DECEMBER 2025

CITY OF HARDIN

PRELIMINARY ENGINEERING REPORT

PREPARED FOR :

City of Hardin
Old US 87
Hardin, MT 59034

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ENGINEERING EST. STAHLY 1970 & ASSOCIATES, INC.

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0. EXECUTIVE SUMMARY

0.1. INTRODUCTION AND BACKGROUND

This Preliminary Engineering Report (PER) is an evaluation of the City of Hardin's potable water system. This includes the intake from the Big Horn River, the water treatment plant located at 401 North Cheyanne Ave, the water distribution system, water storage and a small pumping station. This evaluation has been separated between the intake, water treatment plant and the distribution system. The intake and water treatment plant portion of the PER was completed by Advanced Engineering and Environmental Services and included in Appendix 1. The distribution and storage portions were completed by Stahly Engineering and Associates.

In general, the water treatment system is in excellent condition for being 100 years old. The City has done a good job of maintaining its system, making repairs and improvements to the system often before serious problems arise.

The water system consists of an intake off the Big Horn River. This intake is located approximately 1 mile west of the city. From there, water is pumped to the water treatment facility located at 401North Cheyenne Ave inside the City. The water from the water plant enters the distribution system which consists of approximately 25 miles of water main, two 0.5-million-gallon water tanks and a small pumping station. The water tanks and small pumping station are located approximately 1.5 miles west of the city along Old Highway 87.

Most of the water mains consist of Asbestos Cement (AC) pipe. The City has made several recent improvements to the water distribution system. These include replacing approximately 1800 lineal feet of AC pipe along 1st Street, a water main extension on the north side of the Hardin, to create some developable property, installation of mixers in both tanks to reduce ice buildup in the tanks and installation of a liner inside the concrete tank to seal up some leaks and protect the rebar. This improvement should increase the life of the tank another 10 to 20 years.

The City has meters on virtually all the 1420 services within the system. Comparing the water that is produced versus the water that is metered, 25% of finished water is never metered. This is a significant loss, however comparing this data to data presented in the 2010 PER, it is not increasing.

The distribution system adequately provides delivery of the Peak Hour and Maximum Daily Demand with most fire flow conditions while maintaining the minimum standard pressures throughout the system. The limiting flow rate is based on the production rate of the sedimentation basin inside the water treatment plant, which is 930 gpm. Any flows within the distribution system greater than 930 gpm must be supplemented by the system's storage tanks.

0.2. ALTERNATIVES CONSIDERED

For alternatives for the water intake and the water treatment plant please see Appendix 1.

For the Alternatives for a new 1-million-gallon tank, three alternatives were considered. No Action, Elevated Steel Tank and a Concrete Tank, the No Action is the preferred alternative.

For the distribution system there were two alternatives: No Action and completion of the water main loop around the High School. The completion of the water main is the preferred alternative.

0.3. PREFERRED ALTERNATIVES

The No Action alternative is the preferred alternative for the storage tanks. The current tanks are adequate for the current operational requirements. The only issue is the lack of fire flow around the High School. However, when improvements are made to the water plant and the production capacity increases and this could have an impact on the size of the tank. Furthermore, it is currently not clear where to optimally place the new tank. The City of Hardin is updating their growth policy and while if there is little to no growth currently, if the city grows north of the Interstate, the best option would be to place the water tank in this area.

For the distribution system, the preferred alternative is to complete the loop around the High School to enhance fire flow around the building.

0.4. PROJECT COSTS AND BUDGET

Project costs for the intake and the water treatment plant are located in Appendix 1.

Table 0.1 shows the capital costs for the water main around the High School

TABLE 0.1 - COST ESTIMATE FOR PREFERRED ALTERNATIVES

Alternative	Construction Year	Capitol Cost
Water Main Connection	2030	$700,000

The recommended funding strategy includes utilizing funds from the Montana Coal Endowment Program (MCEP), Department of Natural Resources Renewable Resource Grant and Loan Program (RRGL), Community Block Development Grant (CDBG), and State Revolving Fund (SRF). Hardin may be able to offset additional project costs if additional funds become available.

1. PROJECT PLANNING

The service area considered as part of this report is all the land within the City of Hardin limits, as shown in Figure 1.1.

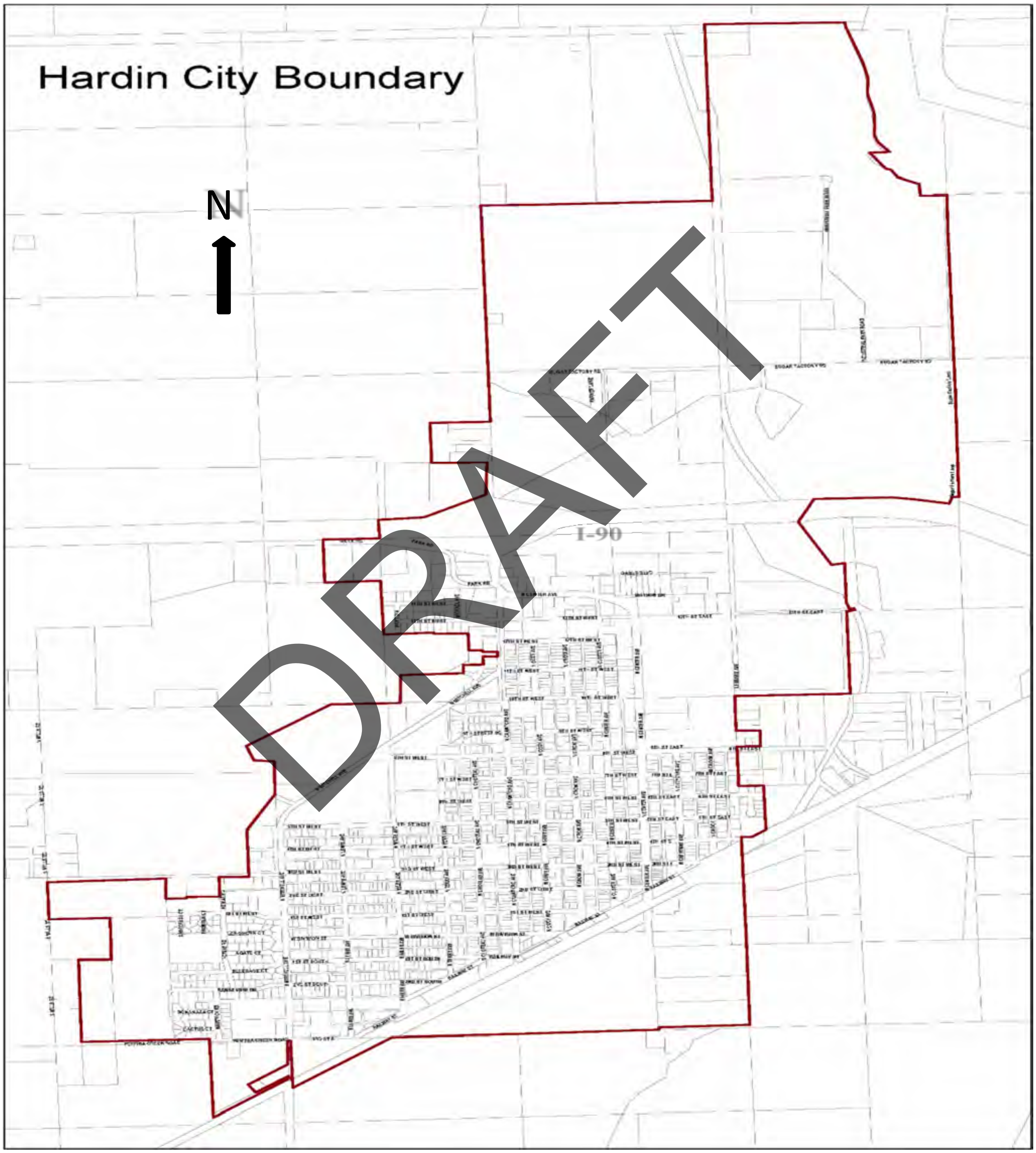

Figure 1.1. Planning Area

There are no current plans to expand the service area and no other known development is planned either within or next to the city limits. Should any plans be created to expand any other development within Hardin, the City will need to re-evaluate the conditions of their water system.

1.1. LOCATION

1.1.1. Project Location

The boundary of the City of Hardin is depicted in Figure 1.1. This PER addresses the city limits along with the long-range utility service area. The long-range utility service area is depicted in Figure 1.2. This area includes a portion of the incorporated limits of the City of Hardin along with some surrounding agricultural and industrial lands. Hardin is in Big Horn County along US Interstate 90, 46 miles east of Billings. The Bighorn River parallels the eastern boundary of the City of Hardin. The incorporated area is approximately 2.62 square miles. The location of Hardin is reported as 45°43’55” N latitude 107°36’45” W longitude.

1.1.2. Land Ownership

The economy of Hardin currently revolves around tourism, retail businesses, agriculture, and government services. Agriculture includes sugar beets, wheat, barley, hay production, and rangeland on both dry land and irrigated ground. The Bighorn River and a variety of small streams are the primary source of irrigation water for the many local farms and ranches.

Land use within the City of Hardin consists of residential housing, various “main street” businesses such as restaurants, hotels, bars, a grocery store, variety stores, service stations, auto dealerships, banks, lumber yards, and other businesses. There is also a hospital with nursing home, power plant, asphalt plant, detention facility, laundromat, two car washes, campgrounds, four parks, and a K-12 school system. Land outside Hardin is agricultural including cultivated farmland, hay land, and livestock pastures.

1.1.3. Climate

Hardin’s climate is typical of weather patterns experienced on the semi-arid plains of eastern Montana. Warm to hot days with low humidity characterize the summer months. The winter months are typically cold with little precipitation and with occasional extremes of below zero temperatures resulting from artic air masses. The fall and spring months are transition periods between the two extremes with variable weather conditions. General temperature variations range from an average maximum and minimum of 37°F and 12°F in December and January, to 91°F and 57°F in July. Average annual precipitation is about 12 inches with May and June being the wettest months.

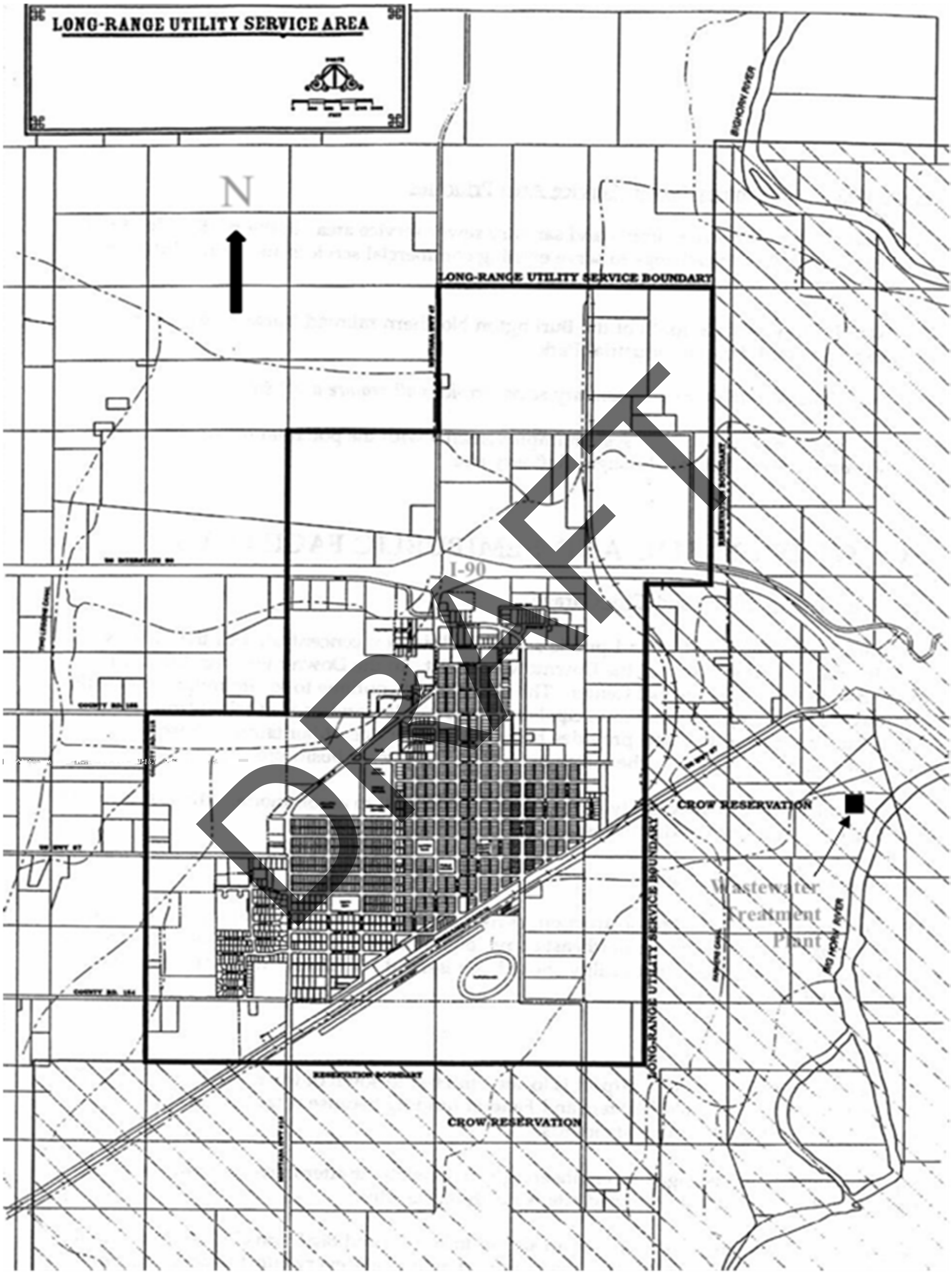

Figure 1.2. Long-range Utility Service Area

1.2. ENVIRONMENTAL RESOURCES PRESENT

This section identifies and briefly discusses known environmental resources so that they may be further considered in later sections of this report. This analysis was prepared by consulting with the appropriate state and federal reviewing agencies as specified by the Uniform Application (UA) 2017 guidelines.

1.2.1. Land Resources

County consists largely of agricultural/pasture land. The land within City limits is classified as low intensity residential and developed open space. The land immediately surrounding City of Hardin is primarily sagebrush, badlands, a small percentage of riparian area along the creeks, and a small percentage of introduced upland vegetation. There is cultivated cropland in some areas, as confirmed by maps produced using the Montana Natural Resource Information System. The Web Soil Survey shows most of the planning area is not prime farmland, and property within Town's limits is developed and has been previously disturbed.

All recommended improvements within Hardin are confined within existing roadways, alleys, and previously disturbed lots. Therefore, there are no anticipated impacts to farmland, or the agricultural industry, as a result of the water system improvements. A web soil survey which can be found in Appendix 1.2, has maps of farmland classification, cadastral lot boundaries, overview of Hardin analysis area, and land cover. There are no expected changes to land use in any areas of Hardin with the recommended improvements. Negative impacts to land resources are not expected.

<u>Topography</u>

The topography of Hardin proper is flat with drainage to the east and the Bighorn River. A significant bench exists along the eastern edge of the Bighorn River adjacent to Hardin. The elevation of the city is approximately 2,900 feet. Soils at the existing treatment site are generally silty sands to a depth of approximately 60 feet. Hardin is located in a seismic zone in which peak accelerations of two to three percent of gravity are anticipated. These values indicate a low risk of significant seismic activity. Figure 1.3 shows a topographic map of Hardin and surrounding area.

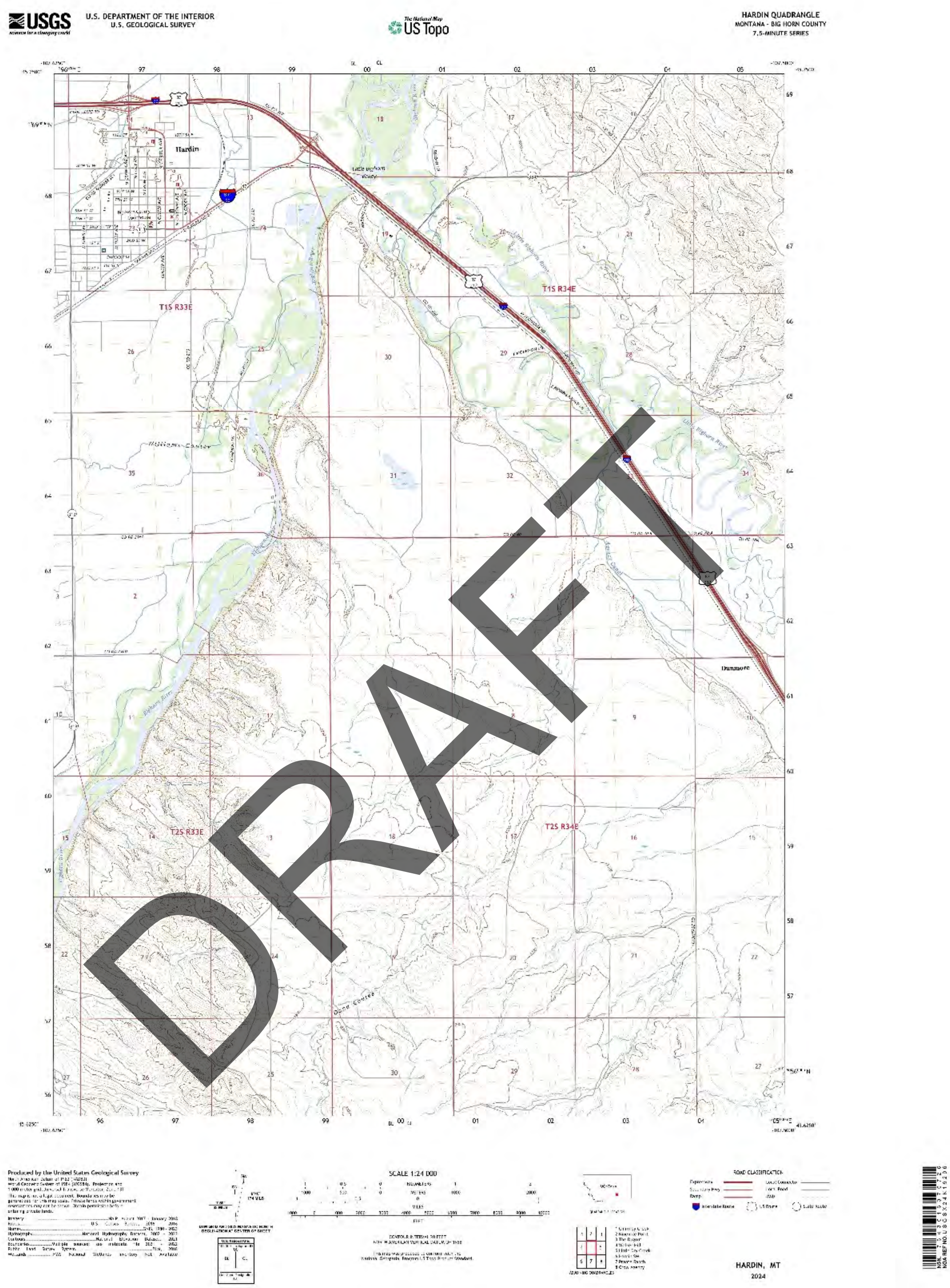

Figure1.3 – Toopgraphic Map

Soils and Geology

According to the Geologic Map of Montana, Geologic Map 62, 2007, Montana Bureau of Mines and Geology website. Hardin is composed of Gravel geologic formations, Gravel (Gqr) and Alluvial terrace deposit (Qat). Figure 2.3 is a map of these geologic formations generated by Montana's Ground Water Information Center (GWIC).

Figure 1.4 -Geology

Figure 1.5 shows the soils information from the Natural Resources Conservation Services (NRCS) Web Soil Survey in and around Hardin.

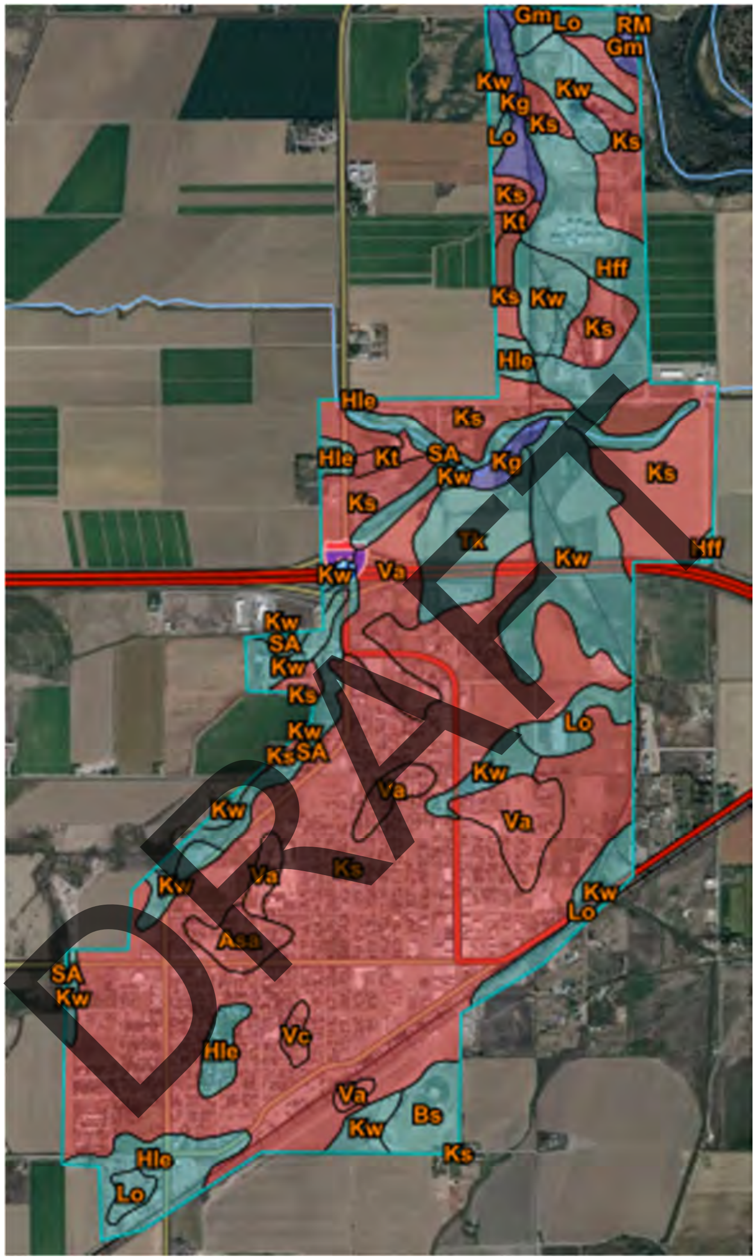

Figure 1.5 - Area Soils

Underlying soils within the city and surrounding areas are primarily clay and silty clays. Soils near the intake, which is located near the banks of the Bighorn River, are primarily loam and sandy loam. The soil descriptions and soil map compiled by the Natural Resource Conservation Service (NRCS) are contained in the Appendix 1.2. The clays, silty clays, loams, and sandy loams are present throughout the entire depth to 60 inches below the ground surface in their respective areas.

