01/2048				5,950.00	5,950.00	-	595,000.00
	05/01/2049		95,000.00	2.000	5,950.00	100,950.00	106,900.00	500,000.00
2050	11/01/2049				5,000.00	5,000.00	-	500,000.00
	05/01/2050		97,000.00	2.000	5,000.00	102,000.00	107,000.00	403,000.00
2051	11/01/2050				4,030.00	4,030.00	-	403,000.00
	05/01/2051		99,000.00	2.000	4,030.00	103,030.00	107,060.00	304,000.00
2052	11/01/2051				3,040.00	3,040.00	-	304,000.00
	05/01/2052		101,000.00	2.000	3,040.00	104,040.00	107,080.00	203,000.00
2053	11/01/2052				2,030.00	2,030.00	-	203,000.00
	05/01/2053		103,000.00	2.000	2,030.00	105,030.00	107,060.00	100,000.00
2054	11/01/2053				1,000.00	1,000.00	-	100,000.00
	05/01/2054		100,000.00	2.000	1,000.00	101,000.00	102,000.00	
			2,932,000.00		1,348,736.46	4,280,736.46		

IRONWOOD
Water Revenue Bond
Debt Service Schedule

Dated: 07/11/2017
Delivered: 07/11/2017
No Calls

\$ 2,701,000.00

<i>Fiscal Yr</i>	<i>Coupon Date</i>	<i>Cusip #</i>	<i>Principal Payment</i>	<i>Coupon Rate</i>	<i>Interest Payment</i>	<i>Periodic Debt Service</i>	<i>Fiscal Debt Service</i>	<i>Outstanding Debt</i>
2018	01/01/2018				20,726.42	20,726.42	20,726.42	2,701,000.00
2019	07/01/2018		48,000.00	1.625	21,945.61	69,945.61	-	2,653,000.00
	01/01/2019				21,555.61	21,555.61	91,501.22	2,653,000.00
2020	07/01/2019		49,000.00	1.625	21,555.61	70,555.61	-	2,604,000.00
	01/01/2020				21,157.49	21,157.49	91,713.10	2,604,000.00
2021	07/01/2020		50,000.00	1.625	21,157.49	71,157.49	-	2,554,000.00
	01/01/2021				20,751.24	20,751.24	91,908.73	2,554,000.00
2022	07/01/2021		51,000.00	1.625	20,751.24	71,751.24	-	2,503,000.00
	01/01/2022				20,336.86	20,336.86	92,088.10	2,503,000.00
2023	07/01/2022		52,000.00	1.625	20,336.86	72,336.86	-	2,451,000.00
	01/01/2023				19,914.36	19,914.36	92,251.22	2,451,000.00
2024	07/01/2023		53,000.00	1.625	19,914.36	72,914.36	-	2,398,000.00
	01/01/2024				19,483.74	19,483.74	92,398.10	2,398,000.00
2025	07/01/2024		53,000.00	1.625	19,483.74	72,483.74	-	2,345,000.00
	01/01/2025				19,053.12	19,053.12	91,536.86	2,345,000.00
2026	07/01/2025		54,000.00	1.625	19,053.12	73,053.12	-	2,291,000.00
	01/01/2026				18,614.37	18,614.37	91,667.49	2,291,000.00
2027	07/01/2026		55,000.00	1.625	18,614.37	73,614.37	-	2,236,000.00
	01/01/2027				18,167.49	18,167.49	91,781.86	2,236,000.00
2028	07/01/2027		56,000.00	1.625	18,167.49	74,167.49	-	2,180,000.00
	01/01/2028				17,712.49	17,712.49	91,879.98	2,180,000.00
2029	07/01/2028		57,000.00	1.625	17,712.49	74,712.49	-	2,123,000.00
	01/01/2029				17,249.37	17,249.37	91,961.86	2,123,000.00
2030	07/01/2029		58,000.00	1.625	17,249.37	75,249.37	-	2,065,000.00
	01/01/2030				16,778.12	16,778.12	92,027.49	2,065,000.00
2031	07/01/2030		59,000.00	1.625	16,778.12	75,778.12	-	2,006,000.00
	01/01/2031				16,298.74	16,298.74	92,076.86	2,006,000.00
2032	07/01/2031		60,000.00	1.625	16,298.74	76,298.74	-	1,946,000.00
	01/01/2032				15,811.24	15,811.24	92,109.98	1,946,000.00
2033	07/01/2032		61,000.00	1.625	15,811.24	76,811.24	-	1,885,000.00
	01/01/2033				15,315.62	15,315.62	92,126.86	1,885,000.00
2034	07/01/2033		62,000.00	1.625	15,315.62	77,315.62	-	1,823,000.00
	01/01/2034				14,811.87	14,811.87	92,127.49	1,823,000.00
2035	07/01/2034		63,000.00	1.625	14,811.87	77,811.87	-	1,760,000.00
	01/01/2035				14,299.99	14,299.99	92,111.86	1,760,000.00
2036	07/01/2035		64,000.00	1.625	14,299.99	78,299.99	-	1,696,000.00
	01/01/2036				13,779.99	13,779.99	92,079.98	1,696,000.00
2037	07/01/2036		65,000.00	1.625	13,779.99	78,779.99	-	1,631,000.00
	01/01/2037				13,251.87	13,251.87	92,031.86	1,631,000.00
2038	07/01/2037		66,000.00	1.625	13,251.87	79,251.87	-	1,565,000.00
	01/01/2038				12,715.62	12,715.62	91,967.49	1,565,000.00
2039	07/01/2038		67,000.00	1.625	12,715.62	79,715.62	-	1,498,000.00
	01/01/2039				12,171.24	12,171.24	91,886.86	1,498,000.00
2040	07/01/2039		68,000.00	1.625	12,171.24	80,171.24	-	1,430,000.00
	01/01/2040				11,618.74	11,618.74	91,789.98	1,430,000.00
2041	07/01/2040		69,000.00	1.625	11,618.74	80,618.74	-	1,361,000.00
	01/01/2041				11,058.12	11,058.12	91,676.86	1,361,000.00
2042	07/01/2041		70,000.00	1.625	11,058.12	81,058.12	-	1,291,000.00
	01/01/2042				10,489.37	10,489.37	91,547.49	1,291,000.00

IRONWOOD
Water Revenue Bond
Debt Service Schedule

Dated: 07/11/2017
Delivered: 07/11/2017
No Calls

\$ 2,701,000.00

<i>Fiscal Yr</i>	<i>Coupon Date</i>	<i>Cusip #</i>	<i>Principal Payment</i>	<i>Coupon Rate</i>	<i>Interest Payment</i>	<i>Periodic Debt Service</i>	<i>Fiscal Debt Service</i>	<i>Outstanding Debt</i>
2043	07/01/2042		71,000.00	1.625	10,489.37	81,489.37	-	1,220,000.00
	01/01/2043				9,912.49	9,912.49	91,401.86	1,220,000.00
2044	07/01/2043		73,000.00	1.625	9,912.49	82,912.49	-	1,147,000.00
	01/01/2044				9,319.37	9,319.37	92,231.86	1,147,000.00
2045	07/01/2044		74,000.00	1.625	9,319.37	83,319.37	-	1,073,000.00
	01/01/2045				8,718.12	8,718.12	92,037.49	1,073,000.00
2046	07/01/2045		75,000.00	1.625	8,718.12	83,718.12	-	998,000.00
	01/01/2046				8,108.74	8,108.74	91,826.86	998,000.00
2047	07/01/2046		76,000.00	1.625	8,108.74	84,108.74	-	922,000.00
	01/01/2047				7,491.24	7,491.24	91,599.98	922,000.00
2048	07/01/2047		77,000.00	1.625	7,491.24	84,491.24	-	845,000.00
	01/01/2048				6,865.62	6,865.62	91,356.86	845,000.00
2049	07/01/2048		79,000.00	1.625	6,865.62	85,865.62	-	766,000.00
	01/01/2049				6,223.74	6,223.74	92,089.36	766,000.00
2050	07/01/2049		80,000.00	1.625	6,223.74	86,223.74	-	686,000.00
	01/01/2050				5,573.74	5,573.74	91,797.48	686,000.00
2051	07/01/2050		81,000.00	1.625	5,573.74	86,573.74	-	605,000.00
	01/01/2051				4,915.62	4,915.62	91,489.36	605,000.00
2052	07/01/2051		83,000.00	1.625	4,915.62	87,915.62	-	522,000.00
	01/01/2052				4,241.24	4,241.24	92,156.86	522,000.00
2053	07/01/2052		84,000.00	1.625	4,241.24	88,241.24	-	438,000.00
	01/01/2053				3,558.74	3,558.74	91,799.98	438,000.00
2054	07/01/2053		85,000.00	1.625	3,558.74	88,558.74	-	353,000.00
	01/01/2054				2,868.12	2,868.12	91,426.86	353,000.00
2055	07/01/2054		87,000.00	1.625	2,868.12	89,868.12	-	266,000.00
	01/01/2055				2,161.24	2,161.24	92,029.36	266,000.00
2056	07/01/2055		88,000.00	1.625	2,161.24	90,161.24	-	178,000.00
	01/01/2056				1,446.24	1,446.24	91,607.48	178,000.00
2057	07/01/2056		89,000.00	1.625	1,446.24	90,446.24	-	89,000.00
	01/01/2057				723.12	723.12	91,169.36	89,000.00
2058	07/01/2057		89,000.00	1.625	723.12	89,723.12	89,723.12	
			2,701,000.00		991,720.13	3,692,720.08		

Example Bond Schedule**Date: 06/10/20**

Borrower Name: City of Ironwood
Project Name: Water Project No. 5
Interest Rate: 1.750%
Yrs Deferred Principle: 0
Principal: \$9,724,000 (round to nearest \$1000)
Ammort. Factor: 0.0350
Ammortized Payment: \$340,069

Type of Bond: Water Project 5

Year	1st Interest	2nd Interest	Principal Paid	Total Year Payment	Loan Balance
					9,724,000
1	85,085	85,085	169,899	340,069	9,554,101
2	83,598	83,598	172,872	340,069	9,381,230
3	82,086	82,086	175,897	340,069	9,205,332
4	80,547	80,547	178,975	340,069	9,026,357
5	78,981	78,981	182,107	340,069	8,844,250
6	77,387	77,387	185,294	340,069	8,658,956
7	75,766	75,766	188,537	340,069	8,470,419
8	74,116	74,116	191,836	340,069	8,278,582
9	72,438	72,438	195,193	340,069	8,083,389
10	70,730	70,730	198,609	340,069	7,884,780
11	68,992	68,992	202,085	340,069	7,682,695
12	67,224	67,224	205,621	340,069	7,477,073
13	65,424	65,424	209,220	340,069	7,267,853
14	63,594	63,594	212,881	340,069	7,054,972
15	61,731	61,731	216,607	340,069	6,838,366
16	59,836	59,836	220,397	340,069	6,617,968
17	57,907	57,907	224,254	340,069	6,393,714
18	55,945	55,945	228,179	340,069	6,165,536
19	53,948	53,948	232,172	340,069	5,933,364
20	51,917	51,917	236,235	340,069	5,697,129
21	49,850	49,850	240,369	340,069	5,456,760
22	47,747	47,747	244,575	340,069	5,212,185
23	45,607	45,607	248,855	340,069	4,963,330
24	43,429	43,429	253,210	340,069	4,710,119
25	41,214	41,214	257,642	340,069	4,452,478
26	38,959	38,959	262,150	340,069	4,190,327
27	36,665	36,665	266,738	340,069	3,923,590
28	34,331	34,331	271,406	340,069	3,652,184
29	31,957	31,957	276,155	340,069	3,376,028
30	29,540	29,540	280,988	340,069	3,095,040
31	27,082	27,082	285,905	340,069	2,809,135
32	24,580	24,580	290,909	340,069	2,518,226
33	22,034	22,034	296,000	340,069	2,222,226
34	19,444	19,444	301,180	340,069	1,921,047
35	16,809	16,809	306,450	340,069	1,614,596
36	14,128	14,128	311,813	340,069	1,302,783
37	11,399	11,399	317,270	340,069	985,513
38	8,623	8,623	322,822	340,069	662,691
39	5,799	5,799	328,472	340,069	334,220
40	2,924	2,924	334,220	340,069	0

City of Ironwood Water System
Short-Lived Depreciation Schedule
Attachment D

Years	Description	Replacement Cost	Annual Reserve
10	Meters	\$40,000	\$4,000
15	Storage Tank	\$131,000	\$8,733
15	Equipment	\$55,000	\$3,667
15	Water Plant Controls	\$90,000	\$6,000
10	Pumps	\$7,500	\$750
10	Mechanical System	\$5,000	\$500
10	Generator	\$100,000	\$10,000
15	VFDs	\$100,000	\$6,667
Total			\$40,317

(2) Water Supply System Bond and Interest Redemption Account. There is hereby established a separate account to be designated as the WATER SUPPLY SYSTEM BOND AND INTEREST REDEMPTION ACCOUNT (the "Bond and Interest Redemption Account"). After the transfer required in (1) above, Revenues shall be transferred each quarter of the Fiscal Year, commencing October 1, 2010 from the Receiving Fund, before any other expenditures or transfer therefrom, and deposited in the Bond and Interest Redemption Account for payment of principal of and interest on the Bonds and to fund the Bond Reserve Account.

Upon any delivery of an installment of the Bonds there shall be set aside at the time of delivery and on the first day of each quarter of the Fiscal Year thereafter to the next interest payment date an amount equal to that fraction of the amount of interest due on the next interest payment date on said installment so delivered, the numerator of which is 1 and the denominator of which is the number of full and partial Fiscal Year quarters from the date of said delivery to the next interest payment date. There shall be set aside each Fiscal Year quarter on or after January 1, 2011, an amount not less than 1/2 of the amount of interest due on the next interest payment date on all outstanding installments of the Bonds not delivered during the then current interest payment period.

Upon any delivery of an installment of the Bonds there shall be set aside at the time of such delivery and on the first day of each quarter of the Fiscal Year thereafter to the next principal payment date an amount equal to that fraction of the amount of principal due on the next principal payment date on said installment so delivered, the numerator of which is 1 and the denominator of which is the number of full and partial Fiscal Year quarters from the date of said delivery to the next principal payment date. There shall also be set aside each Fiscal Year quarter on or after July 1, 2011, an amount not less than 1/4 of the amount of principal due on the next principal payment date. Except as hereinafter provided, no further deposits shall be made into the Bond and Interest Redemption Account (excluding the Bond Reserve Account) once the aforesaid sums have been deposited therein. Any amount on deposit in the Bond and Interest Redemption Account (excluding the Bond Reserve Account) in excess of (a.) the amount needed for payment of principal installments of the Bonds for the then current principal payment period, plus (b.) interest on the Bonds for the then current interest payment period, shall be used by the Issuer for redemption of principal installments of the Bonds in the manner set forth in Section 9 hereof, or, if such use is impracticable, shall be deposited in or credited to the Receiving Fund.

If for any reason there is a failure to make such quarterly deposit in the amounts required, then the entire amount of the deficiency shall be set aside and deposited in the Bond and Interest Redemption Account out of the Revenues first received thereafter which are not required by this Ordinance to be deposited in the Operation and Maintenance Fund or in the Bond and Interest Redemption Account, which amount shall be in addition to the regular quarterly deposit required during such succeeding quarter or quarters.

There is hereby recognized in the Bond and Interest Redemption Account a separate account designated as the BOND RESERVE ACCOUNT. Commencing October 1, 2010 there shall be withdrawn from the Receiving Account at the beginning of each Fiscal Year quarter and set aside in and transferred to the Bond Reserve Account, after provision has been made for the Operation and Maintenance Account and the current requirements of the Bond and Interest

Redemption Account, the sum of at least \$2,562.50 per quarter (\$10,250 annually) until there is accumulated in such account the lesser of the sum of \$102,500 or the Reserve Amount. Except as hereinafter provided, no further deposits shall be made into the Bond and Interest Redemption Account for the purposes of the Bond Reserve Account once the lesser of the sum of \$102,500 or the Reserve Amount has been deposited therein. The moneys in the Bond Reserve Account shall be used solely for the payment of the principal installments of and interest on the Bonds as to which there would otherwise be default; provided however, that in the event the amount on deposit in the Bond Reserve Account exceeds the Reserve Amount, the moneys in excess of the Reserve Amount shall be used to pay principal installments of and interest on the Bonds on the next payment date.