TABLE 1.1 - PREDOMINANT SOIL TYPES

Map Unit Name	Map Unit Symbol	Percent of AOI
Kyle Silty Clay	Ks	57.5%
Kyle Clay	Kw	12.4%
Vanada Clay	Va	6.6%
Heldt Silty Clay	Hle	3.7%
Lohmiller Silty Clay Loam	Lo	3.0%

Information was obtained describing physical and chemical properties for each soil type. The Natural Resources Conservation Service (NRCS) developed four hydrologic soils groups (A, B, C, and D) to categorize the runoff potential of soils. In Figure 1.5 above, pink is Group A, purple is Group B, blue is Group C, and red is Group D. There are no Group A soils in Hardin. The map and complete legend are shown in Appendix 1.2, pages 36 and 37. Table 1.2 show the distribution of the soil's groups.

TABLE 1.2 DISTRIBUTION OF HYDROLOGIC SOILS GROUPS

HYDROLOGIC SOILS GROUPS	PERCENT OF AREA	COLOR
A	0%	Pink
B	2.2%	Purple
C	34.1%	Blue
D	63.7%	Red

The NRCS Web Soil Survey provides the following descriptions of the four hydrologic soils groups:

Group A. Soils having high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well-drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well-drained or well-drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high-water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Another important property of the soils that will affect the materials used in the water system is the propensity of the soils to corrode concrete. According to the NRCS,

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

In the AOI, 10.2% has a "low" risk of corrosion (green area) to concrete. 65.2% has a "moderate" risk of corrosion (yellow area) to concrete, and the remaining 24.6% has a "high" risk (red area) of corrosion to concrete shown in Figure 1.6.

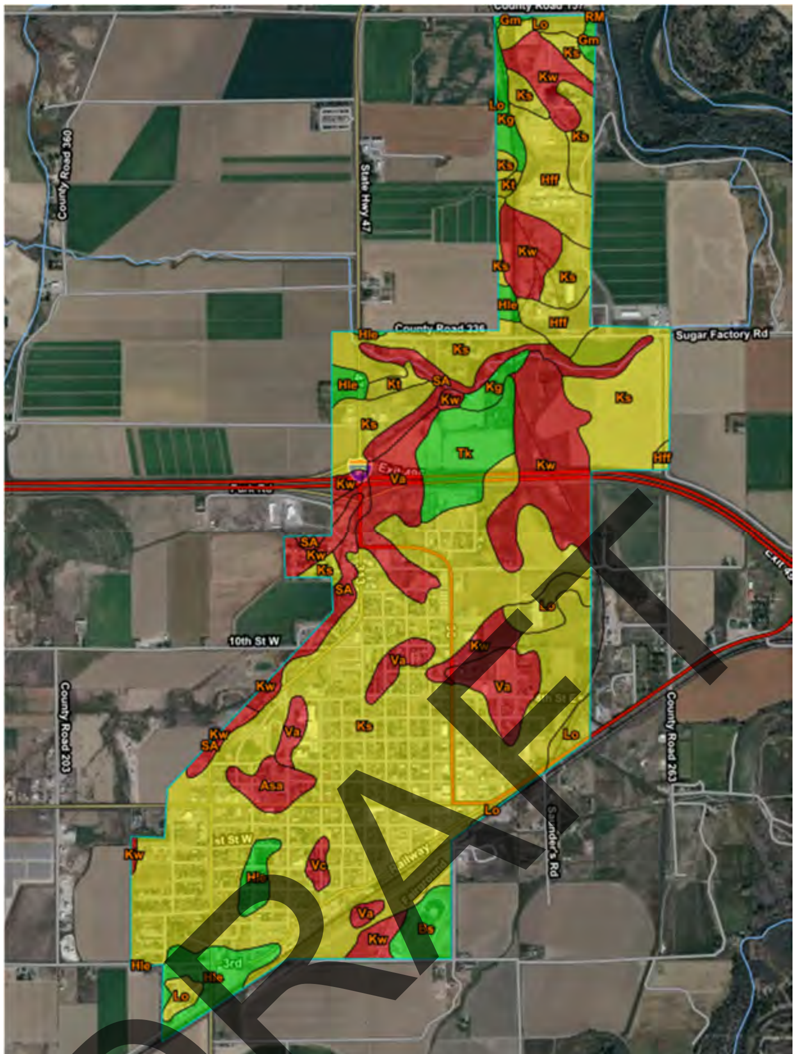

Figure 1.6 – Risk to Concrete Erosion

The propensity to corrode steel for each of the soils was also evaluated. According to the NRCS,

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

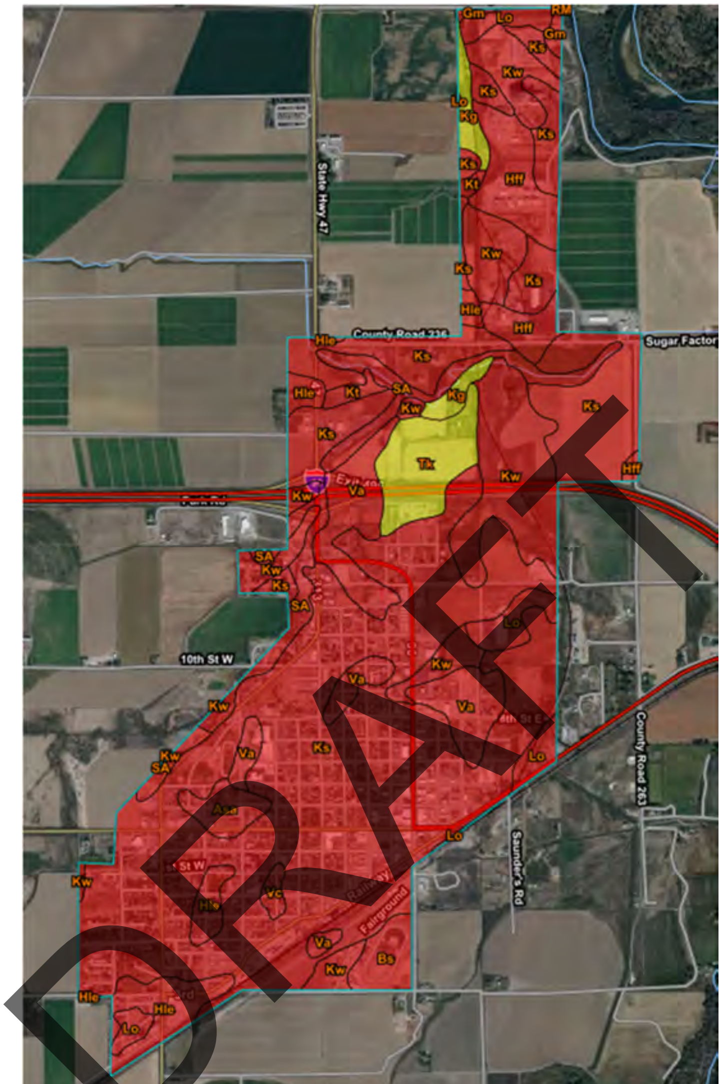

Figure 1.7 Risk of corrosion

In the AOI, 95.2%, has a rating of “High” for risk of corrosion (red area) of steel and the remaining 4.8% has a “Moderate” (yellow area) risk of corrosion shown.

Vegetation

The local vegetation consists primarily of natural grassland and irrigated forage such as alfalfa. Closer to the river, native trees and vegetation are more prevalent. Appendix 1.1 lists all of the species of special concern in Big Horn County, Montana according to information received from United States Fish and Wildlife Service (USFWS), United States Forest Service (USFS) and BLM. Since all construction would be within previously disturbed areas, it is anticipated that there will be no impact on any plant species of concern.

Biological Resources

A search for species of concern was conducted through the Natural Heritage Program website and United States Fish and Wildlife Service (USFWS) within the vicinity of the City of Hardin. The National Heritage Program Environmental Summary shows all potential species of concern for both plants and animals along with the Field Guide for each. The Field Guide provides a location map for each species which shows the number of observations across Montana. The Species of Concern are listed in the summary showing a moderate to low predictive model, see Appendix 1.1 for the full report. The USFWS Information for Planning and Consultation (IPac)was also queried about potential species of concern in the area. The IPaC listed three species of concern within the AOI. The three species are the pallid sturgeon, monarch butterfly, and Suckley's cuckoo bumble bee. The IPaC listed no critical habitats in the AOI. The IPaC report is Appendix 1.1.

A search for the potential of Sage Grouse in the City of Hardin and the surrounding area using the Montana Sage Grouse Habitat Conservation Map shows Hardin is in the Exempt Community Boundaries.

The maps and information about Sage Grouse Habitat in the vicinity are included in Appendix 1.3.

1.2.2. Water Resources

Water resources are groundwater and surface water sources within the project planning area.

Surface Water

According to Discover DEQ Throughout Montana Web Map, there are several surface water sources adjacent to city limits. The Two Leggins Canal is located west of Hardin. The Farmers Canal and the Bighorn River is located east of Hardin. Figure 1.8 shows the location of Hardin's surface water.

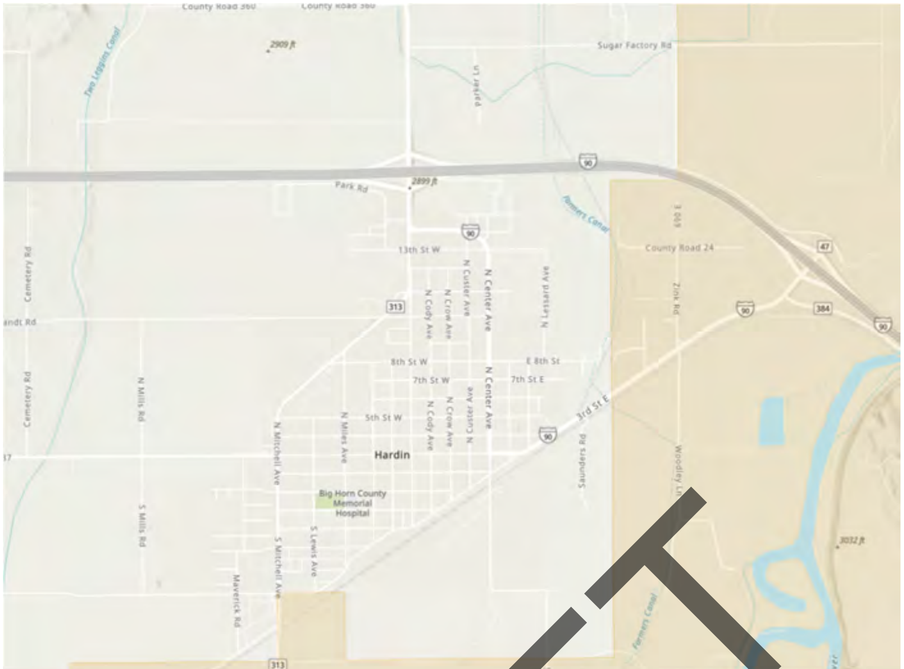

Figure 1.8 Surface Water

Groundwater

A Montana Bureau of Mines and Geology study (2009 by Meredith, Wheaton, and Kuzara) in characterizes the groundwater resources in Big Horn County as primarily shallow alluvial aquifers. Bedrock aquifers, such as the Pryor Conglomerate and the Mississippian Madison Group, are located at depths to which drilling is often not economical. In Hardin, the primary alluvial aquifer (a combination of the Holocene and Pleistocene) is within approximately 10 to 70 feet of the ground surface and is the source for a variety of private water wells.

Groundwater is high during the irrigation season as evidenced by local well logs and the fact that City staff often encounters groundwater within utility excavations for water and sewer repairs. A search of the Montana Bureau of Mines and Geology Groundwater Information Center website (GWIC) revealed several logs for wells in the area. There are over 100 wells recorded within a one-mile radius of Hardin, but very few with water quality data. Wells located near and within the city limits have an average depth of 28 feet. According to the well logs reviewed, groundwater in the surrounding area varies in depth between 4 and 18 feet with an average static water level of approximately 8 feet throughout most of the community. The average reported yield is approximately 22 gpm.

It appears that groundwater levels in the Hardin area are influenced by operation of the Two Leggins Canal, which passes west of the city. This canal typically operates from April 15° through November 15, which coincides with significant increases in sewer flows observed during this same time period. These elevated flows are attributed to the infiltration of groundwater as sewer mains become submerged and the utilization of sump pumps in basements as groundwater levels increase.

It is significant to note that during the recent improvements for the wastewater collection system it was found that groundwater in the area of 11th Street was deeper than 10 feet. Somed egree of groundwater will likely be encountered during construction of the proposed improvements if excavation is required. The amount and elevation of groundwater encountered will be dependent on the time of year that construction takes place and the location of the work within the community. Any proposed water improvements will be planned to avoid encountering groundwater as much as possible. If needed, a detailed geotechnical assessment of the area will be completed prior to design.

Source Water

The Town of Hardin sources water from the Big Horn River. The City's water right number is 43P-426-00. The allowable draw rate is 15 cfs, which is nearly 10 million gallons per day (MGD). There are no problems with the water right and there has never been any notable loss of supply.

The Bighorn River is located within the Bighorn River-Hardin watershed (HUC 100800150704). Both the wastewater treatment plant and the discharge outfall to the Bighorn River are located on the Crow Indian Reservation. The Crow Tribe has not established water quality standards for the section of the Bighorn River that is located on the Crow Indian Reservation. However, approximately 9 miles downstream of the wastewater treatment plant outfall at the boundary of the Crow Indian Reservation, the Bighorn River is identified by the United States Environmental Protection Agency (EPA) database as Montana stream segment MT43R001_010. The Bighorn River at this location is classified as B-2 according to Administrative Rules of Montana (ARM) 17.30.611. Waters classified B-2 are to be maintained suitable for drinking, culinary, and food processing purposes, after conventional treatment; bathing, swimming, and recreation; growth and marginal propagation of salmonid fishes and associated aquatic life, waterfowl, and furbearers; and agricultural and industrial water supply. Pursuant to Montana's Non-Degradation Policy, degradation of high-quality water is not allowed unless authorized by MDEQ. This segment of the Bighorn River is listed as "impaired" for public water supply due to the presence of lead and mercury.

Water Quality

The Consumer Confidence Report (CCR) for 2022, 2023, and 2024 show no violations of Lead and Copper, nor regulated contaminants of Chlorine, Fluoride, Nitrates, Radon and Uranium. The water was tested for secondary contaminant of Manganese and the highest level detected was 21 parts per billion (ppb) which is below the EPA's National Secondary Drinking Water Standards of 0.05 mg/L, which is non-mandatory.

Floodplains

Research of the floodplain in the vicinity of the existing wastewater treatment plant site shows that flood studies have not been conducted for this area. Federal Emergency Management Agency (FEMA) flood zone maps were reviewed. FIRM Panel 300143 0375B indicates that the City of Hardin and the Crow Reservation (on which the treatment site is located) were not included in the flood study. A copy of the FIRM panel is included in Appendix 1.4**.** However, the City of Hardin participates in the National Flood Insurance Program (NFIP).

Wetlands

A search of the United States Fish & Wildlife Service online wetlands inventory showed wetlands near the proposed project site but no wetlands in proposed construction areas.

Cultural Resources

Big Horn County is home to historic sites such as graves, Native American battlefields, stone circles, homesteads, historic mines, and other cultural sites.

Specific to general alternatives under consideration, the State Historical Preservation Office (SHPO) has stated that any structure over 50 years of age is considered historic and is potentially eligible for listing on the National Register of Historic Places. SHPO recommends that if any structures that are over 50 years old are to be altered as part of the project, they be recorded, and a determination of their eligibility be made prior to disturbance. SHPO also recommended that the Tribal Historic Preservation Office (THPO) be contacted regarding the project since the site is located on the Crow Indian Reservation. An agency review letter was mailed to the THPO requesting comments and concerns regarding the project. A response is yet to be received.

The proposed project area is in public rights-of-way and on ground that has been intermittently disturbed over the course of the past century. Therefore, it is unlikely that any historical or cultural resources will be encountered.

1.3. SOCIO-ECONOMIC AND ENVIRONMENTAL JUSTICE ISSUES

According to Headwaters Economics, Hardin's median household income of $60,463, is earned by 23.0% of the households. 34.4% of Households earn above the median household income and 42.5% earn below the median household income. 18.3% of families are below the poverty threshold in Hardin compared to 12% for the State of Montana.

Regardless of income levels, it should be noted that the water system serves the entire community, and any proposed improvements will affect residents equally. By replacing the dilapidated, asbestos cement mains, fire flows will improve, and future breaks will be eliminated.

The contamination potential of the system will also decrease significantly should any line breaks occur in the future. While there have not been many pipe breaks to date for this old system, the potential increases with each passing year. This improves the condition of the drinking water and improves the overall health and safety of the community, which improves the quality of life for all residents. Hardin will avoid unnecessary deferred maintenance and repair costs associated with water main breaks due to the dilapidated and undersized system. Adding fire hydrants will improve the safety of Hardin's residents. Bringing water valve spacing up to MDEQ spacing standards, and replacing non-functional water valves, will allow operators to control and manage the water system with less of an impact on the population by not having to shut down major portions of the water system for maintenance or repairs.

1.3.1. Population Trends

From the Headwaters Economic Report referenced in the previous section, the population from 2010 to 2023 can be analyzed. The population of Hardin in 2010 was 3,450 persons and the population in 2023 is 3,766 persons. The population increased by 9.2% with the median age of 36 years old in 2010 and the median age of 34 years old in 2023. This would indicate that younger generations are staying in Hardin, which increases the young family population as shown in Figure 1.9.

Demographics

Hardin, MT

Age and Gender (cont.)

	2010*	2023*
Total Population, 2010*-2023*	3,450	3,766
Under 18	1,044	1,137
18-34	650	854
35-44	439	424
45-64	730	851
65 and over	587	500
Percent of Total		
Under 18	30.3%	30.2%
18-34	18.8%	22.7%
35-44	12.7%	11.3%
45-64	21.2%	22.6%
65 and over	17.0%	13.3%

High Reliability: Data with coefficients of variation (CVs) < 12% are in black to indicate that the sampling error is relatively small.
Medium Reliability: Data with CVs between 12 & 40% are in orange to indicate that the values should be interpreted with caution.
Low Reliability: Data with CVs > 40% are displayed in red to indicate that the estimate is considered very unreliable.

Figure 1.9- Hardin's Population

1.4. COMMUNITY ENGAGEMENT

Significant shifts in the population and economic activity seen in other eastern Montana communities has yet to occur in Hardin; however, the City has anticipated these impacts by developing a growth management plan in 2021 see Appendix 1.5. The policy identifies water infrastructure as one of the top ten priorities. A formal public hearing about this PER and the associated Environmental Assessment was facilitated in March 2018. Subsequent presentations and updates were conducted at public City Council meetings in 2018 and 2019.

2. EXISTING FACILITIES

The City of Hardin potable water system was originally constructed in the 1920s with major upgrades in the 1950's, 1970's, 1990's and 2000. The Big Horn River approximately 1 mile west of the City provides the water supply for the city. Water is pumped from the Big Horn River approximately 1 mile to the Water Treatment Plant located at 401 Cheyenne Ave. For a more detailed description of the water treatment plant see Appendix 1. "Hardin Water Treatment Plant Preliminary Engineering Report", from AE2S Engineering

The distribution system entails approximately 25.1 miles of pipe, including two 16" mains that transmit water to two 500,000 gallon water tanks located approximately 1 mile west to the city. over Provide a General Description of the existing facilities :

The following are several issues that should be addressed.

- The mains around the High School lack adequate fire capacity. Completing at least one loop in this area would increase fire flow in the area to acceptable levels
- Most of the distribution lines are made of Asbestos Cement (approximately 90,00 lineal feet). These lines should be replaced as street improvements are made.
- In the future, a new 1-million-gallon water tank should be installed. The location will be determined based on growth (a growth policy is currently being developed).

Additional recommended improvements are discussed in Appendix 1.

2.1. LOCATION MAP

Hardin is the county seat of Big Horn County and is approximately 46 miles east of Billlings, Montana. Hardin is located along Interstate 90 on the banks of the Bighorn River near the Little Bighorn Battlefield National Monument. Hardin is on the northern border of the Crow Indian Reservation. The Big Horn Canyon National Recreation Area and Yellowtail Dam are located about 25 miles south of Hardin on State Highway 313.