If at any time it shall be necessary to use moneys in the Bond Reserve Account for such payment, then the moneys so used shall be replaced from the Net Revenues first received thereafter which are not required by this Ordinance to be used for operation and maintenance or for current principal and interest requirements for the Bonds.

No further payments need be made into the Bond and Interest Redemption Account after enough of the principal installments of the Bonds have been retired so that the amount then held in the Bond and Interest Redemption Account (including the Bond Reserve Account), is equal to the entire amount of principal and interest which will be payable at the time of maturity of all the principal installments of the Bonds then remaining outstanding.

The moneys in the Bond and Interest Redemption Account and the Bond Reserve Account shall be invested in accordance with Section 13 of this Ordinance, and profit realized or income earned on such investment shall be used or transferred as provided in Section 13 of this Ordinance.

(3) Repair, Replacement and Improvement Account. There is hereby established a separate account designated REPAIR, REPLACEMENT AND IMPROVEMENT ACCOUNT (the "RRI Account"). After the transfers required in (1) and (2) above, and so long as any principal installments of the Bonds remain outstanding, revenues shall be transferred each Fiscal Year quarter from the Receiving Account and deposited in the RRI Account in an amount not less than \$10,087.50 per quarter (\$40,350 per year), less the amount, if any, deposited in the Bond Reserve Account at the beginning of the same Fiscal Year quarter. Moneys in the RRI Account shall be used and disbursed only for the purpose of paying the cost of (a) repairing any damage to and emergency maintenance of the System, (b) repairing or replacing obsolete, deteriorating, deteriorated or worn out portions of the System, (c) acquiring and constructing extensions and improvements to the System and (d) when necessary, for the purpose of making payment of principal and interest on the Bonds. If the amount in the Bond and Interest Redemption Account and the Bond Reserve Account is not sufficient to pay the principal of and interest on the Bonds when due, the moneys in the RRI Account shall be transferred to the Bond and Interest Redemption Account and used for that purpose. Moneys in the RRI Account may be invested in accordance with Section 13 of this Ordinance.

(4) Reverse Flow of Funds; Surplus Money. In the event the moneys in the Receiving Fund are insufficient to provide for the current requirements of the Operation and Maintenance Fund, the Bond and Interest Redemption Account (including the Bond Reserve

the next principal payment date on said installment so delivered, the numerator of which is 1 and the denominator of which is the number of full and partial Fiscal Year quarters from the date of said delivery to the next principal payment date. There shall also be set aside each Fiscal Year quarter on or after July 1, 2011, an amount not less than 1/4 of the amount of principal due on the next principal payment date. Except as hereinafter provided, no further deposits shall be made into the Bond and Interest Redemption Account (excluding the Bond Reserve Account) once the aforesaid sums have been deposited therein. Any amount on deposit in the Bond and Interest Redemption Account (excluding the Bond Reserve Account) in excess of (a.) the amount needed for payment of principal installments of the Series 2010C Bond and the Outstanding Bonds for the then current principal payment period, plus (b.) interest on the Series 2010C Bond and the Outstanding Bonds for the then current interest payment period, shall be used by the Issuer for redemption of principal installments of the Series 2010C Bond and the Outstanding Bonds pro-rata in the manner set forth in Section 9 hereof, or, if such use is impracticable, shall be deposited in or credited to the Receiving Fund. The set-aside or deposit of amounts in this paragraph shall be in addition to the set-aside or deposit requirements provided in Ordinance No. 481.

If for any reason there is a failure to make such quarterly deposit in the amounts required, then the entire amount of the deficiency shall be set aside and deposited in the Bond and Interest Redemption Account out of the Revenues first received thereafter which are not required by this Ordinance to be deposited in the Operation and Maintenance Fund or in the Bond and Interest Redemption Account, which amount shall be in addition to the regular quarterly deposit required during such succeeding quarter or quarters.

There is hereby recognized in the Bond and Interest Redemption Account a separate account designated as the BOND RESERVE ACCOUNT. Commencing October 1, 2010 there shall be withdrawn from the Receiving Account at the beginning of each Fiscal Year quarter and set aside in and transferred to the Bond Reserve Account, after provision has been made for the Operation and Maintenance Account and the current requirements of the Bond and Interest Redemption Account, the sum of at least \$1,262.50 per quarter (\$5,050 annually) until there is accumulated in such account the lesser of the sum of \$50,500 or the Reserve Amount. Except as hereinafter provided, no further deposits shall be made into the Bond and Interest Redemption Account for the purposes of the Bond Reserve Account once the lesser of the sum of \$50,500 or the Reserve Amount has been deposited therein. The moneys in the Bond Reserve Account shall be used solely for the payment of the principal installments of and interest on the Bonds and the Outstanding Bonds as to which there would otherwise be default; provided however, that in the event the amount on deposit in the Bond Reserve Account exceeds the Reserve Amount, the moneys in excess of the Reserve Amount shall be used to pay principal installments of and interest on the Bonds on the next payment date. The set-aside or deposit of amounts in this paragraph shall be in addition to the set-aside or deposit requirements provided in Ordinance No. 481.

If at any time it shall be necessary to use moneys in the Bond Reserve Account for such payment, then the moneys so used shall be replaced from the Net Revenues first received thereafter which are not required by this Ordinance to be used for operation and maintenance or for current principal and interest requirements for the Bonds and the Outstanding Bonds.

Upon any delivery of an installment of the Series 2014 Bonds, there shall be set aside at the time of delivery and on the first day of each quarter of the Fiscal Year thereafter to the next interest payment date an amount equal to that fraction of the amount of interest due on the next interest payment date on said installment so delivered, the numerator of which is 1 and the denominator of which is the number of full and partial Fiscal Year quarters from the date of said delivery to the next interest payment date. There shall be set aside each Fiscal Year quarter on or after July 1, 2014, an amount not less than 1/2 of the amount of interest due on the next interest payment date on all outstanding installments of the Series 2014 Bonds not delivered during the then current interest payment period. The set aside or deposit of amounts required by this paragraph shall be in addition to the set aside or deposit requirements provided in the Outstanding Senior Lien Ordinances for the Outstanding Senior Lien Bonds.

Upon any delivery of an installment of the Series 2014 Bonds, there shall be set aside at the time of such delivery and on the first day of each quarter of the Fiscal Year thereafter to the next principal payment date, an amount equal to that fraction of the amount of principal due on the next principal payment date on said installment so delivered, the numerator of which is 1 and the denominator of which is the number of full and partial Fiscal Year quarters from the date of said delivery to the next principal payment date. There shall also be set aside each Fiscal Year quarter on or after July 1, 2014, an amount not less than 1/4 of the amount of principal due on the Series 2014 Bonds on the next principal payment date. Except as hereinafter provided, no further deposits shall be made into the Bond and Interest Redemption Account (excluding the Bond Reserve Account) once the aforesaid sums have been deposited therein. Any amount on deposit in the Bond and Interest Redemption Account (excluding the Bond Reserve Account) in excess of (a) the amount needed for payment of principal installments of the Series 2014 Bonds and the Outstanding Senior Lien Bonds for the then current principal payment period, plus (b) interest on the Series 2014 Bonds and the Outstanding Senior Lien Bonds for the then current interest payment period, shall be used by the Issuer for redemption of principal installments of the Series 2014 Bonds or the Outstanding Senior Lien Bonds, or, if such use is impracticable, shall be deposited in or credited to the Receiving Fund. The set aside or deposit of amounts required by this paragraph shall be in addition to the set aside or deposit requirements provided in the Outstanding Senior Lien Ordinances for the Outstanding Senior Lien Bonds.

If for any reason there is a failure to make such quarterly deposit in the amounts required, then the entire amount of the deficiency shall be set aside and deposited in the Bond and Interest Redemption Account out of the Revenues first received thereafter which are not required by the Outstanding Senior Lien Ordinances or this Ordinance to be deposited in the Operation and Maintenance Account or the Bond and Interest Redemption Account, which amount shall be in addition to the regular quarterly deposit required during such succeeding quarter or quarters.

There was established by Ordinance No. 481 a separate account within the Bond and Interest Redemption Account designated the BOND RESERVE ACCOUNT (the "Bond Reserve Account"), which shall continue to be maintained by the Issuer. Commencing July 1, 2014, and in addition to the transfers to the Bond Reserve Account required by the Outstanding Senior Lien Ordinances, there shall be withdrawn from the Receiving Account at the beginning of each Fiscal Year quarter and set aside in and transferred to the Bond Reserve Account, after provision has been made for the Operation and Maintenance Account and the current requirements of the

Bond and Interest Redemption Account, the sum of at least \$5,290.00 per quarter (\$21,160.00 annually) until the lesser of the sum of \$211,600.00 or the Reserve Amount has been added to the amounts required to be deposited in the Bond Reserve Account pursuant to the Outstanding Senior Lien Ordinances. Except as hereinafter provided, no further deposits shall be made into the Bond Reserve Account pursuant to the requirements of this Ordinance once the lesser of the sum of \$211,600.00 or the Reserve Amount has been added to the amounts required to be deposited in the Bond Reserve Account pursuant to the Outstanding Senior Lien Ordinances.

The moneys in the Bond Reserve Account shall be used solely for the payment of the principal installments of and interest on the Series 2014 Bonds and the Outstanding Senior Lien Bonds as to which there would otherwise be default; provided, however, that in the event that the amount on deposit in the Bond Reserve Account at the end of any Fiscal Year exceeds the amount then required to be on deposit therein pursuant to the requirements of the Outstanding Senior Lien Ordinances and this Ordinance, the moneys in excess of such requirements shall be used to pay principal installments of and interest on the Series 2014 Bonds or the Outstanding Senior Lien Bonds on the next payment date.

If at any time it shall be necessary to use moneys in the Bond Reserve Account for such payment, then the moneys so used shall be replaced from the Net Revenues first received thereafter which are not required by the Outstanding Senior Lien Ordinances or this Ordinance to be deposited to the Operation and Maintenance Account or to the Bond and Interest Redemption Account for current principal and interest requirements for the Series 2014 Bonds or the Outstanding Senior Lien Bonds.

No further payments need be made into the Bond and Interest Redemption Account after enough of the principal installments of the Series 2014 Bonds and the Outstanding Senior Lien Bonds have been retired so that the amount then held in the Bond and Interest Redemption Account (including the Bond Reserve Account), is equal to the entire amount of principal and interest which will be payable at the time of maturity of all the principal installments of the Series 2014 Bonds and the Outstanding Senior Lien Bonds then remaining outstanding.

The moneys in the Bond and Interest Redemption Account and the Bond Reserve Account shall be invested in accordance with Section 13 of this Ordinance, and profit realized or income earned on such investment shall be used or transferred as provided in Section 13 of this Ordinance.

(3) Junior Lien Bond Redemption Fund. There was established by Ordinance No. 425 a Junior Lien Bond Redemption Fund, which shall continue to be maintained by the Issuer. After the transfers required in (1) and (2) above, Revenues of the System shall continue to be deposited in the Junior Lien Bond Redemption Fund at the times specified in Ordinance No. 425 for so long as the Outstanding Junior Lien Bonds remain outstanding.

(4) Repair, Replacement and Improvement Account. There was established by Ordinance No. 481 a separate account designated REPAIR, REPLACEMENT AND IMPROVEMENT ACCOUNT (the "RRI Account"), which shall continue to be maintained by the Issuer. After the transfers required in (1), (2) and (3) above, and in addition to the transfers to the RRI Account required by the Outstanding Senior Lien Ordinances, and so long as any principal installments of the Series 2014 Bonds remain outstanding, Revenues shall be

ORDINANCE NO. 515

AN ORDINANCE TO PROVIDE FOR THE ACQUISITION, CONSTRUCTION AND EQUIPPING OF IMPROVEMENTS TO THE WATER SUPPLY SYSTEM OF THE CITY OF IRONWOOD; TO PROVIDE FOR THE ISSUANCE AND SALE OF REVENUE BONDS TO PAY A PORTION OF THE COST THEREOF; TO PRESCRIBE THE FORM OF THE BONDS; TO PROVIDE FOR THE COLLECTION OF REVENUES FROM THE SYSTEM SUFFICIENT FOR THE PURPOSE OF PAYING THE COSTS OF OPERATION AND MAINTENANCE OF THE SYSTEM AND TO PAY THE PRINCIPAL OF AND INTEREST ON THE BONDS AND CERTAIN OUTSTANDING BONDS OF THE SYSTEM; TO PROVIDE AN ADEQUATE RESERVE ACCOUNT FOR THE BONDS; TO PROVIDE FOR THE SEGREGATION AND DISTRIBUTION OF REVENUES OF THE SYSTEM; TO PROVIDE FOR THE RIGHTS OF THE HOLDERS OF THE BONDS IN ENFORCEMENT THEREOF; TO PROVIDE FOR OTHER MATTERS RELATING TO THE BONDS, THE OUTSTANDING BONDS AND THE SYSTEM; AND TO AMEND CERTAIN PROVISIONS OF ORDINANCE NO. 503 OF THE CITY OF IRONWOOD.

THE CITY OF IRONWOOD ORDAINS:

Section 1. Definitions. In addition to the words and terms defined in the Outstanding Senior Lien Ordinances (as hereinafter defined) or elsewhere in this Ordinance, the following words and terms as used in this Ordinance shall have the meanings assigned in this Section, unless the context or use clearly indicates another or different meaning or intent.

The word “acquired,” as used in this Ordinance, shall be construed to include acquisition by purchase, construction or by any other method.

“Act 94” shall mean Act 94, Public Acts of Michigan, 1933, as amended.

“Additional Bonds” shall mean additional bonds issued pursuant to Section 17 of Ordinance No. 481, as amended and restated pursuant to the provisions of Section 17A of Ordinance No. 503.

“Bond Reserve Account” shall mean the subaccount in the Bond and Interest Redemption Account established in accordance with the Outstanding Senior Lien Ordinances.

“Depository Bank” shall mean River Valley Bank, Ironwood, Michigan, a member of the Federal Deposit Insurance Corporation, or other financial institution qualified to serve as depository bank and designated by the Issuer.

“Engineer” shall mean Coleman Engineering Company, Iron Mountain, Michigan.

“Fiscal Year” shall mean the fiscal year of the Issuer and the operating year of the System, commencing July 1 and ending June 30, as such year may be changed from time to time.

“Government” shall mean the government of the United States of America or any agency thereof.

After completion of the Project and disposition of remaining proceeds, if any, of the Series 2017 Bond pursuant to the provisions of this Section, the Construction Account shall be closed.

(B) WATER SUPPLY SYSTEM RECEIVING FUND. Upon and after the effective date of this Ordinance, the Revenues of the System shall continue to be set aside into a separate fund designated the WATER SUPPLY SYSTEM RECEIVING FUND (the "Receiving Fund"). The Revenues credited to the Receiving Fund are pledged for the purposes of the funds and accounts established by the Outstanding Senior Lien Ordinances, Ordinance No. 425 and this Ordinance and shall be transferred from the Receiving Fund periodically in the manner and at the times and in the order of priority specified in the Outstanding Senior Lien Ordinances, Ordinance No. 425 and this Ordinance.

(1) Operation and Maintenance Account. Upon and after the effective date of this Ordinance, the Revenues of the System shall continue to be transferred each quarter of the Fiscal Year from the Receiving Fund to a separate account designated the OPERATION AND MAINTENANCE ACCOUNT (the "Operation and Maintenance Account") to pay the reasonable and necessary current expenses of administration and operating and maintaining the System for the ensuing quarter.

(2) Bond and Interest Redemption Account. There was established by Ordinance No. 481 a separate account designated the WATER SUPPLY SYSTEM BOND AND INTEREST REDEMPTION ACCOUNT (the "Bond and Interest Redemption Account"), which shall continue to be maintained by the Issuer. After the transfer required in (1) above, and in addition to the transfers to the Bond and Interest Redemption Account required by the Outstanding Senior Lien Ordinances, Revenues shall be transferred each quarter of the Fiscal Year from the Receiving Fund, before any other expenditures or transfer therefrom, and deposited in the Bond and Interest Redemption Account for payment of principal of and interest on the Series 2017 Bond and the Outstanding Senior Lien Bonds and to fund the Bond Reserve Account.