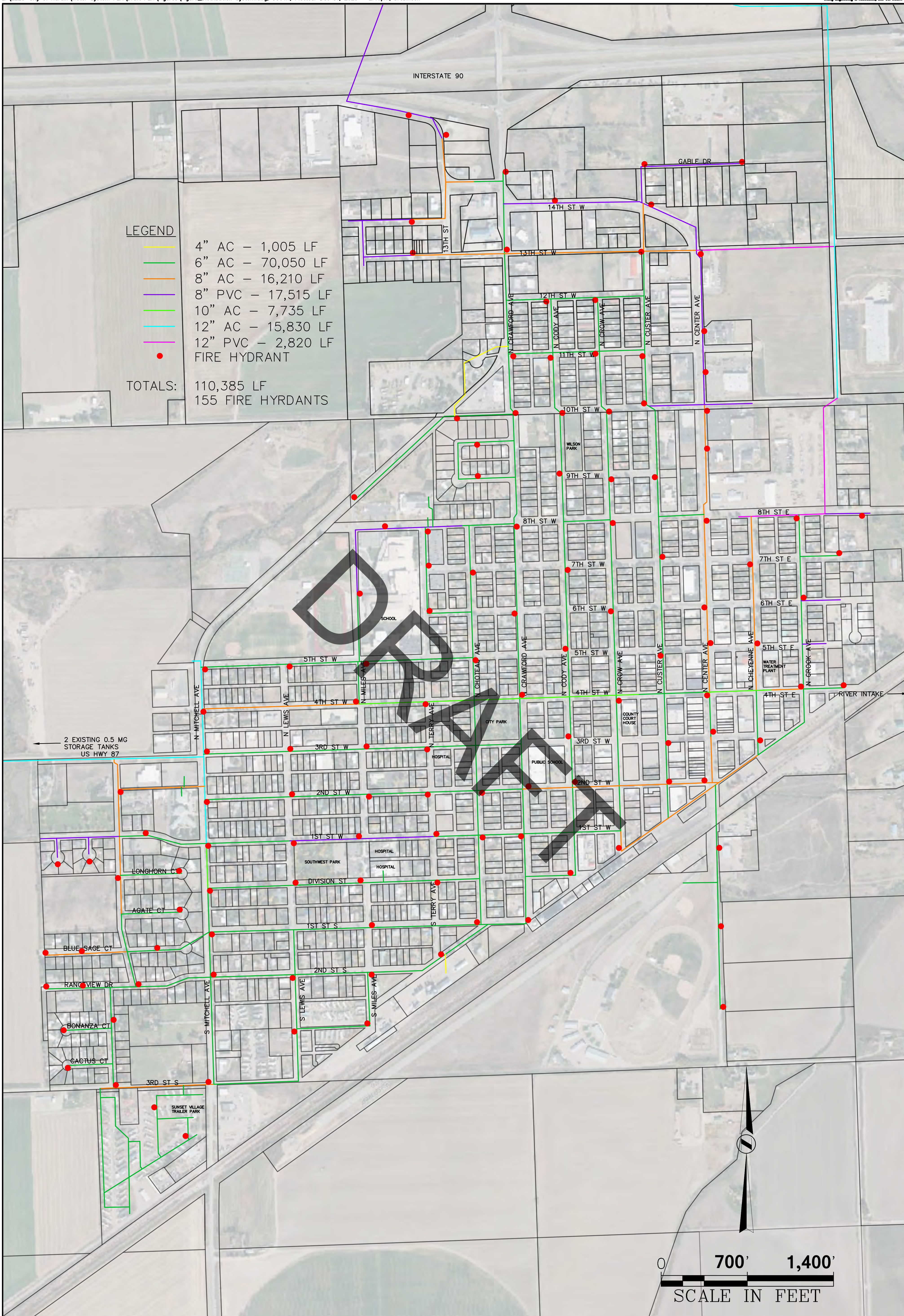

FIGURE 2.1
SOUTH DISTRIBUTION SYSTEM

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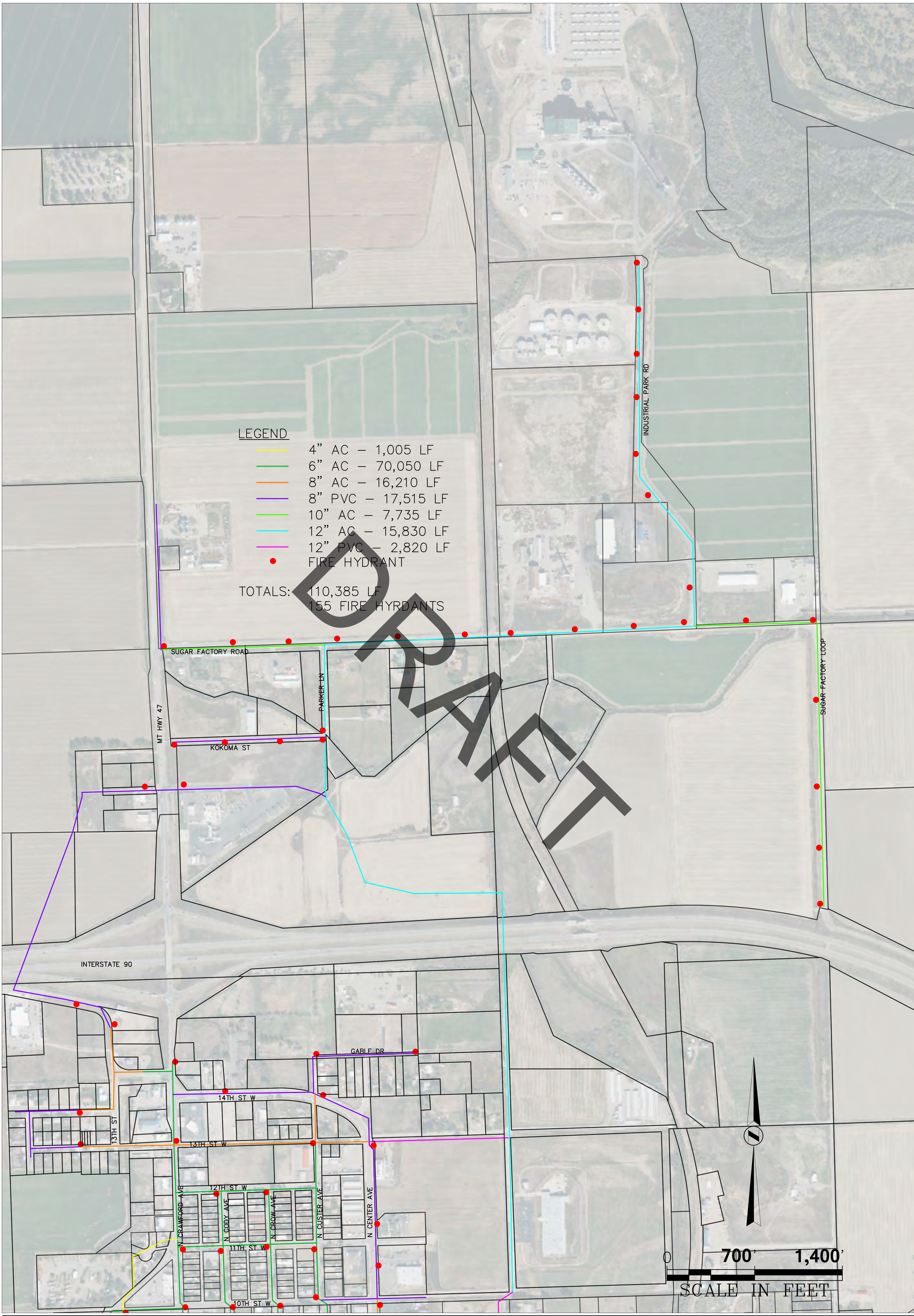

FIGURE 2.2
NORTH DISTRIBUTION SYSTEM

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2.2. HISTORY

2.2.1. Supply/Intake

The Hardin water system comprises two raw water intake structures. The original intake was constructed in the 1950's. The original structure, containing two pumps, is used today as a backup in case of primary pump failure or repair.

This intake was replaced with new intake structure in the 1980's. In 2007 the intake was updated with new split case pumps mounted with a special frame that allows the pumps to be operated upside down from the normal installation.

In 2009, flexible couplings were added to the pumps to minimize transferring vibrations from the pumps to the pipes.

Great West Engineering's 2010 PER does not recommend any improvements to the intake structure or water supply.

The most recent Sanitary Survey completed July 2, 2024 does not recommend any improvements to the intake.

The 2024 Sanitary Survey Inspection Report is included in Appendix 2.1.

2.2.2. Treatment

The water treatment plant is located within the City of Hardin at 401 Cheyenne Ave, over 1 mile from the intake structure along the Big Horn River. The treatment plant was constructed in the 1920's. In the 1950's, an expansion was made to add new sedimentation basins and filters. In 1995 the clearwell was expanded and baffles were installed. This clear well maintained the same depth and elevation of the existing clearwell. The filters originally consisted of gravel and sand media. This was upgraded to a plastic underdrain system with sand and anthracite media.

In 2012, the treatment plant was upgraded to incorporate recommendations from the 2010 PER. These upgrades included:

- Replacing High Service Pumps for the backwash
- New piping for the filter to waste
- Upgrading the SCADA System and controls for the filters
- Backup components for blower and rapid mix

The 2024 Sanitary Survey had several operational recommendations and the following repair:

- "A cross connection was observed in the plant effluent and backwash pump area. This cross connection consists of a turbidimeter drain line that enters a sump in this area of the water treatment plant. The proper back flow in the form of an air gap will need to be provided to eliminate this cross connection. The space required for a proper air gap is twice the diameter of the potable water pipe and not less than an inch."

The operators have made this repair.

The Hardin WTP is currently under no administrative order and has not experienced any recent failures.

Additional Details of the existing system are in Appendix 1.

2.2.3. Storage

The City has two 0.5-million-gallon water tanks (total storage is 1 million gallons). Both above ground tanks are located approximately 1.5 miles west of town, along Old Highway 87. Both tanks are located within a single fenced enclosure. One tank is a steel tank, constructed in 1949. The other tank is a concrete tank constructed in 1974. The steel tank is in good condition. In 2025, the maintenance staff repaired some of the backfill that had eroded around this tank that had eroded away. In addition, to prevent ice buildup in this tank, a mixer was installed in early 2025. The concrete tank had developed a leak that had been gradually getting worse. It was noted in the 2010 PER that the tank was actively leaking. Furthermore, it several cracks around in the tank as well as along the interior column that had rust leaching through the cracks, evidence of rebar corrosion. In the summer of 2025, the concrete tank was lined up and to seal up the cracks. In addition, the ladder inside the tank was replaced and a mixer was installed to minimize ice buildup within the tank.

The natural ground elevates the tanks approximately 100 feet, to provide pressure inside the town. Two parallel 16-inch diameter transmission mains provide the connection between the tanks and the City's water distribution system.

The 2010 PER recommended an interior lining and repair of the steel ladder within the concrete tank. This was completed in the summer of 2025.

A sanitary survey was completed in 2024. There were no significant deficiencies found.

2.2.4. Pumping Stations

The City of Hardin has one small pumping station located within the same fenced area as the water storage tanks. The pumping station provides pressure to seven water services located near the water storage facility. The pumping station consists of a 5 horsepower centrifugal pump with a rated capacity of 80 gpm and three-pressure tanks. This station maintains pressure between 40 and 80 psi to each service.

2.2.5. Distribution System

The water distribution system consists of approximately 110,000 lineal feet of water main. The mains consist of mostly Asbestos Cement and PVC Pipe ranging in size from 6-inch to 16-inch diameter (The raw water line from the intake is 18-inch). There are also 155 fire hydrants connected to the distribution system. The system is in good condition with minimal maintenance required to keep the system in good working order. Figure 2.1 and Figure 2.2 shows the general layout of the system. The system has been extended to the north side of Interstate 90 to provide service to an industrial subdivision. The total number of service connections is 1420. All the connections are metered. However, there are several connections that are currently not in use or are used on a seasonal basis. The distribution system also consists of a Bulk Water Fill Station. This fill station appears to meet all of the DEQ requirements for a Bulk Fill Station. System pressures within the distribution system meet the requirements of DEQ 1.

The break down of EDUs is shown in Table 2.1 and the distribution pipes are shown in Table 2.2.

TABLE 2.1 – TOTAL EQUIVALENT DWELLING UNITS

Size	# of Services	EDU	Total
0.75	1176	1	1176
1	147	1.8	265
1.5	17	4	68
2	53	7.1	376
3	11	16	176
4	7	28.4	199
Unknown	1		
	Total		**2260**

- .

TABLE 2.2 - EXISTING DISTRIBUTION SYSTEM PIPES

SIZE (IN)	MATERIAL	LENGTH (LF)
4	AC	1,000
6	AC	70,100
8	AC	15,900
8	PVC	10,600
10	AC	3,200
12	AC	3,500
12	PVC	6,100
16	PVC	7,500
16	AC	7,500

2.3. CONDITION OF EXISTING FACILITIES

An overview of the water system components was provided in previous sections, with a history of the components in Section 2.2. This section provides a detailed analysis of each part of the system. In addition to the analysis provided here, MDEQ completed a Sanitary Survey in 2024, Appendix 2.1.

2.3.1. Raw Water Intake

The Raw Water Intake is discussed in Appendix 1.

2.3.2. Pretreatment

Pretreatment is discussed in Appendix 1.

2.3.3. Filtration System

The filtration system is discussed in Appendix 1.

2.3.4. Disinfection System

The disinfection system is discussed in Appendix 1.

2.3.5. High Service Pumping

High Service Pumping is discussed in Appendix 1.

2.3.6. Electrical/ I&C

The electrical system and controls are discussed in Appendix 1.

2.3.7. Water Production and Capacity

The production capacity is discussed in Appendix 1.

2.3.8. Comparison with Existing Regulations

Existing regulations are discussed in Appendix 1.

2.3.9. Future Regulation Considerations

2.3.10. Future considerations

Future considerations for the Intake and the Water Treatment Plant are discussed in Appendix 1.

2.4 Water Demand

The City of Hardin provided 2 years of water usage data. The City has provided three different meter readings. The first is the amount of water pumped out of the Big Horn River. The second is the amount of water that is pumped out of the Water Treatment Plant and finally, they have provided the total amount of water that is metered each month

The water supply data shows the amount of water pulled from the river is approximately 590,000 gallons per month. The water plant uses an average of 8% of the water for backwash and other processes. The average amount of water leaving the plant is 543,00 gallons per day.

Average Day Demands (ADD)

The ADD was calculated by averaging the amount of water pumped daily for 2024 and 2025. The result is 590,000 gallons per day. Dividing by 1,440 min/day. equals 409 gpm which includes process water inside the water plant, unmetered water such as water main leaks, dead-end flushing flows, fire hydrant testing and water used for fire suppression purposes. It is important to note the City of Hardin experiences an average unmetered water of 25% per month, or approximately 138,00 gallons per day. This unmetered water can be attributed to:

- leaks in the distribution system,
- leaks or breaks in service lines prior to the service meter
- water used for firefighting or flushing hydrants
- inaccurate water meters, etc.

Unmetered water will be discussed in more detail in the distribution system portion of this section, but it is worth noting that the current unmetered water is very fairly high. The Environmental Protection Agency (EPA) estimates the average unmetered water in a system is 16%. The AWWA unmetered water guideline is less than 10%.

To establish the ADD for a twenty-year growth projection, the population growth is assumed to be 1%, which equals approximately an additional 786 people. To establish the total amount of water used per day per person, the average water volume used per day of 590,000 gallons was divided by the 2025 population of 3708 people. This results in total 160- gallons per capita day (gpcd). Multiplying the design gpcd by the design year 2045 population of 4490 residents results in an ADD design of 718,00-gallons-per-day, or 500 gpm for the analyses in this report.

Maximum Day Demand (MDD)

MDD is the highest water demand of the year during any 24-hour period. MDD is important to consider as water usage varies throughout the day in addition to the month and the year. The most important reason to consider MDD is to ensure that adequate water supply is available to meet the maximum day demands without exceeding the existing water right. The City of Hardin current water right off the Big Horn River is 3.58 cfs (1600 gpm) and 1074 acre -ft (350 million gallons.

The MDD shows up in July of 2024 from Hardin's water records are 1,020,6460 gallons or 708 gpm.

A peaking factor is typically used to estimate future MDD and is the ratio of the MDD to ADD. Dividing the MDD of 708 gpm by the ADD of 408 gpm provides a peaking factor of 1.73.

2.3.11. Supply

As previously discussed, water is supplied to the Town of Hardin by the Big Horn River. For a more complete discussion of the intake structure and the water supply see Appendix 1.

Water Quality

For a discussion of the Supply Water quality see Appendix 1.

Water Quantity

The City of Hardin has been granted a water right that provides adequate water for the next 20 years. Using the ADD of 160 GPCD, and the 20-year population of 4,490, the total volume required is 262 million gallons which is significantly less than the total yearly volume granted in the water right.

Susceptibility to Drought

The water supply for Hardin is believed to have a very low susceptibility to drought. The Big Horn River has been a reliable source of water to Hardin for over 100 year. The water in river is controlled by the Yellowtail Dam which helps to moderate flows in the river during periods of drought.

Capacity for Growth

As discussed above. The water right granted to the City of Hardin makes it possible for the City to have a 1% growth rate for the next 20 years. The last 20 years, the population has grown at less than 1%.

Water Rights

The City of Hardin's current water right off the Big Horn River is limited to 3.58 cfs (1600 gpm) and 1074 acre -ft (350 million gallons) volume per year.

The City also has some irrigation water rights from existing ditches, however these are not considered in the use estimates or included in the water rights

Source Water Protection

Reference and summarize the Source Water Protection Plan, which can be downloaded at the DEQ Website.

2.3.12. Treatment

Water treatment is discussed Appendix 1.

2.3.13. Storage

Description of the existing water storage is discussed above.

Storage Condition

The steel tank is in good condition. The City provides cathodic protection to this tank and a mixer was recently installed to prevent ice buildup within the tank.

The concrete tank is also in good condition. The City of Hardin recently installed a mixer installed a 60-mil liner to repair some cracks that had begun leaking and corroding rebar. The outside of the tank has some cosmetic issues with the leaks showing rust stains on the outside. The tank was inspected for structural integrity which yielded a recommendation to line the inside of the tank.

Domestic Storage

Hardin's storage tanks are governed by Montana DEQ Circular-1, which has the following standards related to the size of storage facilities:

DEQ Circular-1, Section 7.0.1:

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

DEQ Circular-1, Section 7.0.1.a:

> *The minimum allowable storage must be equal to the average day demand plus fire flow demand, as defined below, where fire protection is provided.*

DEQ Circular-1, Section 7.0.1.b:

> *Any volume less than that required under a. above must be accompanied by a Storage Sizing Engineering Analysis, as defined in the glossary. Large non- residential demands must be accompanied by a Storage Sizing Engineering Analysis and may require additional storage to meet system demands.*

DEQ Circular-1, Section 7.0.1.c:

> *Where fire protection is provided, fire flow demand must satisfy the governing fire protection agency recommendation, or without such a recommendation, the fire code adopted by the State of Montana.*

Currently, Hardin's existing water tanks have approximately 1 day of potable water storage available when they are filled. When comparing this to the design year of 2045, with an ADD of 718,000 gallons, Hardin's existing tanks provide water storage for approximately 1.4 days. The industry-recommended baseline to ensure regular turnover and safeguard water quality is 3 to 5 days.

Needed Fire Flow (NFF) is typically based on construction material, use of the building, size of the building, and distance between buildings. The CITY is comprised of mostly residential dwellings, with some commercial, industrial, government buildings and , the county courthouse and several school buildings.

The State of Montana has adopted the 2021 International Fire Code. Table B105.1(2) in the IFC sets the NFF and required duration. The largest fire flow required in Hardin is for the High School which is 6,000 GPM. The remaining buildings have a max flow rate of 2,500 gpm.

Analyzing the minimum storage per DEQ-1, maximum day demand with the NFF of 6000 gpm, a production capacity of 930 gpm, for 2 hours the following calculation gives the required minimum daily storage:

(NFF-gpm – Capacity gpm for well production) x (2 hours) x (60 minutes/hour) = 608,400gallons

+ Design Year MDD = 1,252,800 gallons

Total Storage Needed = 1,861,200 gallons

However, Montana DEQ Circular-1 , Section 7.0.1.e:

> *Excessive storage capacity should be avoided to prevent water quality deterioration and potential freezing problems.*

Hardin would require another 862,000 -gallon tank, using the MDD and fire flows. With the 2045 average day demand estimated at 718,400 gallons of water, the proposed tank would experience a 2.6-day turnover rate, which is under the recommended 3 to 5-day turnover rate.

This analysis is based on the limiting factor of the current sediment basin within the water treatment plant only having a capacity of 930 gpm. If this were improved, and the capacity increased, the amount of storage would need to be reevaluated.

2.3.14. Pumping Stations

There is one small pumping station in the Hardin's water system. The water tanks provide the needed pressure for the water use within Hardin

Montana DEQ Circular-1 , Section 8.2.1:

> *…The system must be designed to maintain a minimum normal working pressure of 35 psi. Minimum pressure under all conditions of flow (e.g., fire flows, hydrant testing, and water main flushing) must be 20 psi.*

Normal working pressures within the distribution system range from 80 pounds per square inch (psi) to 45 psi. This pressure meets the MDEQ minimum of 35 psi. Based on Hydrant test, and Hydraulic analysis, this system meets the minimum requirements for pressure under all flow conditions.

2.3.15 Distribution System

Hardin's distribution system was discussed in Section 3.2.4. Table 2.2 provides the pipe inventory by diameter and material.

Unmetered Water

Approximately 25% of the water produced by the City of Hardin is unmetered. This is substantially more than the 10% AWWA guidelines state for water loss in a well-managed water system.

The water loss can be attributed to the age of the system and leaking water service prior to the meter.

Hydraulic Model

Hydraulic modeling was previously performed for the City's water system using Bentley WaterCAD hydraulic modeling software. Using existing record drawings, the size and material of the water distribution piping was used in the model. Hydrant flow tests were used to ensure the data is similar to the previous model. it was. Furthermore, the previous model used a larger ADD and MDD to determine flow rates due to the possibility of a 1000-person jail, that did not occur. The hydrant tests conducted to show that the previous model is still accurate. However it appears the distribution system has increased leakage as the gallons per capita day has sligh. After calibration, the existing system was analyzed for ADD and MDD, using larger flow rates than current ADD and MDD based on current populations.

The proposed scenarios for ADD and MDD will be discussed in more detail in Chapter 5. Domestic Flows.

The existing ADD is 408 gpm, and the MDD is 708 gpm, as discussed in Section 2.3.1 Using this demand, the water pressures throughout the distribution system could be estimated using the water modeling software

Montana DEQ Circular-1 Section 8.2.1:

All water mains, including those not designed to provide fire protection, must be sized after a hydraulic analysis based on flow demands and pressure requirements. The system must be designed to maintain a minimum normal working pressure of 35 psi. Minimum pressure under all conditions of flow (e.g., fire flows, hydrant testing, and water main flushing) must be 20 psi. Water main pressures must be sufficient to provide the required minimum pressures at ground level at the highest building sites served by the proposed water mains excluding service line head losses (i.e., water main pressure must be equal to or greater than the required minimum pressure plus the elevation difference between the highest building site and ground level at the service connection). Maximum normal working pressure should be approximately 60 to 80 psi.

<u>*Fire Flows*</u>

According to the hydraulic model Hardin's distribution system meets the required fire flow demand except around the existing high school. Currently this does not meet DEQ-1, Section 8.2.3:

When fire protection is to be provided, system design must be such that fire flows and facilities are in accordance with the recommendations of the fire protection agency in which the water system is being developed, or in the absence of such a recommendation, the fire code adopted by the State of Montana.

Based on the IFC standards, 1,000-gpm for a 2-hour sustained period is the minimum required fire flow for one and two-family dwellings with floor areas less than 3,600 square feet. All other buildings with areas more than 3,600 square feet require a minimum fire flow of 1,500-gpm for 2-hours. The 1,000-gpm and 1,500-gpm requirements are applicable to most of the buildings in Hardin.

The high school requires 6,000 gpm for 2 hours. Currently this flow is too high to be met by the existing system, without improvements to the water mains around the High School. However this also exceeds the capacity of the department's equipment to handle that amount of water.

<u>*Dead Ends*</u>

There are very few dead mains within the system. However, there is one on the north side of the interstate that should be looped to provide system redundancy. There is also dead-end mains on the west side of the High School that limits the fire flow available for the school.

Montana DEQ Circular-1 , Section 8.2.4 states:

To provide increased reliability of service and reduce head loss, Dead ends must be minimized by using appropriate tie-ins whenever practical.

Where dead-end mains occur, they must be provided with a fire hydrant if flow and pressure are sufficient, or with an approved flushing hydrant or blow-off for flushing purposes...

Water Valves

Montana DEQ Circular-1 has standards regarding water valves in a water distribution system and Montana DEQ Circular-1 , Section 8.3 requires:

> *Sufficient valves must be provided on water mains so that inconvenience and sanitary hazards will be minimized during repairs. Valves should be located at not more than 500-foot intervals in commercial districts and at not more than one block or 800-foot intervals in other districts.*

The City Hardin currently has adequate water valves, to meet the above standards.

Fire Hydrants

Montana DEQ Circular-1 , Section 8.4.1.a states:

Hydrants should be provided at each street intersection and at intermediate points between intersections and must be provided as recommended by the fire protection agency in which the water system is being developed, or in the absence of such a recommendation, the fire code adopted by the State of Montana.

Hardin currently has a total of 155 fire hydrants varying in age. Fire hydrants are adequate to meet the above requirements and are routinely maintained.

Service Lines and Water Meters

Montana DEQ Circular-1 , Section 8.12 states:

> *Each service connection should be individually metered. New water systems should individually meter each service connection.*

Virtually all the service lines are metered and read on a regular basis. Meters that no longer function are regularly read.

The city raises rates on an as needed basis. The most recent rate increase was in May of 2025.

2.4. OPERATIONAL AND MANAGEMENT PRACTICES AND CAPABILITIES

The system water treatment system is operated by 3 Montana DEQ licensed distribution operators and 4 Montana DEQ licensed treatment operators. During the summer, an additional part time employee is hired to assist the operator.

Typically, Hardin doesn’t experience major problems with its distribution system. They have the manpower and equipment to make most needed repairs. These repairs include replacing fire hydrants, service line components, valves, repairing main leaks and minor repairs inside the water control/treatment building. Electrical repairs and larger water main installations require the Town to contract for those services. Furthermore, Hardin has been proactive in making improvements to their system when warranted.

2.5. FINANCIAL STATUS OF FACILITIES

Income and expenses for the water system for the last three years, including operation and maintenance, was provided by Hardin, and can be found in Appendix 2.2. The operating revenues and expenses for the years 2022 through 2024 have been averaged to determine the project budget. A summary of the income and expenses for Jordan are displayed in Table 2.3.

Table 2.3 Revenue and Expenses

DESCRIPTION	2022	2023	2024	AVG
Metered Water Sales	$ 801,940	$ 792,439	$ 747,542	$ 780,640
Miscellaneous Revenues	$ 7,317	$ 11,546	$ 4,949	$ 7,937
Special Assessments	$ 38	$ 29	$ -	$ 22
Intergovernmental Revenue	$ 20,703	$ 8,861	$ 55,631	$ 28,398
Interest Revenue	$ 5,194	$ 6,735	$ 44,839	$ 18,923
Sale of Capital Assets			$ 5,291	$ 5,291
TOTAL REVENUE	$ 835,192	$ 819,609	$ 858,252	$ 837,684
Personal Services	$ 269,927	$ 519,125	$ 565,553	$ 451,535
Supplies	$ 107,276	$ 151,465	$ 151,495	$ 136,745
Purchased Services	$ 114,202	$ 165,112	$ 178,202	$ 152,505
Fixed Charges	$ 17,508	$ 19,295	$ 20,807	$ 19,203
Depreciation	$ 246,097	$ 250,003	$ 254,513	$ 250,204
TOTAL EXPENSES	$ 755,009	$ 1,105,001	$ 1,170,570	$ 1,010,193
NET PROFIT (LOSS)	**$ 80,183**	**$ (285,392)**	**$ (312,318)**	**$ (172,509)**

As shown in Table 2.3, the Town is averaging $1,000,000 in O&M costs over the last three years. Excessive O&M costs can reduce the City’s reserves if not adequately budgeted. It is expected that the O&M costs will only continue to increase as the AC water mains and Mueller fire hydrants continue to age and deteriorate, leading to even more breaks and leaks each year. The system recently increased the user fees for the water system in order stop losing money.

Existing User Rates

Water rates consist of a Base Rate and a Consumption Rate. The base rate depends on the meter size and includes a fixed amount of water, which increases with the meter size. The Consumption

Rate is based on the amount of water in excess of the Base Rate gallons consumed by each service connection. Currently, the Consumption Rate is $2.75 per 1,000 gallons over the Base Rate amount and is the same regardless of meter size. Water rates are shown in Table 2.4.

TABLE 2.4 - WATER SERVICE RATES

SIZE	BASE RATE	GALLONS IN BASE RATE	CONSUMPTION RATE PER 1,000 GALLONS
3/4 inch	22.00	3000	2.75
1 inch	36.31	3000	2.75
1 ½ inch	44.31	3000	2.75
2 inch	62.96	3000	2.75
3 inch	90.66	3000	2.75
4 inch	94.76	3000	2.75
6 inch	112.72	3000	2.75
Fire System	0.8		

The above rates are for a ¾” diameter water service, typical for a single family home. Larger services are charged proportionally increasing rates based on the ability to deliver larger amounts of water, which has a larger impact to the system. The ratio of the area for larger services is compared to the single-family home, also known as an Equivalent Dwelling Unit (EDU). For example if a service has twice the area of a 3/4” line, the service is 2 EDU’s. The following table shows the total number of EDU’s that currently compose the Town of Jordan’s Water System.

Table 2.5 Total Equivalent Dwelling Units

Size	# of Services	EDU	Total
0.75	1176	1	1176
1	147	1.8	265
1.5	17	4	68
2	53	7.1	376
3	11	16	176
4	7	28.4	199
Unknown	1		
Total	**1412**		**2260**

Also important to the financial status of the City is their ability to meet the “target rate” established by the Montana Department of Commerce (MDOC) for all municipalities across the state. To apply for grant funding from the MDOC, the user rates, after completion of the project, must meet or exceed the established target rates.

Target rates are established as a percentage of Median Household Income (MHI) for municipalities. The percentage is 1.4% of the MHI for water, and 0.9% of the MHI for wastewater, resulting in a combined rate of 2.3%. Hardin is an incorporated town, with an established MHI of $60,463. According to MDOC, Hardin’s Low-to-Moderate Income (LMI) level is 50.0%. The target rates for Hardin are $70.54 for water and $ 45.35 for wastewater, for a total user rate of $115.89.

The City Hardin is willing to provide a substantial investment and financial commitment to the water system and to ensure that the City has funds in emergency reserves and short-lived assets and to be prepared for future improvements

2.6. WATER/ENERGY/WASTE AUDITS

At this time, no water, energy, or waste audits have been completed for the water system, other than the analyses previously made in this report.

3.0 NEED FOR PROJECT

The following subsections provide an overview of the City of Hardin's water system needs. The overview will help determine which alternatives are best for Hardin and prioritize their capital projects while managing limited resources and budgets.

3.1. HEALTH, SANITATION AND SECURITY

Health and safety of the public is a concern for any community water system. Hardin has maintained the water system and there are no significant deficiencies in their water system that compromise the health and safety of the public. However, there are two projects that could be enhance the health and safety of the community. Those are the construction of a 1-million-gallon water tanks and the completion of water main loop around the High School.

3.1.1. Distribution System

Health and safety concerns with the distribution system follows:

a). Pipe Leaks

Currently the distribution system loses approximately 25% of the water that is produced. Although the primary cause of this is unknown, there is over 90,000 lineal feet of Asbestos Cement water line that is past its useful life. This is too much water main to feasibly replace in one project however, the City should consider taking an area of the City to replace water main as it completes street improvements throughout the City. It is important to note that these leaks do not appear to be increasing with time, and this unmetered water could be lost through service lines.

b). Dead-Ends Mains

Hardin's distribution system has a couple of dead-end water mains around the High School. This limits the amount of fire flow around the High School. The two short segments of water main should be installed in order to improve fire flow around the High School. In addition, within the industrial area, a loop should be included to provide greater redundancy within the industrial subdivision. Not only do dead end water mains limit flows within the distribution system, but they can present health concerns. Health concerns occur due to stagnating water which may occur in the dead-ends. The chlorine residual may decay significantly which produces an environment that permits bacteria to grow and thrive. Dead ends may allow the formation of Disinfection Byproducts (DBP) such as TTHM since Name of Town uses liquid sodium hypochlorite to disinfect their water. Some DBPs have carcinogenic potential creating a health concern. Dead-end mains may create water issues such as bad taste, odor, and discoloration.

Frequent flushing of dead-end mains can reduce the chance of these issues.

Dead end mains are discussed in Montana DEQ Circular-1 , Section 8.2.4:

"To provide increased reliability of service and reduce headloss, Dead ends must be minimized by using appropriate tie-ins whenever practical."

"Where dead-end mains occur, they must be provided with a fire hydrant if flow and pressure are sufficient, or with an approved flushing hydrant or blow-off for flushing purposes..."

The two projects above will help to minimize issues with dead end mains and help to enhance the fire flows and water quality in the town.

3.1.2. Water Storage

Water storage for Hardin is currently inadequate during a fire at the school. There is not enough water storage to meet minimum fire flow requirements. To accomplish this, based on the current output of the water treatment plant, a new million-gallon water tank should be installed. There is adequate water storage for all other requirements.

The storage tanks were discussed in Section 2. With improvements to the existing tanks, this project is not an immediate need, however as Hardin grows, there could be a need for installing a new tank eventually. The location of the tank will depend on where the city grows. The two most likely locations is at the current location west of town or north of interstate 90 where there is currently water infrastructure that is underutilized. The location of the tank will dictate the type of tank to be installed. Furthermore, improvements to the water treatment plant may impact the sizing of the tank.

3.1.3. Distribution System

Hardin's distribution system is over 100 years old and has been in service far longer than it was designed to be. The distribution system is discussed at length in previous sections. Following is a breakdown of these sections:

Table 2.2 shows the pipe diameter, material, and length.

Hardin has approximately 155 fire hydrants. These hydrants are maintained, repaired or replaced if found not working. Fire flows other than the area around the high school meet MDD and Fire flow requirements while maintaining minimum pressures.

The gate valves have been discussed in previous sections. The gate valves have been adequately spaced to ensure adequate operation of the system.

Water meters and curb stops were also discussed in previous sections. The city has metered virtually all the water services.

3.2. REASONABLE GROWTH

Population was discussed in Chapter 2.3 and shown in Figure 1.9 Hardin and Big Horn County have experienced a population decline over the past 10 years, but an increase in the last 20 years of just under 1%. For the PER we have used a 1% growth rate.

To determine the number of people living in Jordan in 2045, Equation 4.1 below is used:

$FV=PV \times (1+r)^n$

Where:

Equation 4.1

Po = 2025 Population is 3704 people

Pf = 2045 Population of people

r = 1% total growth

n = 20 years

Solving Equation 4.1 for the 2045 population, Pf = 4490 people.

This amount of growth will not have any adverse impacts on the water system over 20 years.

4. ALTERNATIVES CONSIDERED

A variety of alternatives may exist to address the identified deficiencies within Hardin's water system. However, several alternatives may not be the best course for harsh Montana winters. The screening process will determine the best alternatives for Hardin.

4.1. SUPPLY ALTERNATIVES

For a discussion on Supply Alternatives, see Appendix 1

4.2. TREATMENT ALTERNATIVES

For a discussion on Treatment Alternatives see Appendix 1

4.3. STORAGE ALTERNATIVES

There are currently no significant deficiencies with the City of Hardin's potable water storage. Although both water tanks are close to 50 years old, they are well maintained. With the addition of mixers and the new liner in the concrete tank, these tanks should be able to remain in service for several more years.

However, as Hardin continues to grow, there will be a need to increase potable water storage to serve the expanding population and provide adequate fire flow. When and where this will occur depends largely on how and where the city sees growth occurring and improvements to any production facilities.

The following alternatives were considered for the potable water storage.

4.3.1. Alternative ST-1 - No Action

a). *Description*

This alternative consists of taking no action and is currently the recommended alternative. Currently there is not a need to construct a new water tank. Hardin has adequate capacity to provide both maximum day demand and fire demand with the existing storage.

4.3.2. Alternative ST-2 –Elevated Welded Steel Pedestal Tank

a). *Description*

Th*is* alternative is to build an elevated welded steel pedestal tank. This would be a good alternative if the tank were needed north of Interstate 90. Constructing an elevated tank will allow the required Hydraulic Grade Line to meet DEQ's Standards for 35 psi minimum working pressure in the distribution system and 20 psi minimum system pressure during fire flows.

b). Design Criteria

The new tank would include access road improvements, site work, site piping, geotechnical testing with recommended foundation, site security, SCADA, and all appurtenances to meet MDEQ Standards. Plans and specifications need reviewed and approved by MDEQ before bidding and construction. A General Permit for Storm Water Discharge Associated with Construction Activity from MDEQ will also be required if more than 1-acre is disturbed during construction.

The proposed tank's volume of 1 million gallons would allow one of the existing tanks to be taken offline. showed a needed volume of 188,000 gallons to provide MDD plus Fire Flow. The turnover time of the reduced storage tank volume of 200,000 gallons during 2045 ADD of 36,245 gpd is reduced to 5.5 days which is closer to the industry recommended turnover rate of 3 to 5 days. Jordan hasn't received complaints regarding water quality with their current 230,000-gal storage tank and shouldn't have water quality complaints for the proposed tank with a mixing system.

The maximum and minimum water height inside the new water tank would be determined based on the new location of the water tank.

A welded steel pedestal tank is more resistant to interior ice damage than the bolted steel design. A heated pedestal would minimize the water freezing and having separate inlet and outlet pipes would provide turnover of all the water in the tank which would minimize water quality issues. A mixer could be installed remedy this concern. This would meet the DEQ-1 Circular, Sections 7.0.1. and 8.2.1 discussed in Section 3.3.3 and Section 3.3.4, respectively.

Inspections and maintenance of an elevated tank is slightly more challenging but there are qualified contractors that specialize in elevated tank inspections and repairs. The tank would need inspections every 5 years and recoating every 20 years.

c). Map/Schematic Design

The schematics of an elevated welded steel tank are found in Appendix 4.1.

d). Environmental Impacts

Noise and dust pollution are associated with this type of construction, but best management practices will be incorporated into the construction project to keep these minimal. Construction will only be allowed during normal working hours. After the site is completed, the dust and noise will cease. Other environmental impacts will be determined when the final location of the tank is identified.

e). Land requirements

Land acquisition will be required. Temporary construction easements will be required to complete construction. The permanent easements will remain unchanged.

f). Potential Construction Problems

This alternative will require geotechnical investigations due to the soft soils surrounding Hardin. An engineered foundation may be required to adequately support the elevated tank. No major construction problems are anticipated. All permits will be obtained before beginning construction.

g). Sustainability Considerations

i) Water and Energy Efficiency

Impact on water and energy efficiency are not anticipated.

ii) Green Infrastructure

There is no green infrastructure with this alternative.

iii) Other

Water will be available in the event of a fire, and the system pressure will not drop below the minimum 20 psi requirement.

h). Cost Estimates

Total capital costs for the elevated welded steel tank are in Section 6.1.3. The estimate includes costs for construction, engineering, water mixing system, construction administration, contingency, legal and administrative, and inflation for each phase. Construction on the elevated welded steel tank is anticipated to begin in 2029 and will be the first phase of the water system improvements.

Operation and maintenance costs are shown in Table 4.1. These costs include tank inspection every 5 years and recoating of the tank every 20 years. The recoating may not be needed every 20 years but is used to provide a conservative cost estimate. Another cost that must be included is the power for the water mixing system and a replacement mixer, which is the only significant difference between the existing tank and future tank.

TABLE 4.1 TANK OPERATION AND MAINTENANCE COSTS

Description	Interval	Cost	Present Worth
Tank Inspection	3 year	$ 3,000	$ 27,000
Tank Cleaning	5 Years	$ 5,000	$ 25,000
Mixer Electrical	Annually	$ 1,500	$ 45,000
Mixer Replacement	10 Years	$ 12,000	$ 24,000

Tank Recoating	20 years	$ 200,000	$ 200,000	
			$ 321,000	
Annual O & M Costs for tank		($15,900.18)		
Description	**Interval**	**Cost**	**Present Worth**	
Mixer Electrical	Anually	$ 1,500	$ 45,000	
Mixer Replacement	10 Years	$ 12,000	$ 24,000	
			$ 69,000	
Additional Annual O & M Costs for tank	($3,417.80)			
Cost per month Per EDU				($0.99)

4.3.3 T-3 CONCRETE GROUND RESERVOIR

a). Description

This alternative is the best option for construction costs and maintenance. An estimate was provided by DN Tanks for a 1 million-gal concrete tank, either buried or exposed and is in Appendix 4.2. This tank would need to be constructed on ground at the same elevation as the existing tanks to maintain or require a booster station

b) *Design Criteria*

The new tank would include access road improvements, site work, site piping, geotechnical testing with recommended foundation, site security, SCADA, and all appurtenances to meet MDEQ Standards. Plans and specifications need reviewed and approved by MDEQ before bidding and construction. A General Permit for Storm Water Discharge Associated with Construction Activity from MDEQ will also be required if more than 1-acre is disturbed during construction.

The proposed tank's volume of 1 million gallons would need to be verified based on any increased production capacity of the water treatment plant.

The maximum and minimum water height inside the new water tank would be determined based on the new location of the water tank.

b). Map/Schematic Design

The schematics of an elevated concrete tank are found in Appendix 4.5.

c). Environmental Impacts

Noise and dust pollution are associated with this type of construction, but best management practices will be incorporated into the construction project to keep these minimal. Construction will only be allowed during normal working hours. After the site is completed, the dust and noise will cease. Other environmental impacts will be determined when the final location of the tank is identified.

d). Land requirements

Land acquisition may be required. There is adequate space at the current tank site, however if a location north of the interstate is preferrable, land will need to be acquired.

e). Potential Construction Problems

This alternative will require geotechnical investigations due to the soft soils surrounding Hardin. An engineered foundation may be required to adequately support the e tank. No major construction problems are anticipated. All permits will be obtained before beginning construction.

f). Sustainability Considerations

iv) Water and Energy Efficiency

Impact on water and energy efficiency are not anticipated.

v) Green Infrastructure

There is no green infrastructure with this alternative.

vi) Other

Water will be available in the event of a fire and the system pressure will not drop below the minimum 20 psi requirement.

g). Cost Estimates

Total capital costs for the tank are in Section 8.1.3. The estimate includes costs for construction, engineering, water mixing system, construction administration, contingency, legal and administrative, and inflation for each phase. Construction on the elevated welded steel tank is anticipated to begin in 2029 and will be the first phase of the water system improvements.

Operation and maintenance costs are shown in Table 5.1. These costs include tank inspection every 3 years and recoating of the tank every 20 years. The recoating may not be needed every 20 years but is used to provide a conservative cost estimate. Another cost that must be included is the power for the water mixing system and a replacement mixer, which is the only significant difference between the existing tank and future tank.

4.4. PUMPING STATION ALTERNATIVES

The small pumping station required for the 7 services currently meets system requirements and alternatives were not considered.

4.5. DISTRIBUTION SYSTEM ALTERNATIVES

The following alternatives were considered as possible solutions:

4.5.2. Alternative D-1 – No Action

a). Description

This alternative is not a viable alternative since most of their distribution mains are AC and installed in the 1920s and past their useful life. Although this alternative can be spread out over many years as streets are reconstructed or money is available.

This alternative will not be considered.