Upon any delivery of an installment of the Series 2017 Bond, there shall be set aside at the time of delivery and on the first day of each quarter of the Fiscal Year thereafter to the next interest payment date an amount equal to that fraction of the amount of interest due on the next interest payment date on said installment so delivered, the numerator of which is 1 and the denominator of which is the number of full and partial Fiscal Year quarters from the date of said delivery to the next interest payment date. There shall be set aside each Fiscal Year quarter after the delivery of the first principal installment an amount not less than 1/2 of the amount of interest due on the next interest payment date on all outstanding installments of the Series 2017 Bond not delivered during the then current interest payment period. The set aside or deposit of amounts required by this paragraph shall be in addition to the set aside or deposit requirements provided in the Outstanding Senior Lien Ordinances for the Outstanding Senior Lien Bonds.

Commencing with the Fiscal Year quarter beginning on July 1, 2017, there shall be set aside on the first day of each Fiscal Year quarter an amount not less than 1/4 of the amount of principal due on the Series 2017 Bond on the next principal payment date. Except as hereinafter provided, no further deposits shall be made into the Bond and Interest Redemption Account (excluding the Bond Reserve Account) once the aforesaid sums have been deposited therein. Any amount on deposit in the Bond and Interest Redemption Account (excluding the Bond Reserve

Account) in excess of (a) the amount needed for payment of principal installments of the Series 2017 Bond and the Outstanding Senior Lien Bonds for the then current principal payment period, plus (b) interest on the Series 2017 Bond and the Outstanding Senior Lien Bonds for the then current interest payment period, shall be used by the Issuer for redemption of principal installments of the Series 2017 Bond or the Outstanding Senior Lien Bonds, or, if such use is impracticable, shall be deposited in or credited to the Receiving Fund. The set aside or deposit of amounts required by this paragraph shall be in addition to the set aside or deposit requirements provided in the Outstanding Senior Lien Ordinances for the Outstanding Senior Lien Bonds.

If for any reason there is a failure to make such quarterly deposit in the amounts required, then the entire amount of the deficiency shall be set aside and deposited in the Bond and Interest Redemption Account out of the Revenues first received thereafter which are not required by the Outstanding Senior Lien Ordinances or this Ordinance to be deposited in the Operation and Maintenance Account or the Bond and Interest Redemption Account, which amount shall be in addition to the regular quarterly deposit required during such succeeding quarter or quarters.

There was established by Ordinance No. 481 a separate account within the Bond and Interest Redemption Account designated the BOND RESERVE ACCOUNT (the "Bond Reserve Account"), which shall continue to be maintained by the Issuer. Commencing July 1, 2017, and in addition to the transfers to the Bond Reserve Account required by the Outstanding Senior Lien Ordinances, there shall be withdrawn from the Receiving Account at the beginning of each Fiscal Year quarter and set aside in and transferred to the Bond Reserve Account, after provision has been made for the Operation and Maintenance Account and the current requirements of the Bond and Interest Redemption Account, the sum of at least \$2,325.00 per quarter (\$9,300.00 annually) until the lesser of the sum of \$93,000.00 or the Reserve Amount for the Series 2017 Bond has been added to the amounts required to be deposited in the Bond Reserve Account pursuant to the Outstanding Senior Lien Ordinances. Except as hereinafter provided, no further deposits shall be made into the Bond Reserve Account pursuant to the requirements of this Ordinance once the lesser of the sum of \$93,000.00 or the Reserve Amount for the Series 2017 Bond has been added to the amounts required to be deposited in the Bond Reserve Account pursuant to the Outstanding Senior Lien Ordinances. The moneys in the Bond Reserve Account shall be used solely for the payment of the principal installments of and interest on the Series 2017 Bond and the Outstanding Senior Lien Bonds as to which there would otherwise be default; provided, however, that in the event that the amount on deposit in the Bond Reserve Account at the end of any Fiscal Year exceeds the amount then required to be on deposit therein pursuant to the requirements of the Outstanding Senior Lien Ordinances and this Ordinance, the moneys in excess of such requirements shall be used to pay principal installments of and interest on the Series 2017 Bond or the Outstanding Senior Lien Bonds on the next payment date.

If at any time it shall be necessary to use moneys in the Bond Reserve Account for such payment, then the moneys so used shall be replaced from the Net Revenues first received thereafter which are not required by the Outstanding Senior Lien Ordinances or this Ordinance to be deposited to the Operation and Maintenance Account or to the Bond and Interest Redemption Account for current principal and interest requirements for the Series 2017 Bond or the Outstanding Senior Lien Bonds.

No further payments need be made into the Bond and Interest Redemption Account after

enough of the principal installments of the Series 2017 Bond and the Outstanding Senior Lien Bonds have been retired so that the amount then held in the Bond and Interest Redemption Account (including the Bond Reserve Account), is equal to the entire amount of principal and interest which will be payable at the time of maturity of all the principal installments of the Series 2017 Bond and the Outstanding Senior Lien Bonds then remaining outstanding.

The moneys in the Bond and Interest Redemption Account and the Bond Reserve Account shall be invested in accordance with Section 13 of this Ordinance, and profit realized or income earned on such investment shall be used or transferred as provided in Section 13 of this Ordinance.

(3) Junior Lien Bond Redemption Fund. There was established by Ordinance No. 425 a Junior Lien Bond Redemption Fund, which shall continue to be maintained by the Issuer. After the transfers required in (1) and (2) above, Revenues of the System shall continue to be deposited in the Junior Lien Bond Redemption Fund at the times specified in Ordinance No. 425 for so long as the Outstanding Junior Lien Bonds remain outstanding.

(4) Repair, Replacement and Improvement Account. There was established by Ordinance No. 481 a separate account designated REPAIR, REPLACEMENT AND IMPROVEMENT ACCOUNT (the "RRI Account"), which shall continue to be maintained by the Issuer. After the transfers required in (1), (2) and (3) above, and so long as any principal installments of the Series 2017 Bond or the Outstanding Senior Lien Bonds remain outstanding, Revenues shall continue to be transferred each Fiscal Year quarter from the Receiving Account and deposited in the RRI Account in the amounts required by the Outstanding Senior Lien Ordinances. In addition, after the transfers required in (1), (2) and (3) above, and so long as any principal installments of the Series 2017 Bond or the Outstanding Senior Lien Bonds remain outstanding, there shall be made an additional transfer each Fiscal Year quarter from the Receiving Account to the RRI Account in an amount not less than \$2,325.00 (\$9,300.00 annually), less the amount, if any, deposited in the Bond Reserve Account for the Series 2017 Bond in satisfaction of the requirements of Section 12(B)(2) of this Ordinance at the beginning of the same Fiscal Year quarter. Moneys in the RRI Account shall be used and disbursed only for the purpose of paying the cost of (a) repairing any damage to and emergency maintenance of the System, (b) repairing or replacing obsolete, deteriorating, deteriorated or worn out portions of the System, (c) acquiring and constructing extensions and improvements to the System and (d) when necessary, for the purpose of making payment of principal and interest on the Series 2017 Bonds and the Outstanding Senior Lien Bonds. If the amount in the Bond and Interest Redemption Account and the Bond Reserve Account is not sufficient to pay the principal of and interest on the Series 2017 Bond or the Outstanding Senior Lien Bonds when due, the moneys in the RRI Account shall be transferred to the Bond and Interest Redemption Account and used for that purpose. Moneys in the RRI Account may be invested in accordance with Section 13 of this Ordinance.

(4) Reverse Flow of Funds; Surplus Money. In the event the moneys in the Receiving Fund are insufficient to provide for the current requirements of the Operation and Maintenance Account, the Bond and Interest Redemption Account (including the Bond Reserve Account), the Junior Lien Bond Redemption Fund or the RRI Account, any moneys and/or securities in the funds of the System described by the Outstanding Senior Lien Ordinances, Ordinance No. 425 and this Ordinance shall be transferred, first, to the Operation and Maintenance Account, second, to the Bond and Interest Redemption Account, third, to the Junior Lien Bond Redemption Fund, and

fourth, to the RRI Account.

All moneys remaining in the Receiving Fund at the end of any Fiscal Year after satisfying the above requirements for the deposit of moneys into the Operation and Maintenance Account, the Bond and Interest Redemption Account (including the Bond Reserve Account), the Junior Lien Bond Redemption Fund and the RRI Account may be transferred to the Bond and Interest Redemption Account and used to call the Series 2017 Bond or Outstanding Senior Lien Bonds for redemption, or at the option of the Issuer, transferred to the RRI Account and used for the purpose for which such funds were established; provided, however, that if there should be a deficit in the Operation and Maintenance Account, the Bond and Interest Redemption Account (including the Bond Reserve Account), the Junior Lien Bond Redemption Fund or the RRI Account, on account of defaults in setting aside therein the amounts hereinbefore required, then transfers shall be made from such moneys remaining in the Receiving Fund to such funds in the priority and order named in this Section, to the extent of such deficits.

Section 13. Investments. Moneys in the funds and accounts established herein and moneys derived from the proceeds of sale of the Series 2017 Bond may be invested by the Issuer in the obligations and instruments permitted for investment by Section 24 of Act 94, as the same may be amended from time to time; provided, however, that as long as the Series 2017 Bond is held by the Government, then the investment may be limited to the obligations and instruments authorized by the Government. Investment of moneys in the Bond and Interest Redemption Account being accumulated for payment on the next maturing principal or interest payment on the Series 2017 Bond shall be limited to obligations and instruments bearing maturity dates prior to the date of the next maturing principal or interest payment on the Series 2017 Bond. Investment of moneys in the Bond Reserve Account shall be limited to direct obligations of the United States of America or obligations the timely payment of which are fully guaranteed by the United States of America and bearing maturity dates or subject to redemption, at the option of the holder thereof, not later than five (5) years from the date of the investment. In the event investments are made, any securities representing the same shall be kept on deposit with the Depository Bank. Interest income earned on investment of funds in the Bond and Interest Redemption Account (except the Bond Reserve Account) shall be deposited in or credited to the Receiving Fund. Interest income earned on the investment of funds in the Bond Reserve Account shall be deposited in the Bond and Interest Redemption Account.

Section 14. Rates and Charges. Rates and charges for the services of the System have been established by the Issuer in an amount sufficient to pay the costs of operating, maintaining and administering the System, to pay the principal of and interest on the Series 2017 Bond, the Outstanding Senior Lien Bonds and the Outstanding Junior Lien Bonds and to meet the requirements for repair, replacement, reconstruction and improvement and all other requirements provided in the Outstanding Senior Lien Ordinances, Ordinance No. 425 and this Ordinance. The Issuer hereby covenants and agrees to fix and maintain at all times while any of the Series 2017 Bond or the Outstanding Senior Lien Bonds shall be outstanding such rates for service furnished by the System as shall be sufficient to provide for the foregoing expenses, requirements and covenants, and to create a Bond and Interest Redemption Account (including a Bond Reserve Account) for the Series 2017 Bond and the Outstanding Senior Lien Bonds. The rates and charges for all services and facilities rendered by the System shall be reasonable and just, taking into

Appendix M

Bond Reserves

NOTES TO FINANCIAL STATEMENTS (CONTINUED)

NOTE B – STEWARDSHIP, COMPLIANCE AND ACCOUNTABILITY (CONTINUED)

Compliance with Bond Covenants

Revenue bond ordinances issued by the Water Utility, Sewer Utility and Pat O’Donnell Civic Center Funds require the City to segregate receipts to establish several reserve accounts. Following is a summary of required reserves and funding levels at June 30, 2019:

	<u>June 30, 2019</u>	
	<u>Required</u>	<u>Reserve</u>
	<u>Reserve</u>	<u>Balance</u>
2013 Capital Improvement Bonds - Bond Redemption Account	\$ 0	\$ 2,796
2010 Water Supply System Revenue Bonds:		
Bond Redemption Account	62,084	100,912
Bond Reserve Account	104,893	110,447
Repairs, Replacements and Improvement Account	0	100,042
2010 Sewage Disposal System Revenue Bonds:		
Bond Redemption Account	26,859	41,798
Bond Reserve Account	87,271	92,002
Repairs, Replacements and Improvement Account	0	17,167
2014 Water Supply System Revenue Bonds:		
Bond Reserve Account	105,800	105,800
Repairs, Replacements and Improvement Account	0	150,500
2014 Sewage Disposal System Revenue Bonds:		
Bond Reserve Account	102,300	102,300
Repairs, Replacements and Improvement Account	0	40,000
2017 Water Supply System Revenue Bonds:		
Construction	0	730
Bond Redemption Account	46,480	83,640
Bond Reserve Account	18,600	18,600
2017 Sewage Disposal System Revenue Bonds:		
Construction	0	166
Bond Redemption Account	7,682	11,364
Bond Reserve Account	3,000	3,000
	<u>\$ 564,969</u>	<u>\$ 981,264</u>

Appendix N

MDEQ Correspondence



STATE OF MICHIGAN
 DEPARTMENT OF
 ENVIRONMENT, GREAT LAKES, AND ENERGY
 MARQUETTE DISTRICT OFFICE



GRETCHEN WHITMER
 GOVERNOR

LIESL EICHLER CLARK
 DIRECTOR

January 30, 2020

Ironwood City Council
 213 South Marquette Street
 Ironwood, Michigan 49938

WSSN: 03420

ATTENTION: Ms. Karen Gullan, Clerk

Dear Council Members:

We understand the City of Ironwood (City) is seeking funding for construction of water system improvements and City staff has requested we document features that do not meet the Michigan Safe Drinking Water Program minimum requirements nor the Michigan Public Health Code. The deficiencies are briefly listed below with reference to the Rules the water supply presently violates. The relevant Act and Rules cited are from the Michigan Safe Drinking Water Act, 1976 PA 399, as amended, MCL 325.1001, *et seq*; MSA 14.427(1) *et seq*; and the Administrative Rules promulgated by authority of 1976 PA 399, being 1995AACS, R325.10101, *et seq* and the Michigan Public Health Code, Act 368 of 1978 Article 2.

1. The water system is required to continuously supply water for drinking and household use. The Michigan Department of Health and Human Services (DHHS) ordered the City to place a Do Not Drink Advisory for infants under age 12 months from August 9, 2019 through September 6, 2019 based on elevated manganese in the source water. Two of the City's six wells are currently on standby for emergency use only due to high manganese. (Act 399, R325.11201; Act 368, R333.2221 and 333.2226).

If you have any questions, please feel free to contact me at the phone number listed below, or by e-mail at flaminio@michigan.gov.

Sincerely,

Tom Flaminio, P.E., District Supervisor
 Field Operations Section
 Marquette District Office
 Drinking Water and Environment Health Division
 906-236-9746

TF:cw

cc: Ms. Brenda Stevenson, USDA Rural Development, Gladstone

Mr. Scott Erickson, City Manager

Mr. Mike Foley, Coleman Engineering Company, Ironwood

Mr. Chris Larson, SEH, Inc. St. Paul, Minnesota

File: City of Ironwood Water Supply Correspondence

Appendix O

Public Participation

DAILY GLOBE

Daily Globe, Inc.
118 E. McLeod Avenue ~ Ironwood, MI 49938
906-932-2211 Fax 906-932-5358

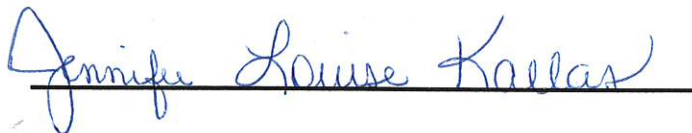
*****PROOF OF PUBLICATION*****
STATE OF MICHIGAN – COUNTY OF GOGEBIC



Marissa Casari being duly sworn says: I am the Legal Advertising Representative of The Daily Globe, a newspaper published and circulated in Gogebic and Ontonagon Counties. The Annexed is a printed copy of a notice which was published in said paper on the following date(s):

May 21, 2020

Subscribed and sworn to before me
This 21st day of May 2020



Jennifer Louise Kallas
Gogebic County, Acting in Gogebic County

My commission expires 09-19-2020

JENNIFER LOUISE KALLAS
Notary Public, State of Michigan
County of Gogebic
My commission expires
September 19, 2020
Acting in the County of Gogebic

HURLEY GRAD

Grants to

removed because of irregularities in voting.

But a Trojka journalist this week said that management ordered him to stop airing the song.

The station has been in operation since 1962. Under communism it played rock music geared at the youth and was given some leeway to be more independent than other censored media.

One of the journalists who quit in protest over the weekend, Marcin Kydrynski, said he couldn't recognize the station anymore.