4.5.3. Alternative D-2 – Water Main Replacement

a). Description

This alternative replaces all the AC pipe currently in the City. Due to the large scope of total AC water main replacement, this project will need to be divided into phases. The phases should be incorporated in replacing street surfacing, as they historically have been done

b). Design Criteria

The new mains will run parallel to the existing mains with a 3 foot to 5-foot offset. The existing mains will be abandoned in-place. If sections of the AC mains need to be removed and disposed of off-site, the AC main removal must follow the asbestos mitigation requirements of MDEQ and the EPA. Thise special requirements will be addressed during design of the new distribution system.

Plans and specifications must be reviewed and approved by MDEQ before bidding and construction. A General Permit for Storm Water Discharge Associated with Construction Activity from DEQ will be required if more than 1-ac is disturbed during construction.

Permits from MDT and Big Horn County may be required and will be addressed during final design.

c). Environmental Impacts

Construction is expected to take place within Hardin’s existing streets rights-of-way. These areas are classified as developed residential roads. The land use is not anticipated to change because of these improvements. There are no wetlands, floodplains, wetlands, endangered species, or historical or archeological sites that will be disturbed during construction.

Noise and dust pollution are associated with this type of construction, but best management practices will be incorporated into the construction project to keep these minimal. Construction will only be allowed during normal working hours. After the site is completed, the dust and noise will cease.

Asbestos dust from removing the existing AC pipes will be mitigated per EPA and MDEQ Standards.

d). Land requirements

No land acquisition is anticipated.

e). Potential Construction Problems

No major construction problems are anticipated. It will be required that residents will not be without water for longer than one day. The contractor will notify residents 48 hours before their water is turned off and when their water should be turned back on.

Traffic control will be required to route traffic around the project sites. Contaminated soil is not anticipated to be encountered. However, if it is found, the removal will follow DEQ and EPA regulations.

f). Sustainability Considerations

i) Water and Energy Efficiency

This alternative may save water in the future by removing the 1950's AC mains thus reducing the potential of failure and leaks. Saving water would in turn save energy too by reducing the water demand on the treatment plant.

ii) Green Infrastructure

There is no green infrastructure with this alternative.

g). Cost Estimates

Costs for water main replacement have not been included. The extents will depend on the replacement of surface infrastructure.

4.5.4. Alternative D-3 – Water Main Extension

a). Description

This alternative completes the water main loop around the High School to increase the fire flows. This includes connecting two dead end mains on the west side of the High School and providing a main on the east side of the High School that will complete the pipe network as shown in Exhibit 4.1

b). Design Criteria

Plans and specifications must be reviewed and approved by MDEQ before bidding and construction. A General Permit for Storm Water Discharge Associated with Construction Activity from DEQ will be required if more than 1-ac is disturbed during construction.

Permits from MDT and Big Horn County will be required and will be addressed during final design.

c). Environmental Impacts

Construction is expected to take place within Hardin's existing streets rights-of-way. These areas are classified as developed residential roads. The land use is not anticipated to change because of these improvements. There are no wetlands, floodplains, wetlands, endangered species, or historical or archeological sites that will be disturbed during construction.

Noise and dust pollution are associated with this type of construction, but best management practices will be incorporated into the construction project to keep these minimal. Construction will only be allowed during normal working hours. After the site is completed, the dust and noise will cease.

Asbestos dust from removing the existing AC pipes at points of connection will be mitigated per EPA and MDEQ Standards.

d). Land requirements

No land acquisition is anticipated.

e). Potential Construction Problems

No major construction problems are anticipated. It will be required that residents will not be without water for longer than one day. The contractor will notify residents 48 hours before their water is turned off and when their water should be turned back on.

Traffic control will be required to route traffic around the project sites. Contaminated soil is not anticipated to be encountered. However, if it is found, the removal will follow DEQ and EPA regulations.

f). Sustainability Considerations

iii) Water and Energy Efficiency

This alternative may save water in the future by removing the 1950's AC mains thus reducing the potential of failure and leaks. Saving water would in turn save energy too by reducing the water demand on the treatment plant.

iv) Green Infrastructure

There is no green infrastructure with this alternative.

g). Cost Estimates

Costs for water main extension is $700,000 and been included in not been included. The extents will depend on the replacement of surface infrastructure.

L:\2223-City of Hardin\Water System PER\Draft PER\Figures\Figure_Distribution System.dwg, ALTERNATIVE, Plotted: Dec 31, 2025 - 9:54am, brobinson

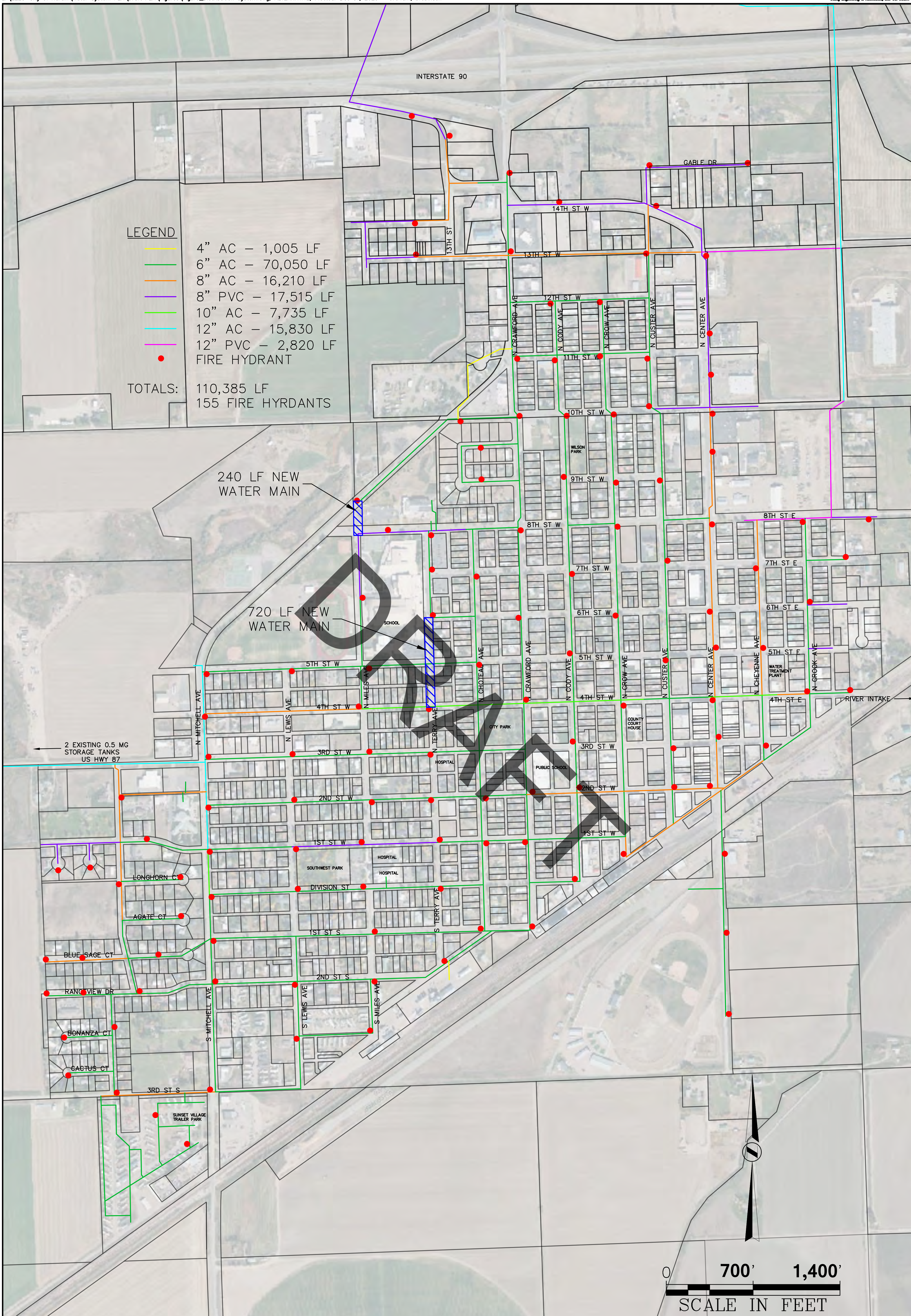

FIGURE 3.1
SOUTH DISTRIBUTION SYSTEM ALTERNATIVE

CITY OF HARDIN, MONTANA

Water Preliminary Engineering Report

STAHLY ENGINEERING & ASSOCIATES
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5. SELECTION OF ALTERNATIVE

Each technically feasible alternative presented in Chapter 4 was evaluated to select the most beneficial alternatives for the water system. The feasible alternatives are evaluated below based on an organized and systematic approach. This methodology ensures a consistent and unbiased means of selecting the most beneficial alternative for the City of Hardin. Each alternative was evaluated by applying consistent criteria. These criteria include life cycle cost, technical and logistical feasibility, operations and maintenance complexity, public health and safety, environmental impacts, and public acceptance. Each viable option was qualitatively compared. Alternatives determined to be the most beneficial will be discussed in greater detail in Chapter 6.0-Proposed Project.

5.1. WATER SUPPLY ALTERNATIVES

See Appendix 1 for Water Supply Alternatives.

5.2. WATER TREATEMENT ALTERNATIVES

See Appendix 1 for Water Treatment Alternatives.

5.3. WATER STORAGE ALTERNATIVES

Water Storage Alternatives include the following:

WT-1 No Action

WT-2 Concrete Tank

WT-3 Elevated Steel Tank

5.3.1. Life Cycle Cost Analysis- Water Storage

The net present value (NPV) evaluation of the remaining collection system alternatives is presented in Table 5.1. A low NPV is desired.

TABLE 5.1 – WATER SUPPLY ALTERNATIVES
LIFE CYCLE COST ANALYSIS

ALTERNATIVE	PRESENT WORTH O& M COSTS	CAPITAL COSTS	PRESENT WORTH SALVAGE COSTS	NET PRESENT VALUE
WT-1	0	0	0	0
WT-2	40,000	6,500,000	0	7,276,699

WT-3	15000	8,000,000	80,000	8,247,262

5.3.2. Non-Monetary Factors

The alternative analysis includes consideration of non-monetary factors such as technical and logistical feasibility, operations and maintenance complexity, public health and safety, environmental impacts, and public acceptance. The following discussion evaluates the remaining collection system alternatives with respect to each criterion.

a) Technical and Logistical Feasibility

Technical and logistical feasibility considers factors such as permitting requirements, land acquisition, and technical practicality of the project.

The no action alternative does not require any additional land or permitting This was rated as the best alternative.

The concrete tank would not require any new land as it could be constructed on land owned by the City near the current tanks. Connections to the existing system would be minimal. A booster station would be required to provide adequate system pressures.The City's Operation and Maintenance costs would increase to account for the booster station.

The steel tank would require additional land. That location has not been identified but ideally would be installed north of the interstate to provide redundancy for the water distribution system.

All the alternatives are technically feasible.

b) Operations and Maintenance Requirements

There is no additional maintenance required for the no action alternative. This alternative was rated as the best.

The concrete tank would require the most due to the requirement for the booster station. This was rated as the least favorable.

It has been assumed that an elevated tank would not require a booster station. Operation and Maintenance would be similar to how the City currently operates.

c) Public Health and Safety

The No Action Alternative does not address the fire flow requirement around high school.

Both storage alternatives enhance public health and safety by providing more fire flow storage. These were rated equally better than No Action.

d) Environmental Impacts

The No Action Alternative has no environmental impact. This was rated as the best alternative.

The concrete tank with a booster station would require additional land that would have a detrimental impact. In addition, the booster station would have an require a continuous energy requirement. This was rated last.

The elevated water tank would require a significant land dedication. This was rated as the second-best solution.

e) Public Input

No action was preferred due to the costs associated with this alternative.

The City of Hardin is going through a significant Wastewater Treatment upgrade. To accomplish this, a significant wastewater rate increase was required. Current sentiment within the City is to not create another significant capital improvement for several years. For this reason, both tanks were rated low.

5.3.3. Alternative Ranking

A qualitative summary of the water supply alternatives and criteria is provided in Table 5.1.2

TABLE 5.3.2 – WATER STORAGE ALTERNATIVES COMPARISON

ALTERNATIVE	CRITERIA AND RESULTS					
	NPV	TECHNICAL AND LOGISTICAL FEASIBILITY	O&M REQUIREMENTS	PUBLIC HEALTH AND SAFETY	ENVIRONMENTAL IMPACTS	PUBLIC INPUT
WT-1`	1	1	1	3	1	1
WT-2	2	2	3	1	3	3
WT-3	3	2	2	1	2	3

The No Action Alternative was the preferred alternative, based on the above ranking. Both the elevate tank and new concrete tank were rated equally.

5.4. PUMPING STATION ALTERNATIVES

Due to the size and adequacy of the existing pumping station, no additional pumping stations were considered.

5.5. DISTRIBUTION ALTERNATIVES

The no action alternative was screened out due to Health and Safety risks due to the inadequate fire flows at the school with the current system. Although there is not adequate storage, completing the loop will enhance the fire flow to the school and enhance public health and safety at a reasonable cost. Furthermore, all of the AC pipe should eventually be replaced as they are past their useful service life.

6. PROPOSED PROJECT

For the proposed project for the Water Treatment Plant and Intake, see Appendix 1.

For the water distribution system, there is only one project which is to loop the water mains around the High School   This consists of installing approximately 1000 feet of water main and a crossing of the highway.

6.1. PRELIMINARY PROJECT DESIGN

6.1.1. Distribution System

a). Description

This project consists of installing an 8” main at the end of an existing main located at the intersection of Miles Ave and N. Mitchell Ave. From this point of connection the water main will extend south across N. Mitchell Ave along Miles Ave, approximately 250 feet to a main that dead ends in front of the High School.

In addition, a second 8” water main be constructed along the east side of the high school, from the intersection of 6th Street and N. Terry Ave, approximately 750 lineal feet south the intersection of N. Terry Ave and 4th Street West.

The estimate cost of these extensions is $700,000 .

b). Project Schedule

PER findings were presented to Hardin on October 21, 2025, at a public hearing. The PER will be used to apply for grant funding from MCEP and RRGL. Table 6.1 shows the schedule summary for the proposed improvements.

TABLE 6.1 - PROJECT SCHEDULE SUMMARY

Action	Date
APPLY FOR FUNDING	MAY 2028
GRANTS RESULTS	APRIL 2029
RECEIVE FUNDING	JULY 2029
BEGIN DESIGN PHASE	AUG 2029
SUBMIT PLANS TO DEQ	NOV 2029
DEQ APPROVAL	JAN 2030
ADVERTISE AND BID PROJECT	FEB 2030
CONSTRUCTION	MAY 2030
FINAL WALK-THROUGH	JULY 2030
CLOSE OUT	AUGUST 2030
LOAN CLOSING	AUGUST 2030

WARRANTY PERIOD WALK THRU	AUGUST 2031

6.2. PERMIT REQUIREMENTS

6.2.1. DEQ Requirements

Improvements to the distribution system will require MDEQ approval. Additionally, if there is removal of AC pipe it will require a permit from MDEQ Asbestos Control Program.

6.2.2. MDT Permits

The crossing of N. Mitchell Ave will require an Occupancy Permit from the Montana Department of Transportation.

6.2.3. SWPPP Permit

Depending on the size of the excavation required by the contractor, a Stormwater Pollution Prevention Plan may be required.

6.2.4. Traffic Control

Since the entire project is within existing MDT and City Rights of Way amd in the proximity of a significant traffic generator in the High School, traffic control will be required and an integral part of the project. Ideally construction will occur during the summer to minimize disrupt to school year activities.

6.3. SUSTAINABILITY CONSIDERATION

Once the above improvements are made, the city will be able to operate the system more easily. Two dead end mains will be eliminated reducing the requirement to flush these mains on a regular basis.

6.3.1. Water and Energy Efficiency

a). Water Efficiency

The new mains, water valves, and fire hydrants do not consume energy. The increase in fire flow will benefit the safety of the residents and High School.

b). Water Conservation

Water consumption will decrease due to not having to blow out two dead end mains on a regular basis.

c). Energy Efficiency

There is no reduction in energy costs.

6.4. TOTAL PROJECT COST ESTIMATE (ENGINEERS OPINION OF PROBABLE COST)

TABLE 6.1 –
RECOMMENDED ALTERNATIVE

cConstruction Costs				
Description	Est. QT	Unit	Unit Price	Total
Mobilization/Demobilization	1	LS	$ 150,000.00	$ 150,000.00
Taxes, Bonds, and Insurance	1	LS	$ 75,000.00	$ 75,000.00
Traffic Control	1	LS	$ 25,000.00	$ 25,000.00
8" C-900 PVC Water Main	960	LF	$ 120.00	$ 115,200.00
10" X 8" Tee	1	EA	$ 3,000.00	$ 3,000.00
8" Cross	1	EA	$ 4,000.00	$ 4,000.00
8" X 6" Reducer	5	EA	$ 3,000.00	$ 15,000.00
8" Tee	2	EA	$ 3,000.00	$ 6,000.00
8" Gate Valve & Box	4	EA	$ 2,500.00	$ 10,000.00
Fire Hydrant Assembly	1	EA	$ 10,000.00	$ 10,000.00
1" Water Service with Curb Stop	7	EA	$ 3,500.00	$ 24,500.00
Connect to Existing Main	4	EA	$ 4,000.00	$ 16,000.00
3" Asphalt	640	SY	$ 35.00	$ 22,400.00
1-1/2" Minus Crushed Base Course	250	CY	$ 50.00	$ 12,500.00
				$ 488, 600
Subtotal-(Year) Construction Costs				
Engineering and Contingency				
Activity				Total
Design Engineering				$ 45,000
Construction Engineering				$ 50,000
20% Contingency				$ 95,000
Subtotal Engineering and Contingency				$ 190,000
Administrative Costs				
Activity				Total
Legal and Administrative Costs				$ 5000
Grant Administration				$ 15,000
Land/Easement Acquisition				$ 0
Audit				$ 5000
Permit and Review Fees				$ 2500
Subtotal Administrative Costs				$ 27,500
Total Estimated Costs				$ 706,000

6.5. ANNUAL OPERATING BUDGET

The proposed project will have a minimal impact on the annual operating budget for the City of Hardin. annual operating budget, including income, O&M costs, debt repayment, debt service reserves, and short-lived assets, is discussed in the following sections.

6.5.1. Debt Repayments

The City is currently does not have any loans on the water system.

6.6. FUNDING STRATEGY

This section will discuss available funding sources and scenarios. A preferred funding scenario and proposed implementation plan are also presented.

6.6.1. Funding Eligibility

Funding programs have different eligibility requirements. Community income levels are considered for most of the grant programs, either as a primary qualifier or as a basis for determining the level of financial responsibility the applicant must meet before they qualify for grant funds. Community size and the current rates charged for the use of public infrastructure are also considered.

Median household income (MHI) is used by agencies to make the grant eligibility determination. Target monthly water and sewer rates have been established by the funding agencies as a percentage of the median household income.

6.6.2. Likely Funding Sources

The following sections provide a brief description of potential funding sources which are relevant and available to the project. This section is not intended to cover all funding opportunities.

a). Montana Coal Endowment Program (MCEP)

MCEP is a state funded grant program, which is administered by the Montana Department of Commerce (MDOC). MCEP provides financial assistance to local governments for infrastructure improvements. Grants can be obtained from MCEP in amounts up to $500,000 if the projected user rates are less than 125% of the target rate; up to $625,000 if projected user rates are between 125% and 150% of the target rate; and up to $750,000 if the projected user rates are over 150% of the target rate. MCEP grant recipients are required to match the grant dollar for dollar, using other grants, loans, or cash contributions. There is also a limit of $20,000 per household.

b). Renewable Resource Grant and Loan Program (RRGL)

RRGL is a state program that is funded through interest accrued on the Resource Indemnity Trust Fund and the sale of Coal Severance Tax Bonds and is administered by the Department of Natural Resources and Conservation (DNRC). The primary purpose of the RRGL program is to enhance Montana's renewable resources. For public facilities projects that conserve, manage, develop, or protect renewable resources, grants up to $125,000 are available. There is no match required for RRGL grants.

c). Community Development Block Grant (CDBG)

CDBG is a federally funded program that is also administered by the MDOC. The primary purpose of CDBG funds is to benefit low to moderate income (LMI) families where they comprise at least 51 percent of the municipality. An income survey may be allowed in some circumstances such as recent major economic changes, or if a community is only slightly under the required LMI percentage. The City of Hardin would be required to conduct an income survey to be eligible for CDBG funding. According to the Target Rate Calculation Resource found on the Montana Department of Commerce (https://commerce.mt.gov/Infrastructure-Planning/Resources/Census-and-Target-Rate) website LMI percentage in Hardin is 50.0%. In order to qualify for CDBG funding an LMI of 51% is required. A 25% match is required for CDBG Public and Community Facilities Grants.

d). USDA Rural Development (RD)

RD provides funding to municipalities with less than 10,000 residents with a preference for communities under 5,500 residents. Grant eligibility and loan interest rates are based on the community's MHI and user rates. Long-term, low interest loans are provided by RD and, if available, a grant may be combined with a loan to keep user costs reasonable. In general, a 25% grant may be available and, depending on the impact of user rates on the population, that amount may increase.

e). State Revolving Fund (SRF)

SRF provides low-interest loan funds for both water and wastewater projects through the Drinking Water State Revolving Fund (DWSRF) and the Water Pollution Control State Revolving Fund (WPCSRF). The current loan interest rate is 2.50% with payment schedules not to exceed a 30-year period. A certain percentage of loan forgiveness may be available depending on the project and its effect on user rates.

6.6.3. Funding Strategy (and Phasing)

Phasing of individual projects based on priority recommendations of the City's engineer and the desires of the City Council, City staff, and the public will be necessary to successfully fund and construct all the elements of the preferred alternatives. The ability of the City to acquire funding and raise rates will be critical to moving projects forward.

Hardin's water rate will need to increase to meet the requirements of grant funds and, more importantly, to meet coverage required to qualify for low interest loans. While public opinion has strongly opposed increasing water rates due to the significant rate increase created by the improvements to the wastewater treatment system.

Following adoption of this PER, implementation of the recommended alternative for water system improvements will require the City and its engineering consultant and grant specialists to take steps toward prioritizing funding, environmental review, final engineering design, and a contractor procurement process.

a). Phasing Options

The replacement of all 90,000 lineal feet of AC water main should be phased. The City is currently preparing a Capital Improvement Plan to prioritize needed street improvements. Areas where there is AC water main should be included in the CIP to ensure replacement of the water mains occurs as streets are improved. Based on current data, there is no emergency base on increased water loss to replace the mains.

b). Funding and Rates

Utilizing the current capital costs of the preferred alternative, and without using any grants, a loan repayment would increase user rates $ 1.64 per EDU. Assuming the City will qualify and apply for MCEP and RRGL grants, this cost would be significantly less

6.7. IMPLEMENTATION

Final design activities for the preferred alternative and the subsequent water main replacement will include developing a funding strategy consisting of grants and loans. Determining the need for rate increases will be part of the overall funding strategy with assistance from the City.

Anticipating funding needs and planning for grant cycles is critical to moving projects forward. MCEP and RRGL grants are due every other even year and are ranked by agency staff prior to submittal for inclusion in the Governor's budget. They are not awarded until the Montana Legislature approves them, and the Governor awards them. Submitting projects for inclusion in the Montana DEQ Intended Use Plan makes them eligible for SRF funding. That application can be submitted any time utilizing information from this PER.

Upon securing funding, project start-up is expected to be a two-month process. Milestone activities include completing Montana DEQ's environmental assessment process. The assessment must be completed and advertised for public comment early in the process. A Finding of No Significant Impact (FONSI) is the agency's official declarative document and must be obtained before proceeding with design.

Tasks anticipated to advance the project to construction include:

- Engineering site survey.
- Geotechnical investigation.
- Final design of improvements.
- Development of drawings, specifications, and bid documents which require approval from MDEQ and funding agencies before advertising for bids.
- Bid advertisement, bid opening and recommendation of contractor to award project.

TABLE 6.2 - TIMELINE FOR PROJECT SCHEDULE

Timeframe	Action	Notes
Month 1	Hire Engineer/Administrator	Requires adherence to procurement policy. May utilize term contracted engineer.
Month 2-3	Project startup and pre-design activities	
Month 4-12	Final design	
Month 10-13	Submit plans and specs to MDEQ and funding agencies	
Month 12-15	DEQ/agency Approval	2-month review
Month 16-17	Advertise and Bid Project	
Month 18-24	Construction	Timeframe depends on project complexities
Month 21-25	Close-out	
Month 32-36	11-month contractor warranty walk-through	

7.0 CONCLUSIONS AND RECOMMENDATIONS

For conclusions and recommendations for the water treatment plant, see Appendix 1.

In general, the City of Hardin's water system is in excellent condition. Although the age of the system is past its design life, the City has done a good job of maintaining the system to make it last.

Currently the unmetered water is over 25%, however it is not known where the unmetered water is going. A leak study could be conducted to determine more specific locations of water loss. However, since there is over 90,000 lineal feet of water main that is over 100 years old, well past its useful life, we recommend developing a Capital Improvements Plan that systematically replaces the water mains on a regular basis. After completion of the mains, the amount of unmetered water can then be compared to determine if there is a change over time.

In addition, eventually, the City will require a new 1-million-gallon tank. However, improvements to the water treatment plant, the growth of the City and other changes to infrastructure may have an impact on the location, size and type of water tank that is required. The existing tanks provide adequate water and fire flow for most of the City and should be able to continue to provide adequate service for the next 10 to 20 years. We recommend an analysis of the water storage facilities every 5 years to ensure this doe not change. For instance there may be a as significant impact if a new Mental Health Facility were constructed in Hardin.

The one project that is proposed is the completion of water main around the High School to increase fire flow around the High School. The cost is approximately $700,000 and could be funded through a small increase in user rates. It is important to note this is not an project that needs to be completed immediately but should be a priority for new water main installations.

APPENDIX

1

AE2S REPORT

An Employee-Owned Company

HARDIN WATER TREATMENT PLANT PRELIMINARY ENGINEERING REPORT

FOR

CITY OF HARDIN

STAHLY ENGINEERING

HARDIN, MONTANA

PROJECT NO. 15003-2024-001

DECEMBER 2025

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

MONTANA
DAVID J.
CARLSON
12-18-25
No. 38371 PE
LICENSED
PROFESSIONAL ENGINEER

David Carlson, P.E.

Date: 12/18/2025 Reg. No. 38371

Prepared By:

Advanced Engineering and Environmental Services, Inc.
3490 Gabel Rd, Suite 200
Billings, MT 59102

Table of Contents

CHAPTER 1 EXECUTIVE SUMMARY

This evaluation of the City of Hardin's drinking Water Treatment Plant (WTP) assesses the existing conditions of the plant and is intended to provide recommendations for improvements of facility components.

1.1 Recommended Implementation Plan

The table below summarizes each the recommended action taken, recommending timing, and the estimates costs associated for the City of Hardin for the next 10-15 year planning period. More detailed information on issues identified and suggested actions can be found in the respective sections of Chapter 4-6.

Improvement		Type	Estimated Cost	Recommended Timing	Trigger Point/Decision
1	Electrical Condition Assessment (Existing WTP)	Study	$30,000	Near-term	Starts Capital Planning
2	Filter Media Evaluation	Study	$25,000	Near-term	Starts Capital Planning
3	Add Backup Generators at WTP and Raw Water Intake	Capital Improvement	$870,000	After electrical study	Electrical reliability warrants investment
4	Replace Alum Feed System	Capital Improvement	$3,000 – $84,000	As needed	Failure of existing feeders
5	Sedimentation System Improvements	Capital Improvement	$663,000	Mid-term	Manual sludge removal burden
7	New Pretreatment at Intake Site	Capital Improvement	TBD	Long-term	Completion of 8.1
8	New Water Plant Intake Site	Long Term Planning	TBD	Long-term	New WTP commitment
8.1	Process & Site Evaluation (New WTP)	Study	$40,000	Near-term	Initiation of WTP planning
8.2	Lime Softening Cost-Benefit Analysis	Study	$25,000	Near-term	Water quality improvement evaluation

8.3	Rate Impact Study	Study	$15,000	Near-term	Financial feasibility assessment
8.4	Pilot Test New Technologies	Study	$75,000	Near-term	Completion of 8.1, 8.2, 8.3

1.2 Summary of WTP Component Conditions

Hardin WTP remains in excellent condition despite being in service for over 100 years. The system faces no major deficiencies and in general is maintained to a high quality by experienced operators. The plant can continue operating within DEQ guidelines and regulations without major improvements; however, targeted upgrades would enhance efficiency and reduce future risk

The Hardin WTP currently does not have an onsite emergency backup power generation system. Despite a lack of regular upsets to the Hardin power grid, backup generators would provide resiliency in an outage. Because the intake building and main water treatment plant building are on separate campuses, a separate generator would be needed for each site.

The solids removal system inside the sedimentation basin is non-functional. Currently, operators manually remove this sludge 1-2 times per year. The removal capacity of the sedimentation basin decreases as sediment builds up, putting additional strain on the sand filters. It is recommended that this system is replaced.

The sedimentation basin is undersized per modern design standards. Without a turbidity sensor between the sedimentation basin and sand filters, it is difficult to determine where most sediment is removed. Despite this basin being undersized, the sand filters do not appear to be overloaded. If filters run times significantly decrease, either from increased sediment load, increased WTP flow or another change in treatment conditions, it is recommended that an expanded sedimentation basin is investigated. If a need for sedimentation expansion is identified and no space is available on the WTP campus, a new sedimentation system can be constructed on the intake property.

Detailed cost estimates for these improvements are included in the Appendix.

It is also recommended that further studies into the electrical system and sand filters is conducted. While no deficiencies were identified in investigations for this preliminary engineering report, deeper investigations will not only reveal what components are most likely to fail but would provide a schedule of when improvements need to be made to avoid critical failures.

Finally, alternative chemical systems are provided in chapter 4.11 that can modernize aging equipment and address taste and odor issues.

1.3 Summary of Current and Future Regulatory Compliance

Hardin does not face any compliance issues with the quality of water produced. Sampling results in 2023 and 2024 indicated relatively low Lead and Copper concentrations which were within the current drinking water regulations.

The Fifth Unregulated Contaminant Monitoring Rule (UCMR-5) focused on sampling water systems for PFAS compounds as well as Lithium. PFAS concentrations were found to be below the Minimum Reporting Limit (MRL), meaning concentrations were too low to be accurately measured and therefore could not be reported as valid data. Lithium concentrations were found to be around 3 times higher than the health-based reference concentration. UCMR-5 is investigating the health effects of lithium in drinking water and findings will be presented at the end of 2026. The determination for setting removal requirements is still several years away, with compliance dates years after that determination is made.

Contaminant	Reported Concentration	Health Based Reference Concentration
Lithium (ug/L)	28.25	10
All PFAS Compounds (29)	<MRL	Varies

UCMR-6 is set to begin nationwide sampling in 2026. While compounds selected to be tested have not yet been decided by the EPA, the City of Hardin should plan for increasefghboratory testing costs starting in 2027.

1.4 Summary of Water Rights

The City of Hardin has the water right to pump 3.58 cubic feet per second (CFS), or 1,600 gallons per minute from the Bighorn River year-round, with maximum volume limited to 1074 acre-feet per year. Hardin's peak day demand, or the single highest daily water volume treated throughout the year, is approximately 900,000 gallons. Hardin WTP could treat up to 2.31 million gallons per day within their water right if the plant were operational for 24 hours.

If Hardin saw an increase in water demand due to a spike in population, the yearly total water volume limit would likely not be an issue. To accommodate daily water demands, the flowrate limit will require the plant to run for a longer period each day as demand increases.

See Chapter 4.8 for additional information.

CHAPTER 2 PROJECT INFORMATION

Stahly Engineering is the prime consultant for this Preliminary Engineer Report, focusing on water storage and distribution. AE2S is a subconsultant focusing on water treatment. The Stahly Engineering contact person for this project is Mr. Matt Smith, PE, PMP. Information for Stahly and Mr. Smith is presented below:

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PE, PMP
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CHAPTER 3 PROJECT BACKGROUND AND DATA

3.1 Basis of Project

The objective of this Preliminary Engineering Report is to establish the need for a project to address the existing water treatment plant conditions and constraints, water quality concerns and anticipated water supply needs of the Hardin system. This report will evaluate the technical and economic feasibility of the proposed project alternatives. Ultimately, a preferred alternative will be recommended for State and Federal interest in participating in a cost shared project.

3.1.1 Scope of Preliminary Engineering Report

Recommendations for improvements were made based on the Department of Environmental Quality Circular 1: Standards for Water Works (DEQ 1) and The Ten States Recommended Standards for Water Works. Each component of the water plant was evaluated for compliance with these standards, both in the design of the system and the quality of water produced. These recommendations were compiled into alternatives for consideration, along with additional considerations for each alternative and additional improvements that can be made to the treatment system.

3.2 Background of Existing System and Service Area

Figure 3.1: Site Map

The Hardin WTP was originally built in the early 1920s and has received several updates since, most recently in 2012 when aging pumps were replaced and improvements were made that allowed the filters to operate in compliance with DEQ regulations.

Water is sourced from the Big Horn River, approximately 1 mile east of the WTP building. Roughly 37 miles upstream of the intake, the Yellowtail Dam provides significant sediment reduction, flood mitigation and source water security.

CHAPTER 4 WATER TREATMENT PLANT EVALUATION

4.1 Treatment Process and Water Quality Overview

The Hardin Water Treatment Plant is a conventional surface water treatment plant that utilizes coagulation, flocculation, sedimentation and dual media filtration. Below is an overview of these treatment steps.

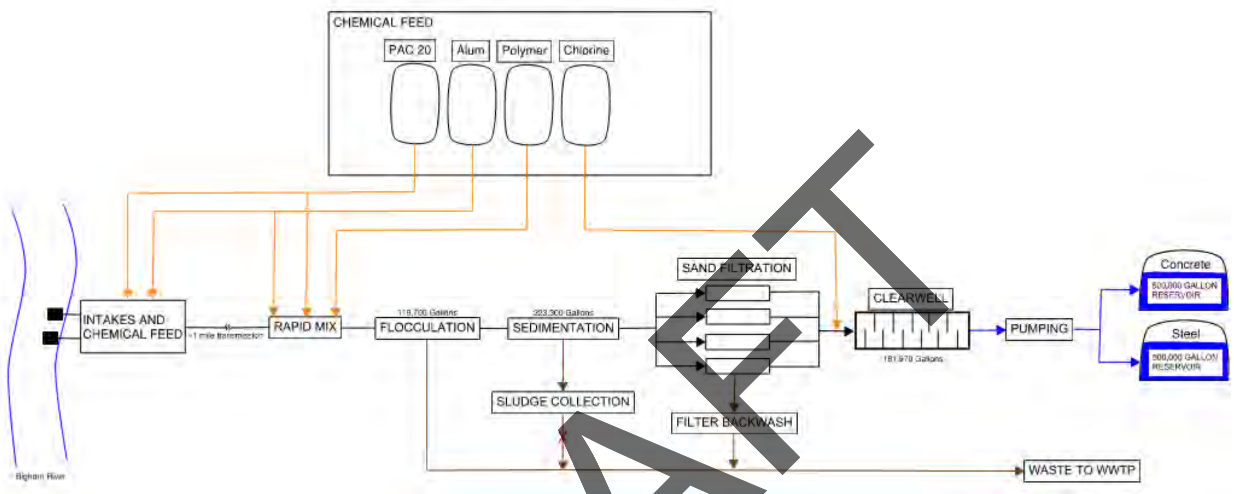

Figure 4.1: Treatment Process Overview

4.1.1 Raw Water Quality

The Hardin water treatment plant experiences relatively little seasonal variation in raw water quality due to the upstream Yellowtail Dam. This Dam does however provide water conditions for the formation of algal blooms, typically in the summer. Total Organic Carbon (TOC) also changes seasonally.

Hardin's water is generally hard, with hardness typically measuring around 180 mg/L. Of the roughly 1,400 service connections, the City regularly receives around 5 complaints per year in regard to hard water or taste and odor complaints. Treatment options and considerations are provided in chapter 4.11 below.

4.2 Raw Water Intake

The Hardin water system comprises two raw water intake structures. The original intake structure, containing two pumps, is used today as a redundant backup in case of primary pump failure or repair. The active intake structure contains two split case pumps. The pumping system is capable of meeting winter and summer demands with the largest pump out of service. These pumps displayed minimal vibrations during walkthrough and appear to be in good operating condition.

The primary intake structure contains a passive submerged stainless steel slotted barrel screening system that was recently upgraded in 2012. Based on information available, the screens appear to be modern design, with appropriate slot openings to reduce debris and adequately allow aquatic organism escape. The screening system is backwashed with an air burst system, which provides a blast of pressurized air every 15 minutes and appears to be effective.

Based on the information to date, there has been no reporting of Zebra or Quagga mussel infestations along the Big Horn River that would require raw water screening improvements. If mussels become problematic, there are numerous technologies available such as replacement screens with specialized Z-alloy copper screens, chemical feed systems or ion dosing systems.

4.3 Pretreatment System Evaluation

4.3.1 Rapid Mix

Polyaluminum Chloride (AF 60000) is dosed into the raw water pumping system in the intake building, where it is pumped through the roughly 1 mile of piping to the water treatment plant. Operators have noted that this plug flow style of coagulation provides additional floc formation benefits.

Once at the treatment plant site, additional AF 60000 is dosed, along with a Cationic Polymer, just upstream of the rapid mixer. The Rapid Mixer meets all requirements of DEQ circular 1 and remains operational, despite its advanced age. A backup mixer is stored on site in the event that the existing mixer fails.

To operate within DEQ design standards, the flowrate in the Hardin WTP must remain above a minimum of approximately 900 gpm to keep the detention time under 30s. No deficiencies are noted in this system.

4.3.2 Flocculation

The Flocculation basin is a 97 ft long horseshoe shaped basin with a cross-sectional area of 165 ft. This area allows for flow through velocities between 1.0 and 1.45 ft/min over the range of flows experienced throughout the year, compliant with DEQ 1. The basin is equipped with two 2 HP vertical shaft flocculators that adequately agitate the water for floc formation.

Generally, the flocculation basin is adequately sized and operates as intended. The greatest concern with the flocculation basin is the lack of redundancy. With only one basin, any failure or shutdown due to maintenance or repair causes the entire system to shut down.

The flocculation basin can support the treatment of up to 1850 gallons per minute (gpm) to operate within DEQ design standards.

4.3.3 Sedimentation

The sedimentation basin is a rectangular basin, 157 ft long and 190 ft2 in cross sectional area. These dimensions allow for a flow through velocity of 0.84 ft/min and a detention time of 3.1 hours at average flows.

Neither the velocity of water nor the total detention time are compliant with DEQ-1. High velocities can leave the water too turbulent to properly settle sediment, and the overall size of the basin does not allow enough time to settle sediment out of the flow.

Despite the basin's design standard deficiencies, the quality of water produced does not appear to be detrimental to the filters. This cannot be confirmed without a turbidimeter placed between the sedimentation basin and filters, which currently does not exist. The effectiveness of the sedimentation basin is believed to be due to the relatively large outlet weirs, allowing water to slowly overflow out of the basin at a maximum rate of 16200 gallons per day per ft (gpd/ft). It is assumed that equivalent effective settling has been previously established for the operations of this facility by the DEQ.

The greatest concern with the sedimentation basin is the lack of a sludge removal system. A Trac-Vac® system was installed around 2012 and was functional for about two weeks, according to operators. Without this system, sludge builds to a substantial depth, significantly reducing settling effectiveness and requiring a full plant shutdown 1-2 times a year. Additionally, turbidity is not monitored after sedimentation / prior to filtration. Without the ability to monitor this, it is unclear how much turbidity removal takes place within the sedimentation basin vs. the filters. It is known that the water is sufficiently clean after the filters, but it is unclear how much strain is being placed onto the filters when built up sediment fills the sedimentation basin. If sludge renders the sedimentation basin useless, filter run time will decline rapidly.

In order for the sedimentation basin to operate within DEQ design standards, it would need to flow a maximum of 930 gpm.

4.4 Filtration System

The Hardin water plant utilizes 4 dual media filters, consisting of 1 ft of sand atop 1.5 ft of anthracite. The filter media currently in place is at least 15 years old, according to operators at the plant. Each filter has a surface area of 178 ft^2 and observes a loading rate of up to 3.36 gallons per minute per foot squared (gpm/ft^2) at peak flows.

The design of the filter boxes allows for 2’-2” of freeboard, or the depth of water over the top of the filter media during normal operation. The DEQ design guidelines recommend a minimum freeboard is 3 feet, which cannot be accommodated without a massive retrofit of the treatment building. This can affect backwash efficiency and effectiveness, as more freeboard allows filter media to settle more before overflowing out of the wash water troughs.

Filter media was last replaced pre-2012, with anthracite periodically added in small lifts (between ½” and ¾”), with the last lift added in 2022. Operators have not noticed significantly reduced run times or finished water quality over the last 15 years.

The wash water troughs were observed to be slightly uneven, flowing more water over one end than the other. While this is minor, it can have unpredictable effects on the loss of filter media. It has been assumed that because filter media loss is not observed to be increasing, this uneven backwash rate is not affecting media loss or becoming more severe.

The useful life of the filter media is hard to predict without a thorough media evaluation. It is recommended that the City of Hardin pursues a Filter Media Evaluation to determine when media will need to be fully replaced for budgetary purposes.

4.5 Disinfection System

Gaseous chlorine is dosed into the filtered water stream at around 1.85 mg/L. Gas chlorine is fed via 150lb cylinder system, which appears to have been recently upgraded to include modern safety requirements such as viewing window, gas detectors, and weight scales.

This setpoint is adjustable through the Supervisor Control and Data Acquisition (SCADA) system and works well for operators. Detention time in the Clearwell varies based on flowrate but is generally between 54 and 82 minutes. The water plant receives a 2.5 log removal credit for Giardia from filtration. With a baffling factor of 0.6, the plant is required to provide a CT value of 47 mg/L*mins through disinfection. At a dose concentration of 1.85 mg/L, the plant can produce an inactivation ratio of 3.12 in the winter and 2.16 in the summer.

4.6 High Service Pumping

The high service pumps that transfer water from the Clearwell to the distribution system were replaced during the upgrades in 2012 and are in normal operating condition.

These pumps are in the basement of the water treatment plant and equipped with drain lines, proper heating and ventilation and meet all applicable requirements of DEQ-1. The pumps appear to be in good operation condition. It is recommended that annual maintenance is continued.

4.7 Electrical / I&C

Hardin's SCADA systems were last upgraded in 2012, with electrical distribution panels being upgraded at that time as well. It is generally recommended to upgrade SCADA servers and PCs every 5-8 years, although this is highly subjective to operator preference. The computers used for plant operations are similar to a home PC or a smartphone, both of which have seen massive technological advancements since 2012. If the underlying Programmable Logic Controllers (PLCs) are not at the end of their service life, there is not an immediate need to replace the system, although operators would notice improved functionality with an upgraded system.

The most notable deficiency the Hardin WTP faces at present is the lack of a backup power generation. Without this, an upset to the historically stable power grid would force a plant shutdown. Additionally, this is a violation from the DEQ that results in fines whenever the plant is inspected.

4.7.1 Electrical Service Description

The electrical items discussed in this section present the conceptual design philosophy for the electrical systems for the Hardin Water Treatment Plant. The items outlined in this section include:

- Relevant codes and standards.
- Electric power service and distribution.
- Specifications of standby generator(s).
- Instrumentation and controls.

The electrical service provided to the Hardin Water Plant is provided by NorthWestern Energy. The utility provides three services to the two facilities that comprise the plant: the main building and two to the intake buildings. Both facilities need a backup generator to meet DEQ compliance requirements.

This section contains relevant information on dimensions, cost, and recommendations for the facilities.