Hurley Senior Center Board of Directors, 12:30 p.m., Hurley Senior Center, Hurley.

Hurley City Council, 2:30 p.m., City Hall, Hurley.

Gogebic Range Solid Waste Management Authority, 4:30 p.m., transfer station.

Gogebic County Forestry and Parks Commission, 4:30 p.m., meeting by teleconference by calling 888-748-9073. ID 379 699 656.

Mercer Town Board, 5:30 p.m., town hall.

Iron County Harbor Committee, 7 p.m., Harbor Lights, Saxon.

Friday, May 22

Mercer Cribbage, 9:30-11:30 a.m., Mercer Senior Center.

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2101 Beaser Avenue, Suite 3 • in Ashland

Aspirus Ironwood Clinic - Wednesdays 9am-3pm

Cloverland Motors

300 E. Cloverland Dr., (U.S. 2) • Ironwood, MI 49938
906-932-1202 www.cloverlandmotorsports.com



IRONWOOD
MICHIGAN | Find Your North

NOTICE OF INTENT TO FILE APPLICATION FOR FEDERAL ASSISTANCE

The City of Ironwood intends to apply for loan and grant funding assistance for a water system improvement project. The proposed work will include the construction of a new water filtration plant, clearwell, high lift pumps, water well improvements and valve and hydrant installations on the existing water transmission main between the Big Springs wellfield and the existing clearwell. The new water filtration plant, clearwell and high lift pumps will be located adjacent to the existing high lift pump station. The water well improvement will be completed at all existing wells between Lake and Pump Station Roads adjacent to Spring Creek and the existing wells in the area where Spring Creek intersects the Montreal River. The valve and hydrant work will be completed at the intersection of Norlund and Big Springs Road and the Railroad Right-of-Way intersection of Junet, Vanderhagen and Pump Station Roads.

The purpose of the project is to reduce the quantity of iron and manganese in the water. The estimated cost of the project is \$ 9.95 million. The project is anticipated to be constructed in 2021 and 2022. The application for federal assistance will be filed within sixty (60) days, with the United States Department of Agriculture – Rural Development office.

All comments and inquiries should be directed to:

Mr. Scott Erickson, City Manager
City of Ironwood
213 South Marquette Street
Ironwood, MI 49938

City of Ironwood
Public Hearing Attendees
June 22, 2020

Annette Burchell - Mayor
213 S. Marquette St.
Ironwood, MI 49938

Chris Larson - Short, Elliot, Hendrickson, Inc
3535 Vadnais Center Drive
St. Paul, MN 55110-5196

Rick Semo - City Commissioner
213 S. Marquette St.
Ironwood, MI 49938

Jeff Sjoquist - Coleman Engineering
635 Circle Drive
Iron Mountain, MI 49801

Jim Mildren - City Commissioner
213 S. Marquette St.
Ironwood, MI 49938

Mike Foley - Coleman Engineering
200 E. Ayer Street
Ironwood, MI 4938

Kim Corcoran - City Commissioner
213 S. Marquette St.
Ironwood, MI 49938

Mike Graham - Coleman Engineering
200 E. Ayer Street
Ironwood, MI 4938

Joseph Cayer - City Commissioner
213 S. Marquette St.
Ironwood, MI 49938

Tim Pertile – City of Ironwood
213 S. Marquette St.
Ironwood, MI 49938

Karen Gullan - City Clerk
213 S. Marquette St.
Ironwood, MI 49938

Dennis Hewitt – City Assessor
213 S. Marquette St.
Ironwood, MI 49938

Scott Erickson - City Manager
213 S. Marquette St.
Ironwood, MI 49938

Tom Bergman – Community Development Director
213 S. Marquette St.
Ironwood, MI 49938

Paul Linn – Finance Director/Treasurer
213 S. Marquette St.
Ironwood, MI 49938

Andrew DiGiorgio - Ironwood Public Safety
Director
123 W. McLeod Ave
Ironwood, MI 49938

Bob Richards – City Public Work Supervisor
213 S. Marquette St.
Ironwood, MI 49938

Justin Kasieta
714 Scott Street
Hancock, MI 49930

Tim Dean – City of Ironwood Attorney
213 S. Marquette St.
Ironwood, MI 49938

Tom Laventure - Ironwood Daily Globe
118 E. McLeod Ave
Ironwood, MI 49938

Bob Tervonen – City Utilities Manager
213 S. Marquette St.
Ironwood, MI 49938

Ironwood Public Hearing Video Recording

Video Recording of Public Hearing is attached on USB Jump Drive

Appendix P

Resolution to Submit Project Plan

#020-008

**A RESOLUTION ADOPTING A FINAL PROJECT
PLAN FOR WATER SYSTEM IMPROVEMENTS
AND
DESIGNATING AN AUTHORIZED PROJECT
REPRESENTATIVE**

WHEREAS, the City of Ironwood, Michigan recognizes the need to make improvements to its existing water treatment and distribution system; and

WHEREAS, the City of Ironwood, Michigan authorized SEH of Michigan, LLC to prepare a Project Plan, which recommends the construction of a water treatment facility and pump station; and

WHEREAS, said Project Plan was presented at a Public Hearing held on June 22, 2020 and all public comments have been considered and addressed;

NOW THEREFORE BE IT RESOLVED, that the City of Ironwood, Michigan formally adopts said Project Plan and agrees to implement the selected alternative (Alternative #1).

BE IT FURTHER RESOLVED, that the City Manager, a position currently held by Scott B. Erickson, is designated as the authorized representative for all activities associated with the project referenced above, including the submittal of said Project Plan as the first step in applying to the State of Michigan for a Drinking Water Revolving Loan to assist in the implementation of the selected alternative.

Dated this 22nd day of June, 2020.

The foregoing resolution offered by Mildren and supported by Cayer.

Upon roll call vote, the following voted:

Yes: Commissioner Cayer, Corcoran, Mildren, Semo, and Mayor Burchell.

No: None.

Absent: None.


Annette Da Lio-Burchell, Mayor

RESOLUTION DECLARED ADOPTED

I, Karen M. Gullan, do hereby certify that I am the duly appointed acting and qualified Clerk of the City of Ironwood, and do further certify that the above and foregoing Resolution is a true and correct copy of the Resolution passed by the City of Ironwood City Commission, at a Regular Meeting held June 22, 2020.


KAREN M. GULLAN, CITY CLERK

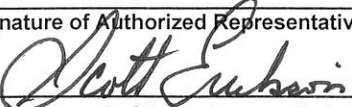
Appendix Q

Project Plan Submittal Forms

Michigan Department of Environment, Great Lakes, and Energy
Gretchen Whitmer, Governor
Liesl Eichler Clark, Director

<http://www.michigan.gov/EGLE>

Drinking Water Revolving Fund Project Plan Submittal

Name of the Project City of Ironwood - Water Treatment Plant	Applicant's Federal Employer Identification Number (EIN) 38-6004566	
Legal Name of Applicant (The legal name of the applicant may be different than the name of the project. For example, a county may be the applicant for bonding purposes, while the project may be named for the particular village or township it serves.) City of Ironwood	Areas Served by this Project Counties <u> Gogebic </u> _____ _____	
Address of Applicant (Street, PO Box, City, State & Zip) 213 S. Marquette St Ironwood, MI 49938	Congressional Districts <u> 1st </u> State Senate Districts <u> 38th </u> State House Districts <u> 110th </u>	
Population Served by the Water Supplier <u> 5387 </u> If you are interested in an interim planning loan for the immediate reimbursement of project planning costs, check here <input type="checkbox"/> (An interim planning loan is available only to a municipality serving a population of less than 10,000.)		
Brief Description of the Project Construction of a Water Treatment Plant, which would replace the existing water pumping station that was constructed in the early 1900's. The proposed treatment plant construction would include a water filtration system in order to remove iron and manganese from the drinking water.		
Disadvantaged Community Determination <input checked="" type="checkbox"/> The applicant is requesting a disadvantaged community determination, and a completed <i>Disadvantaged Community Status Determination Worksheet</i> is attached.		
Estimated Total Cost of the Project \$9,724,000	Construction Start Target Date Spring 2021	
Name and Title of Applicant's Authorized Representative Scott Erickson, City Manager	Telephone (906) 932-5050	E-mail Address ericksons@cityofironwood.org
Address of Authorized Representative if same as address above, check here <input checked="" type="checkbox"/>		
Signature of Authorized Representative 		Date June 23, 2020
State approval of the water supplier's Surface Water Intake Protection Program is attached (if applicable) check here <input type="checkbox"/> State approval of the water supplier's Wellhead Protection Program is attached (if applicable) check here <input checked="" type="checkbox"/> Joint Resolution of Project Plan Adoption/Authorized Representative Designation is attached check here <input checked="" type="checkbox"/>		