4.7.2 Applicable Codes and Standards

- NFPA 70 – National Electric Code, 2023 Edition
- Montana Electrical Code

4.7.3 Existing Electrical Infrastructure

The existing Hardin Water Plant consists of two main facilities; the main building located on 4th Street and Cheyenne Avenue and the intake building on the Bighorn River. These services are fed power from local utility NorthWestern Energy.

- A 480/277V 3-phase service to the main building. (Meter number: 2000256112)
- A primary, newer 480/277V 3-phase service to the intake facility. (Meter number: 2000256111)
- A secondary and/or backup, older 480/277V 3-phase service to the intake facility. (Meter number: 2000206399)

It is unclear as to the exact purpose of having two services at the intake facility. One is newer than the other and has a higher peak power draw. For convenience, it might be feasible to consolidate both buildings at the intake under one meter.

Due to the Hardin Water Plant being effectively built into two main facilities, each service would require its own standby emergency generator. The most recent electrical upgrades made to the Hardin Water Plant and Intake Facility were completed in 2012, consisting of raw water intake upgrades and SCADA upgrades. For more information on the latter, see section 4.7.2.

Hardin Water Plant Building

This facility contains the following electrical loads: a backwash pump started via VFD at 30 HP, a high-service pump also started via VFD at 150 HP, a small mechanical mixer at 2 HP, and an uninterruptible power supply rated at 0.85 kVA. As per bills from NorthWestern Energy, the maximum metered demand at the building was 174.4 kW as given in October 2023.

Intake Facility

This facility load is much smaller: only a single 20 HP intake pump started via VFD and a 10 HP air compressor. This intake facility has two active meters: an older meter for the old intake (peak power draw of 3 kW) and a newer meter for the newer intake (peak power draw of 27 kW). In total, this is 30kW peak for the intake at one time.

As a part of these electrical improvements, it would be feasible to potentially modify this service so that only one meter is needed for this section. Further discussion with NorthWestern Energy and the client will be necessary to determine if this upgrade is feasible at this time.

4.7.4 Preliminary Generator Sizing

In order to size the generators, two web-based tools were used: Caterpillar SpecSizer and Cummins GenSize 2.0. Both gave comparable results for both buildings. Based on their results, a generator was selected that would fit each building's electrical needs.

Hardin Water Plant Building

- The selected model is a Cummins DQDAB, with a rating of 250 kW or 312.5 kVA at a 0.8 power factor. This generator would have dimensions of 119" L x 50" W x 64" H.

Intake Facility

- The selected model is a Cummins C50D6, with a rating of 45 kW or 56.25 kVA at 0.8 power factor. This generator would have dimensions of 107.5" L x 43" W x 73.5" H.

4.7.5 Modification of Existing Service and Transfer Switch Requirements

As a part of the installation of a backup generator, adding a transfer switch to both facilities would be useful to allow for a switch to the generator power when necessary. While both a manual or an automatic switch would work for this purpose, an automatic switch would not require around-the-clock monitoring as opposed to a manual switch, so an automatic transfer switch (ATS) at both sites would be recommended as the most convenient solution. However, a manual transfer switch (MTS) is available as an option if the client sees it is a better fit for either facility.

Hardin Water Plant Building

- For the main building, the recommended model would be an ASCO series 300 open-transition ATS, rated at 800A 4P with a NEMA 3R enclosure.

Intake Building

- For the intake building, the recommended model would be an ASCO series 300 open-transition ATS, rated at 600A 3P with a NEMA 3R enclosure.

Both ATS models could be installed outdoors or indoors at either facility.

In addition to a generator or ATS, it would also be useful to consolidate the service at the intake facility to one meter from two. As a part of this upgrade, it would also be of use to upgrade the meters at both the intake facility and the main building if the utility or the client sees fit.

4.7.6 Generator Enclosure and Fuel Details

Both generators at their respective site would be outdoor, skin-tight enclosed generators. Both generators would be diesel fuel.

4.7.74.6.3 Instrumentation and Controls (I&C)

The Hardin Water Plant main building, as a part of the general improvements made in 2012, included a series of SCADA and I&C upgrades that consist of a series of control panels built in 2012 by In Control, Inc.

The current control system consists of the following components:

- The VFDs for the backwash pumps
- The VFD for the high-service pump
- A power monitor panel
- A valve control panel
- Filter console UPS cabinet
- Supervisory control panel
- RTU control panel
- Tank level transmitter RTU panel

As the extent of the electrical improvements are strictly the generator and not any pump or other electrical system, the existing control panels are sufficient for continued use. However, the plant receiving additional equipment in the form of a transfer switch and generator would require the following additional signals/alarms to be added to the existing SCADA system:

- ATS utility power available and generator power available.
- ATS connected to utility and connected to generator.
- ATS pre-transfer.
- Generator low fuel.
- Generator breaker trip.
- Generator shutdown alarm.
- Generator battery charger fault.
- Generator running.
- Generator in auto and/or remote.

All of these signals need to be added to the SCADA systems for both the building and intake facility. If these changes cannot fit on the existing systems as it is, it would be necessary to add a digital input (DI) card to fit these signals.

Furthermore, if the plant receives improved pumps or panelboards in the future, it would be necessary to upgrade the VFDs or control panels alongside accounting for their new alarms and signals.

4.8 Water Production and Capacity

The Hardin Water Plant produces anywhere from 500,000 gallons per day in the winter to 900,000 gallons per day in the summer.

The city's water right allows for up to 3.58 CFS (2.31 million gallons per day) year-round, with a yearly volume limit of 1074 acre feet. This yearly volume limit will be achieved at an average day demand of 960,000 gallons.

While water demands generally increase at a lower rate than population, its conservative to assume water demand grows at this same rate, estimated to be a 1% increase year over year in the Stahley Engineering Preliminary Engineering Report. Because the existing plant already treats the maximum flowrate allowed by the water right, the plant would need to run for longer than its typical 8 hours to meet increased demands. This flowrate limit also means that increasing plant flowrate capacity is not available.

4.9 Chemical Feed System

Generally, the chemical feed and monitoring systems in the plant are in good condition although the dry alum feeder is beyond is expected life cycle. As noted in section 4.2.1, Polyaluminum Chloride (AF 60000) is dosed into the intake and the rapid mixer. Also mixed into rapid mix are Cationic Polymer (Aqua Hawk 7347) and Dry Alum (Aluminum Sulphate).

4.10 Alum

The age of the dry Alum feeders is a concern. Despite being used only during periods of high turbidity, typically in July and August, they are among the oldest equipment in the plant. There are two dry Alum feeders, so the plant can continue to dose Alum as needed in the event of a failure of a single feeder. Companies such as Scaletron offer direct replacement feeders for the Wallace and Tiernan feeders currently in the Hardin WTP. Quotes received in November 2025 price these dry chemical feeder systems roughly $42,000 each, or $84,000 for two feeders, not including optional upgrades, delivery or installation.

If replacement of this equipment was desired, the water plant could also switch to dose Alum in liquid form. Based on typical liquid Alum solution concentrations and dose data from 2024, the plant could expect to use approximately 410 gallons per month, or 830 gallons per year, to achieve the same Alum dose currently fed as a dry powder. The wet chemical feed system could be a peristaltic pump drawing from a chemical storage tote, similar to how Polyaluminum

Chloride is dosed in the intake building. For the size and scale of this system, a wet system has no operational disadvantages compared to dry fed systems.

In terms of costs, generally dry Alum is significantly cheaper than Alum purchased in liquid form. However, a liquid Alum feed system would require significantly lower capital investment compared to replacing the dry feeder, and the WTP uses are very small amount annually that likely would not warrant the need for a dry feeder. Therefore, when the time comes for replacement, a wet feed system is recommended.

Despite the dry Alum feeders and rapid mixer potentially nearing the end of their useful life, backup equipment is stored on site should something fail. Because of this, operations can continue normally until a unit requires replacement, at which point the backup can be installed and a replacement can be ordered.

4.10.1 Chlorination Systems

Chlorine is dosed from gas cylinders just before entering the Clearwell. This dosing system is discussed further in chapter 4.5 above and functions as needed.

Operators should continue current maintenance practices and that equipment is replaced as needed.

4.11 Comparison of Finished Water Quality with Existing Regulations

Based on several years of Water Quality Reports for the City, no water quality violations have been observed. The City has been continually monitoring its lead and copper concentrations in the distribution system since 1993, with no violations reported in the last 18 years.

4.12 Secondary Standards and Aesthetic Water Quality Goals

As described earlier, the City of Hardin receives occasional water complaints, some being seasonal related to taste and odor, others being related to source water hardness. A summary of these concerns and considerations for solutions is discussed below:

4.12.1 Hard Water Complaints

As mentioned above, the Hardin water system source water is generally considered hard and the water treatment plant does not provide any treatment to reduce hardness, which is shown in its finished water with a hardness around 180 mg/L. Of this size and scale of system, the two primary treatment technologies used are reverse osmosis and lime softening systems.

Reverse osmosis is technology that forces water through a semi-permeable membrane to separate dissolved minerals such as salt and calcium carbonate, which creates a finished water stream and a brine waste stream that requires treatment. Of the size and scale of the Hardin WTP, the brine waste stream would be considerable and would likely be a costly treatment requirement. However, a more detailed evaluation of this technology could be considered in the future.

Lime softening works by raising the pH of water within the plant, allowing bicarbonate (hardness) to precipitate out of solution and settle out in the treatment process. After the hardness has been removed, the water pH is lowered to finish water quality goals before distribution. This would require the addition of a solids contact unit to dose, flocculate and settle precipitated minerals as well as a recarbonation process to adjust the pH to finished water quality goals.

To demonstrate an order of magnitude cost, the construction of lime softening system are generally around $1-$2 per gallon per day of design treatment capacity to add to the planning of a new water treatment plant.

Besides better tasting water, softened water can increase the useful life of water heaters and piping by reducing scale buildup. The community should evaluate whether the benefits of softened water justify the associated costs and potential rate increases. AE2S benchmarking of community water rates across the region found that systems that use lime softening have 20% higher water rates on average.

4.12.2 Taste and Odor Complaints

Regulations require Public Water Systems to minimize severe taste and odor issues. Some residents have reported strong taste and odor issues in the summer. Blue-green algal blooms have historically been reported in the Bighorn Canyon, typically in August.

For controlling algae-caused taste and odor issues, Sodium Permanganate or Powdered Activated Carbon (PAC) are often used. Because regulations are less stringent around taste and odor issues, Public Water Systems (PWS) typically dose these chemicals at the minimum effective dose to minimize customer complaints. A full-scale pilot test can be conducted by ordering a small amount of these chemicals, such as a 55-gallon drum of Sodium Permanganate or a pallet of PAC, and dosing into the rapid mixer when taste and odor issues are reported. A 55-gallon drum of Sodium Permanganate currently costs approximately $1,300 and would require a peristaltic pump to dose. PAC costs approximately $52 for an equivalent 55 gallons, although it would be delivered as a powder and would need to be adequately mixed into a slurry through a process similar to that of the existing volumetric screw feeders.

Dose rates would be determined through pilot testing. While dose can also be determined through jar testing, taste and odor issues are often subjective and can be costly to quantify in a lab. At a typical PAC dose rate of 10 mg/L, the WTP could expect to spend $240 per million gallons of water treated to significantly reduce the concentration of key containments such as geosmin, which is a compound produced by algae often associated with taste and odor issues. At a typical Sodium Permanganate dose rate of 1 mg/L, the WTP could expect to spend $100 per million gallons of water treated. Although the dose rates given here are typical for water treatment plants treating for high organic matter, actual dosage may vary by up to +- 5 times the concentrations given.

Chemical quotes were received October 2025 and are subject to change with market conditions.

4.13 Future Regulation Considerations

Important upcoming regulation changes include Lead and Copper Rule Revisions, PFAS, PFOA and PFOS.

In addition to these updates to existing regulations, the Environmental Protection Agency (EPA) conducts monitoring of unregulated contaminants in four-year cycles. The current cycle ends in 2026 and is monitoring the presence of 29 PFAS related substances and lithium in PWS across the country. The goal of the Unregulated Contaminant Monitoring Rule (UCMR) is to determine whether monitored contaminants should be regulated in PWSs. While monitoring under the current cycle (UCMR5) is still taking place and updated regulatory information has not yet been released, PWSs should be aware that new and more stringent regulations could come into effect from these analyses. These new regulations, if implemented, would not come into effect for years and the date to comply with said regulations would follow years behind that. For these reasons, updated treatment technologies are not considered a necessity at this time.

The 6th round of UCMR is planned to start in 2026 and will involve more sampling from each PWS. While the compounds tested in UCMR-6 have not yet been determined, another round of sampling from the Hardin WTP will be required by the EPA.

CHAPTER 5 SYSTEM IMPROVEMENTS CONSIDERATIONS, COST ESTIMATES, AND RECOMMENDATIONS

Based on the engineering evaluation of the current conditions of the water treatment plant, considerations of possible improvements requested by the City of Hardin, an evaluation of each improvement was prepared and summarized below. These alternatives were reviewed with the City Council, presented at the Public Meeting, and were reviewed with the Public Works Director.

As noted in chapter 4 above, the Hardin Water Treatment Plant faces no current water quality violations or has a significant treatment deficiency in its system. All equipment visually observed appears to be in effective operating condition and is always monitored by highly competent operators during operation. The 2024 DEQ Sanitary Survey states that all reporting and record keeping are up to date and compliant with current regulations.

Therefore, it would be a reasonable approach to continue maintaining and operate equipment without any major improvements. However, there are several next level evaluations that are strongly recommended to be conducted that will improve operating conditions, add system resiliency and support the long-term budgeting, planning and future phasing of the Hardin water system.

As part of this engineering evaluation, it's important to note that any total estimated project and O&M costs are based on preliminary engineering data, equipment drawings and graphics from manufacturers, engineering and operator experience, recent bid tabulations for projects of similar scope, input from area contractors and material suppliers, and literary review from text.

5.1 Study 1: Electrical Condition Assessment

1. *Improvement Description:*

   The Electrical Condition Assessment will consist of a comprehensive evaluation of the existing electrical systems at the Hardin Water Treatment Plant, including power distribution, motor control centers, control panels, standby power provisions, wiring, and associated electrical infrastructure. The assessment will document existing conditions, identify deficiencies and code compliance issues, evaluate remaining useful life of major components, and provide planning-level cost estimates and recommended timelines for repair or replacement.

2. *Pros/cons considerations*

   This assessment will provide an estimate of the useful life remaining for all electrical components of WTP, as well as an estimate of when each component will need to be replaced and what it will cost. This will allow operators and city planners to prepare for these necessary and often costly improvements and determine if and when the time is right to start investing in a new WTP.

3. *Total Opinion of Probable Cost*:

   $25,000

4. *Recommendation:*

   It is recommended that the City of Hardin plan an electrical condition assessment in its next reasonable budget cycle.

5.2 Study 2: Filter Media Evaluation

1. *Improvement Description:*

   A filter media evaluation involves observation of physical characteristics of the filtration system and of filter media sampled from a WTP bed. Filter media characteristics evaluated include uniformity coefficient and effective size, turbidity and mudball data, carbonate precipitation and sludge retention profiles. Filtration system evaluation includes an in-depth analysis of components like backwash troughs, valves and actuators, instrumentation, structural integrity and underdrain integrity. Also evaluated are data and trends in filter run times, filtration rates and the backwash process.

2. *Pros/cons considerations*

   Based on recent projects across Montana, the material cost of replacing all filter media would be approximately $250,000. The replacement logistics can require significant planning and preparation, as well as can be a large capital expenditure. These two factors can compound the planning process for any city.

   The benefit of this media evaluation is to develop a critical understanding on how the filter media has worn with use since, optimization the backwash process, and developing a hard timeline to prepare for filter media replacement.

3. *Total Opinion of Probable Cost:*

   $25,000 (Study)

   $250,000 (Filter Media Replacement)

4. *Recommendation:*

   It is recommended that the City of Hardin conduct a filter media evaluation as part of its next feasible budget cycle.

5.3 Improvement 1: Backup Generator

1. *Improvement Description:*

   Install backup power generators at the intake and main WTP sites. Improvement involves installing generators, Automatic Transfer Switches (ATS), cabling and integration into SCADA system.

2. *Pros/Cons considerations*

   This improvement will add resiliency to the Hardin water treatment system, allowing it to remain operational in the event of a disaster or prolonged power outage that otherwise would result in a lack of drinking water supply. Adding generators to both sites will have a cost implication as described in the Alternative #1 cost estimate in the Appendix. In addition to this, both generators will need to be operated periodically to ensure functionality and will require fuel if used regularly.

3. *Total Opinion of Probable Cost:*

   $870,000

4. *Recommendation:*

   It is recommended that this improvement is included in the next TSEP grant funding application or pursued when electrical reliability warrants backup power generation.

5.4 Improvement 2: Replace Dry Alum Feeders

It is recommended that once one of the existing dry alum feeders begins to fail, the feed system is replaced with a liquid dosing system. This avoids the $84,000 purchase of two new dry chemical feed systems, as a liquid feed system only requires peristaltic pumps and the chemical tote delivered to the plant.

5.5 Improvement 3: Sedimentation System Improvements

5.5.1 Existing Sludge Removal Equipment Upgrade

1. *Improvement Description:*

   Retrofit a new sludge removal system into the existing sedimentation basin, including new effluent piping connected to the sewer manhole just outside the basin, as well as a small SCADA upgrade to allow operators to control the system.

2. *Pros/Cons considerations*

   As discussed in chapter 4.3, the existing sludge removal procedure requires a full plant shut down, dramatically reduces effectiveness of the sedimentation basin between cleanings and requires manual labor by operators. The Trac-Vac system currently in place has been taken out of operation for consistently causing issues and is no longer being serviced by the manufacturer. With this existing sludge removal device out of service, sediment builds in the basin above designed levels, reducing the cross-sectional area of the basin and reducing settling effectiveness.

   A replaced sludge removal system would eliminate this decrease in efficiency and reduce the workload of operators. Meurer Research Institute (MRI) makes an industry standard Hoseless Cable Vac™ Sludge Collection system that has been installed in countless sedimentation basins with little to no issues. This product was used in cost estimating, as shown in the appendix.

3. *Total Opinion of Probable Cost:*

   $663,000

4. *Recommendation*:

   It is recommended that this improvement is made in the event that operators cannot effectively keep up with sludge removal and ineffective sedimentation causes significant operational impacts.

5.5.2 Sedimentation Basin Expansion

As discussed in section 4.3.3, the sedimentation basin is roughly half the size used by modern design standards. Additional settling time would improve the water quality and overall water plant efficiency. These improvements can be lower turbidity, longer filter runs times, extended media life, as well as longer detention times to support taste and odor causing compound removal. There are a few alternatives to achieve additional sedimentation capacity, which are summarized below:

Alternative 1 – Expand Pretreatment at WTP site:

1. *Improvement Description:*

   This would require extending the existing sedimentation basin roughly 75’ to the north. Because of structural concerns with removing the wall of an existing basin, holes would be core drilled into the existing basin wall and connected to a separate basin. An example of this concept is shown in the figure below.

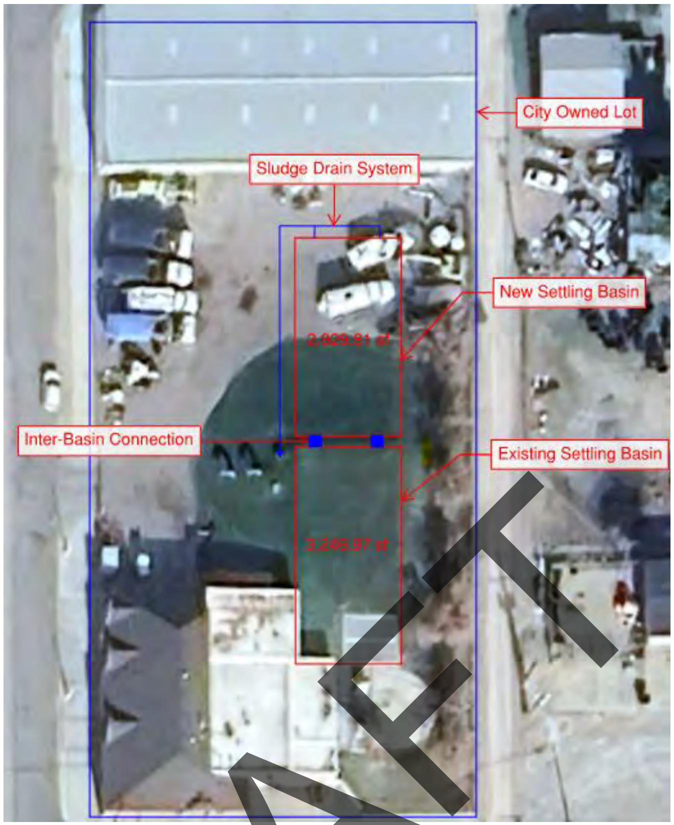

Figure 5.1: Expanded Pretreatment at WTP Site

2. *Pros/Cons Considerations:*

   While this improvement would increase settling capacity and improvement water quality to filters, it has several drawbacks. Not only would this improvement take away valuable working space in the public works lot, but it would also require two separate sludge removal systems. This improvement also does not completely solve the issue of high water velocity in the existing basin. The new basin would be constructed with a slightly larger cross sectional area to allow for more effective settling but this has no impact on the existing basin.

3. *Total Opinion of Probable Cost:*

   $2,379,000

Alternative 2 – New Pretreatment at Intake site:

1. *Improvement description:*

   Install a new facility at the pretreatment site complete with new chemical dosing, rapid mix, flocculation, coagulation and sedimentation equipment. An idea of this concept is shown in the figure below.