A final project plan, prepared and adopted in accordance with the Department's *Drinking Water Revolving Fund Program Project Plan Preparation Guidance*, must be submitted by May 1st in order for a proposed project to be considered for placement on Michigan's Project Priority List for the next fiscal year. Please send your final project plan with this form to:

WATER INFRASTRUCTURE FINANCING SECTION
FINANCE DIVISION
MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
P O BOX 30457
LANSING MI 48909-7957

#020-008

**A RESOLUTION ADOPTING A FINAL PROJECT
PLAN FOR WATER SYSTEM IMPROVEMENTS
AND
DESIGNATING AN AUTHORIZED PROJECT
REPRESENTATIVE**

WHEREAS, the City of Ironwood, Michigan recognizes the need to make improvements to its existing water treatment and distribution system; and

WHEREAS, the City of Ironwood, Michigan authorized SEH of Michigan, LLC to prepare a Project Plan, which recommends the construction of a water treatment facility and pump station; and

WHEREAS, said Project Plan was presented at a Public Hearing held on June 22, 2020 and all public comments have been considered and addressed;

NOW THEREFORE BE IT RESOLVED, that the City of Ironwood, Michigan formally adopts said Project Plan and agrees to implement the selected alternative (Alternative #1).

BE IT FURTHER RESOLVED, that the City Manager, a position currently held by Scott B. Erickson, is designated as the authorized representative for all activities associated with the project referenced above, including the submittal of said Project Plan as the first step in applying to the State of Michigan for a Drinking Water Revolving Loan to assist in the implementation of the selected alternative.

Dated this 22nd day of June, 2020.

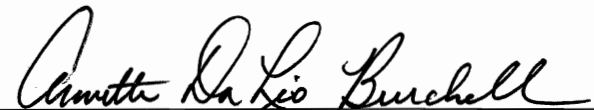
The foregoing resolution offered by Mildren and supported by Cayer.

Upon roll call vote, the following voted:

Yes: Commissioner Cayer, Corcoran, Mildren, Semo, and Mayor Burchell.

No: None.

Absent: None.


Annette Da Lio-Burchell, Mayor

RESOLUTION DECLARED ADOPTED

I, Karen M. Gullan, do hereby certify that I am the duly appointed acting and qualified Clerk of the City of Ironwood, and do further certify that the above and foregoing Resolution is a true and correct copy of the Resolution passed by the City of Ironwood City Commission, at a Regular Meeting held June 22, 2020.


KAREN M. GULLAN, CITY CLERK

Disadvantaged Community Status Determination Worksheet

The following data is required from each municipality in order to assess the disadvantaged community status. Please provide the necessary information and return to:

Robert Schneider
Revolving Loan Section
Drinking Water and Municipal Assistance Division
P.O. Box 30817
Lansing, MI 48909-8311
Schneiderr@michigan.gov

If you have any questions please contact Robert Schneider at 517-388-6466

Please check the box this determination is for:

DWRF SRF

1. Total amount of anticipated debt for the proposed project, if applicable.

\$ 9,190,000

2. Annual payments on the existing debt for the system.

\$ 347,578

3. Total operation, maintenance and replacement expenses for the system on an annual basis.

\$ ~~1,287,210~~ 1,287,210

4. Number of "residential equivalent users" in the system.

3551 without bulk users Hurley, WI
5474 with Hurley, WI

For determinations made using anticipated debt, a final determination will be made based upon the awarded loan amount.

Subject: FW: Drinking Water Revolving Fund - Disadvantaged Community Status Determination Worksheet
Attachments: [Ironwood.xlsx](#)

From: Schneider, Robert (EGLE) <SCHNEIDERR@michigan.gov>
Sent: Tuesday, March 17, 2020 5:03 PM
To: White, Valorie (EGLE) <WHITEV1@michigan.gov>
Subject: RE: Drinking Water Revolving Fund - Disadvantaged Community Status Determination Worksheet

Valorie,

Ironwood is disadvantaged based on poverty as well as thru annual costs

Bob

Bob Schneider
Financial Analyst
Michigan Department of Environment, Great Lakes, and Energy
517-388-6466 / schneiderr@michigan.gov
[Follow Us](#) | Michigan.gov/EGLE

Appendix R

Intent to Apply



MICHIGAN DEPARTMENT OF ENVIRONMENT, GREAT LAKES, AND ENERGY
FINANCE DIVISION
CLEAN WATER AND DRINKING WATER STATE REVOLVING FUND/
STRATEGIC WATER QUALITY INITIATIVES FUND

INTENT TO APPLY FORM

This form should be submitted by all applicants seeking funding in the next five years. Applicants participating in the ITA process receive early indication of the funding outlook for their project(s).

DATE: March 18, 2020

PROJECT(S) NAME (Brief Identifier): City of Ironwood Water Pump Station and Filtration Project

PROJECT(S) PURPOSE (Including general location and public health or water quality issue being addressed): This project will replace the existing water pumping station that was constructed in the early 1900's and will also include the construction of water filtration to remove iron and manganese from the drinking water.

Applicant Legal Name: City of Ironwood

Applicant Contact Name: Scott Erickson Title: City Manager

Mailing Address (street, city, state, zip+4): 213 S. Marquette Street, Ironwood, MI 49938

Phone No.: 906-932-5050

Email: ericksons@cityofironwood.org

Consulting Engineer Name* (if applicable): Chris Larson Firm: Short Elliot Hendrickson (SEH)

Mailing Address (street, city, state, zip+4): 3535 Vadnais Center Drive, St. Paul, MN 55110

Phone No.: 651-955-1428

Email: clarson@sehinc.com

PROJECT INFORMATION

Applicant Population: 5387 Population Served by Project: 5387

Treatment Facility Name (if applicable): City of Ironwood Water Pumping Station and Water Filtration Plant

Estimated Total Project Cost: \$9.190 million

Year 1 Costs: \$9.190 million

Estimated Year 1 Costs Financed Through SRF:
\$9.19 million

Future Year Costs (if applicable):

Estimated Future Costs Financed Through SRF:

Other Funding Sources (check all that apply): MDOT MEDC USDA Rural Development

Other Financing/Funding Agency:

Proposed Construction Start Date (mm/yyyy): 06/2021

Completed Project-Related Planning Documents (check all that apply; do not need to submit at this time):
Capital Improvements Plan Asset Management Plan Preliminary Engineering Report
Environmental Report Project Plan Infiltration & Inflow Study Sanitary Sewer Evaluation Study
NASSCO Report Watershed Management Plan Master Plan Reliability Study Other: Letter from
EGLE Indicating Water Treatment is necessary to remove Manganese from the water

ADDITIONAL INFORMATION

Disadvantaged Community (as determined by EGLE)? Yes No Unknown

For a preliminary determination from EGLE, complete and attach the [Disadvantaged Community Status Determination Worksheet](#).

Does the proposed project include any green infrastructure, water or energy efficiency improvements, or other environmentally innovative activities? Yes No Unknown

If yes, please describe:

Deadlines: The ITA form may be submitted at any time, but is due on or before April 1, to allow for sufficient time for the pre-application meeting and to be placed on the DWSRF or CWSRF/SWQIF Project Priority List (PPL).

Pre-Application Meeting: The applicant will be contacted by an assigned Water Infrastructure Financing Section (WIFS) project manager within 14 days of receipt of this ITA form to schedule a pre-application discussion. This meeting can help to identify project funding opportunities and challenges earlier in the planning stage to better guide the efforts of the applicant and their consulting engineer. Suggested attendees would include the WIFS project manager, EGLE district engineer, applicant representative(s), and any other applicable attendees.

Questions: Please visit our website at Michigan.gov/CleanWaterRevolvingFund or Michigan.gov/DrinkingWaterRevolvingFund or call 517-284-5433.

Please submit this form by email to EGLE-WIFS@Michigan.gov.



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We're confident in our ability to balance these requirements.

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