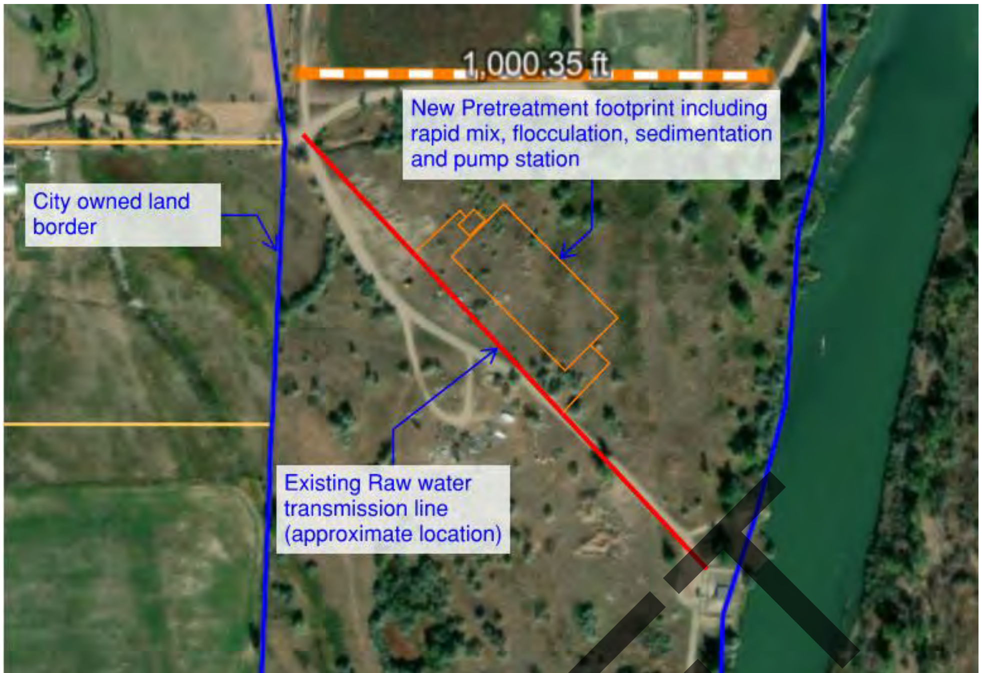

Figure 5.2: Footprint of new Pretreatment System at Intake Site

2. *Pros/Cons Considerations:*

This new facility would be designed to handle the full pretreatment needs of the water system, eliminating the need for the pretreatment system at the main WTP. This new system would create higher water quality, reducing strain on the filters while efficiently and automatically transferring solids waste to the lagoons within the same property, reducing operation and maintenance load on operators.

Another benefit of this alternative is that it can be phased into Improvement #4, the construction of a new WTP. All piping, pumping facilities, instrumentation, etc. can be configured in a way to easily accommodate expansion to include the remaining components of a fully functional WTP. As this proposed site is located on existing city owned land close to the intake building, the main raw water pumping facility can be incorporated into this facility, reducing flood hazard and the number of assets the City needs to manage.

Any new construction on this site would require a flood study to determine the risk and the improvements required to adequately mitigate said risks. Additionally, this facility would require separate chemical storage and dosing, pumping capacity to convey water to the main WTP and a drain line to the lagoons on the north end of the property, although these would fit well into alternative #5. Operators would also be required to manage two separate facilities while both are in use.

3. *Total Opinion of Probable Cost:*

   $7,643,000

4. *Alternatives Analysis:*

   The appropriate alternative will be determined by factors such as land availability at the existing WTP site, differential cost considerations and potential for the construction of a new WTP. In the event that the existing sedimentation system operations are operationally burdensome, one of these two alternatives should be selected to allow proper settling time prior to filtration. A new pretreatment system at the intake site can continue to utilize existing sand filters, pump stations, etc. within the existing WTP, but would also support the development of a new WTP should prove to be the most cost effective and beneficial solution.

5. *Recommendation:*

   It is recommended that any major capital improvements made to expand the sedimentation process be considered at the intake site.

5.6 Improvement 4: Planning for a New WTP

1. *Improvement Description:*

   The existing WTP is ultimately technology and site limited, which ultimately requires major capital improvements to adequately support the community needs into the future. At some point, it will be more financially sound to invest those capital dollars into a new water treatment plant. Given the significant efforts that would need to be performed prior to construction, the City of Hardin requested a road map for how and when to start this planning effort.

   The planning, design, and construction of a new water treatment plan is a serious and major undertaking requiring years for successful implementation. There are many aspects that need to be considered such as capacity, location, treatment capacity, long term operations and maintenance, to long term infrastructure risk and resiliency.

   For the purposes of this evaluation, it was considered constructing a new water treatment plant near the intake site. This location was picked for this report given the land availability, consolidation of infrastructure, and the connectivity of the recently improved wastewater treatment plant. In addition, this site would support a phased approach, which would be a new plant to be constructed and commissioned prior to the demolition of any existing infrastructure.

   There are several steps can be taken that the City can undertake before the decision is made to build a new water treatment plant that will substantially assist the future planning, design and construction. A few initial steps that are recommended to be completed at this stage in concept planning:

- *Process and site evaluation*. This step involves engineering evaluation of possible treatment technologies to use to best suit staffing needs, future regulations, raw water quality and desired finished water quality. This evaluation usually develops a recommended treatment technology. Also involved is site selection and land planning, which evaluates spaces available with considerations for expandability, drought and flooding resiliency, residuals handling, and many other factors. Treatment technologies and land are the primary cost drivers in determining the cost of a new water treatment plant, which is critical to support future planning considerations.

- *Lime softening cost-benefit analysis.* This step would involve evaluation of costs. benefits for addition of a softening technology treatment step to improve water quality. This evaluation would consider costs to implement such an improvement in comparison to the detriments caused by current water hardness, to the water distribution system, in home appliances life impacts, and consumer satisfaction. In most communities, the decision to soften water, therefore this evaluation provides the key information for supporting the fiscal impact considerations at the community level.

- *Rate impact study*. This step would help to inform the city and residents of the anticipated water rate changes associated with the new water treatment plant. This evaluation would include the estimated capital costs, debt service requirements, and expected operations and maintenance costs. This evaluation would also need to include the cost savings by

  In addition, a rate evaluation can develop a prospective funding package, which would include examples of expected debt payments, interest rates, loan forgiveness, and loan period. This information is critical for preparing for funding applications, as well as rate structure adjustments for support community planning.

- Pilot Program. A small-scale version of potential treatment technologies allows their efficacy to be tested and for operators to gain experience running a new system. These systems can be set up anywhere with access to raw water and larger components such as flocculation and sedimentation can often be accommodated for outdoors.

2. *Pros/cons considerations*

There are several considerations as part of the planning process for a new water treatment plant, a summary of these is below:

- Recommended Planning Steps/Studies
  - Pros
    - Gains critical cost information to support the future financial planning for a new water treatment plant.
    - Identifies the water treatment technology that will meet the needs for the Hardin Community
    - Verifies treatment technology performance to support future operations and maintenance planning.
    - Identifies and confirms site suitability.
    - Site suitability determines the permitting requirements along with timeline for improvements.
    - Even should the City delay any implementation, these efforts will always support the City's ability to plan for the future water needs of the community.
  - Cons
    - Any sunk costs associated with evaluations that become obsolete.

- If the City pursued a new water treatment plant long term, some considerations of a new water treatment plant are shown below:
  - Pro
    - Improved water quality and quantity.
    - Expandability that could better support compliance with future regulation in a more cost effectively manner.
    - Lowering operations and maintenance requirements with more efficient technologies and improved residual handling capabilities
    - Expandability supports economic development for more cost effectively supporting a water intensive industry.
    - Avoids potential sunk costs of future capital improvements of the existing water treatment plant. Figure 5.2 above demonstrates the financial benefits of investing capital dollars into a new facility instead of investing them in the existing facility:

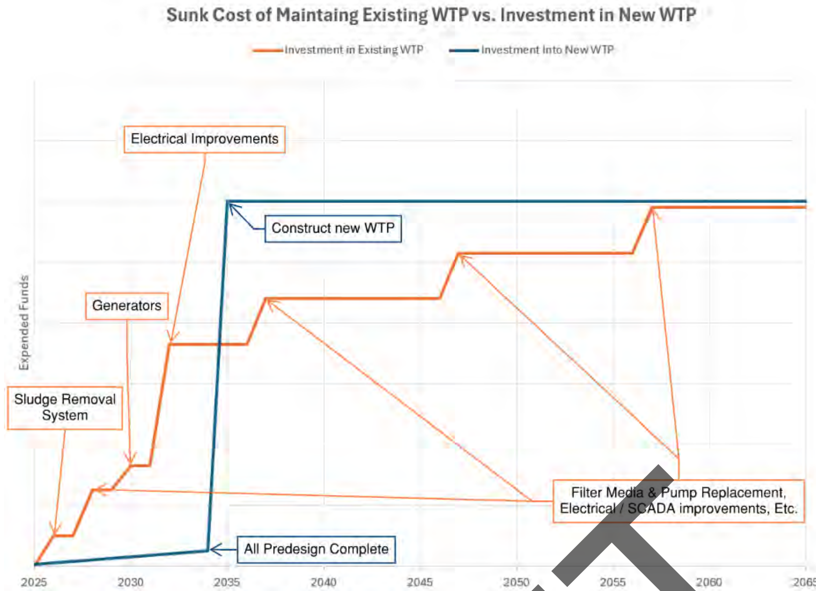

Figure 5.2 Sunk Cost of Maintaining Existing WTP vs. Investment in New WTP

- Cons
  - Extensive Capital Costs that require careful rate structure to minimize impacts

3. *Total Opinion of Probable Cost:*

   $25,000 - $150,000 (recommended steps)

   $15-20 Million (planning level estimate for new greenfield water treatment plant)

4. *Recommendation:*

   It is recommended that Hardin begins the planning efforts in regard to a new WTP as soon as is financially feasible in its capital expenditure plan. See Chapter 6 for the timeline.

5.7 Summary of Improvement Recommendations

Below is a summary of the evaluated System Improvements Considerations, Cost Estimates, and Recommendations.

	Study	Pros	Cost
1	Electrical Condition	Determine cost estimate and timeline for required	$30,000

	Assessment	improvements	
2	Filter Media Evaluation	Determine cost estimate and timeline for required improvements	$25,000
	Improvement	**Pros**	**Cost**
1	Add Backup Generators at WTP and Raw Water Intake	Increased Resiliency Aligns systems infrastructure with DEQ Circular 1 guidelines	$870,000
2	Replace Alum Feed System	Maintain system functionality	$3,000 - $84,000
3	Sedimentation System Improvements	Improved sludge removal Increased Settling Effectiveness	$663,000
4	Expand Pretreatment at Plant Site	Increased Settling Effectiveness	$2,379,000
5	New Pretreatment at Intake Site	No Effect on Existing Site Increased Settling Effectiveness	$7,643,000
6	New Water Plant Planning	Long term infrastructure planning Water Quality Improvements Lower Operations and Maintenance costs through efficiency improvements	See Chapter 6

CHAPTER 6 RECOMMENDED IMPLEMENTATION PLAN

This chapter presents the recommended implementation plan for improvements to Hardin WTP and associated facilities. The recommendations are based on the evaluations summarized in previous chapters and are intended to guide the City in prioritizing studies, capital improvements, and long-term planning actions.

The implementation plan is structured to address near-term operational reliability needs at the existing WTP while helping avoid major sunk capital investments as the City advances toward considering the development of a new water treatment facility. The recommendations focus on understanding system risks, improving reliability where justified, and completing targeted planning tasks that inform future decision-making.

Near-term actions focus on studies and planning tasks that can be completed without committing the City to major capital construction. These actions include evaluation of the electrical condition of the existing WTP, filter media performance, treatment process options, and potential rate impacts. Completion of these tasks will provide the City with improved understanding of system risks, capital needs, and financial feasibility, and will inform decisions regarding both interim improvements and long-term replacement of the WTP.

Mid-term improvements include targeted capital investments intended to reduce operational burden and maintain system reliability, such as sedimentation system improvements and replacement of aging chemical feed equipment as needed.

Long-term improvements are associated with development of a new water treatment plant and intake facilities. These improvements are recommended only after completion of key planning and predesign tasks and upon formal commitment by the City to proceed with a new WTP.

Based on this information, a recommended implementation plan was prepared and presented below:

Improvement		**Type**	**Estimated Cost**	**Recommended Timing**	**Trigger Point/Decision**
1	Electrical Condition Assessment (Existing WTP)	Study	$30,000	Near-term	Starts Capital Planning
2	Filter Media Evaluation	Study	$25,000	Near-term	Starts Capital Planning
3	Add Backup Generators at WTP and Raw Water Intake	Capital Improvement	$870,000	After electrical study	Electrical reliability warrants investment
4	Replace Alum Feed System	Capital Improvement	$3,000 – $84,000	As needed	Failure of existing feeders

5	Sedimentation System Improvements	Capital Improvement	$663,000	Mid-term	Manual sludge removal burden
7	New Pretreatment at Intake Site	Capital Improvement	TBD	Long-term	Completion of 8.1
8	New Water Plant Intake Site	Long Term Planning	TBD	Long-term	New WTP commitment
8.1	Process & Site Evaluation (New WTP)	Study	$40,000	Near-term	Initiation of WTP planning
8.2	Lime Softening Cost-Benefit Analysis	Study	$25,000	Near-term	Water quality improvement evaluation
8.3	Rate Impact Study	Study	$15,000	Near-term	Financial feasibility assessment
8.4	Pilot Test New Technologies	Study	$75,000	Near-term	Completion of 8.1, 8.2, 8.3

CHAPTER 7 FUNDING CONSIDERATIONS

Several grant and loan programs exist to serve municipalities with infrastructure projects. The tables below summarize available sources and include pertinent information.

Available Grant Programs

Name	Cost-Share	Application Window	Information Required
FEMA Hazard Mitigation Grant Program (HMGP)	50% grant 50% local	Year Round, Dependent on Disaster Declaration	PER and Environmental Review
Montana Coal Endowment Program	50% grant, 50% local, up to $750,000	Accepted in Spring 2026	PER and Environmental Review
Community Development Block Grant (CDBG)	75% grant 25% local	Closes November 10th Annually	PER and Environmental Review. Hardin is not currently eligible, need to conduct income survey.

Available Loan Programs

Name	Max Loan Amount	Interest Rate	Term
NRWA Rural Water	$200,000	Currently 3.125%	Up to 10 years
INTERCAP Loan Program	-	Currently 5%	Up to 15 years
Drinking Water SRF	-	2.5%	Varies, 20-40 years

Appendix
Cost Estimates

Hardin WTP PER **12/2025**

Improvement #1: New WTP Generators at Intake and Treatment sites

Budgetary Preliminary Estimate of Costs

No.	Item			QUANTITY	UNIT	UNIT COST	EXTENDED COST
A.	**General Conditions**						
	1.0	**General Conditions**					
		A. 1	Insurance, Bonds, Mobilization, Travel, Subsistence, Etc.	1	LS	$ 50,400.00	$ 50,400
B.	**Process**						
	1.0	**Division 40 - Process**					
		A.	**Process Improvements**				
		1	Generator Set	1	ea.	$208,000	$236,800
		2	Concrete Pad / Rigging	1	ea.	$20,000	$20,000
		3	Fuel / Tank	1	ea.	$6,500	$6,500
		4	Trenching / Backfill / Restoration	1	ea.	$18,000	$18,000
			Subtotal Process				**$ 281,300**
C.	**Electrical**						
	1.0	**Electrical Improvements**					
		A. 1	Service-Entrance ATS (Main Breaker)	1	ea.	$47,000	$47,000
		2	Raceway & Cable	1	ea.	$29,500	$29,500
		3	Installation Labor (Electrical & Controls)	1	ea.	$67,000	$67,000
		4	Startup / Load Test	1	ea.	$12,000	$12,000
		5	Grounding and Bonding	1	ea.	$17,000	$17,000
		6	Existing Facility Demo/ Modifications	1	ea.	$20,000	$20,000
		7	SCADA Integration	1	ea.	$30,000	$30,000
			Subtotal Electrical				**$ 222,500**
	SUBTOTAL CONSTRUCTION COSTS						$ 554,200
		Contingencies (Market Conditions, Unknowns, etc.) 25%		1	LS	$ 125,950.00	$ 125,950
	TOTAL CONSTRUCTION COSTS						**$ 680,000**
	1.0	**Non-Construction Costs**					
		A. 1	Administration/Legal/Permitting	5	%	$ 34,000.00	$ 34,000.00
		2	Floodplain Analysis	1	ea.	$ 20,000.00	$ 20,000.00
		3	Engineering Design/Construction Administration	20	%	$ 136,000.00	$ 136,000.00
		SUBTOTAL NON-CONSTRUCTION COSTS					**$ 190,000**
	TOTAL OPINION OF PROBABLE PROJECT COSTS						**$ 870,000**

Hardin WTP PER **12/2025**

Improvement #2: Replace Pretreatment Sludge Removal System

Budgetary Preliminary Estimate of Costs

No.	Item			QUANTITY	UNIT	UNIT COST	EXTENDED COST
A.	**General Conditions**						
	1.0	**General Conditions**					
		A. 1	Insurance, Bonds, Mobilization, Travel, Subsistence, Etc.	1	LS	$ 38,500.00	$ 38,500
D.	**Process**						
	1.0	**Division 40 - Process**					
		A.	**Process Improvements**				
		1	MRI Sludge Package	1	ea.	$ 275,080.00	$ 275,080
		2	Sewer Pipe (4"-6")	40	L.F.	$ 100.00	$ 4,000
		3	Connection to Manhole	1	ea.	$ 15,000.00	$ 15,000
		4	Excavation	107	CY	$ 20.00	$ 2,140
		5	Remove Trac-Vac System	1	ea.	$ 10,000.00	$ 10,000
		6	Core Drill Existing Basin	1	ea.	$ 15,000.00	$ 15,000
			Subtotal Process				**$ 321,220**
G.	**Electrical**						
	1.0	**Improvements**					
		A. 1	Electrical Systems	20	%	$ 321,220.00	$ 64,244
			Subtotal Electrical				**$ 64,244**
	SUBTOTAL CONSTRUCTION COSTS						$ 423,964
		Contingencies (Market Conditions, Unknowns, etc.) 25%		1	LS	$ 105,991.00	$ 105,991
	TOTAL CONSTRUCTION COSTS						**$ 530,000**
	1.0	**Non-Construction Costs**					
		A. 1	Administration/Legal/Permitting	5	%	$ 26,500.00	$ 26,500.00
		2	Engineering Design/Construction Administration	20	%	$ 106,000.00	$ 106,000.00
		SUBTOTAL NON-CONSTRUCTION COSTS					**$ 132,500**
	TOTAL OPINION OF PROBABLE PROJECT COSTS						**$ 662,500**

Hardin WTP PER **12/2025**

Improvement #3: Expanded Pretreatment Basin at WTP Site

Budgetary Preliminary Estimate of Costs

No.	Item				QUANTITY	UNIT		UNIT COST		EXTENDED COST
A.	**General Conditions**									
	1.0	**General Conditions**								
		A.	1	Insurance, Bonds, Mobilization, Travel, Subsistence, Etc.	1	LS	$	138,400.00	$	138,400
B.	**Civil/Site**									
	1.0	**Improvements**								
		A.	1	Soil Excavation	390	CY	$	14.00	$	5,460
				Subtotal Civil/Site					**$**	**5,460**
C.	**Structural**									
	1.0	**Improvements**								
		A.	**Improvements**							
			1	Concrete Roof Slab (12")	108	CY	$	1,800.00	$	194,400.00
			2	Concrete Slab (24")	217	CY	$	1,100.00	$	238,700.00
			3	Concrete Walls (18")	165	CY	$	1,500.00	$	247,500.00
				Subtotal Structural					**$**	**680,600**
D.	**Process**									
	1.0	**Division 40 - Process**								
		A.	**Process Improvements**							
			1	MRI Sludge Package	1	ea.	$	550,160.00	$	550,160
			2	Sewer Pipe (4"-6")	110	l.f.	$	150.00	$	16,500
			3	Connect to Existing MH	1	ea.	$	15,000.00	$	15,000
				Subtotal Process					**$**	**581,660**
G.	**Electrical**									
	1.0	**Improvements**								
		A.	1	Electrical Systems	20	%	$	581,660.00	$	116,332
				Subtotal Electrical					**$**	**116,332**
	SUBTOTAL CONSTRUCTION COSTS								$	1,522,452
		Contingencies (Market Conditions, Unknowns, etc.) 25%			1	LS	$	380,613.00	$	380,613
	TOTAL CONSTRUCTION COSTS								**$**	**1,903,000**
	1.0	**Non-Construction Costs**								
		A.	1	Administration/Legal/Permitting	5	%	$	95,150.00	$	95,150.00
			2	Engineering Design/Construction Administration	20	%	$	380,600.00	$	380,600.00
		SUBTOTAL NON-CONSTRUCTION COSTS							**$**	**475,750**
	TOTAL OPINION OF PROBABLE PROJECT COSTS								**$**	**2,378,750**

Hardin WTP PER **12/2025**

Improvement #4: New Sedimentation Basin at Intake Site

Budgetary Preliminary Estimate of Costs

No.	Item				QUANTITY	UNIT		UNIT COST		EXTENDED COST
A.	**General Conditions**									
	1.0	**General Conditions**								
		A.	1	Insurance, Bonds, Mobilization, Travel, Subsistence, Etc.	1	LS	$	454,400.00	$	454,400
B.	**Civil/Site**									
	1.0	**Improvements**								
		A.	1	Site Clearing	1	LS	$	5,000.00	$	5,000
			2	Site Grading	1	LS	$	50,000.00	$	50,000
			3	SWPP	1	LS	$	5,000.00	$	5,000
			4	Yard Piping & Connections	1	LS	$	45,000.00	$	45,000
			5	Soil Excavation	611	CY	$	14.00	$	8,554
				Subtotal Civil/Site					**$**	**113,554**
C.	**Structural**									
	1.0	**Improvements**								
		A.	**Improvements**							
			2	Architectural Precast Building, Roofing, & Accessories	5000	SF	$	140.00	$	700,000.00
			3	Concrete Slab 24 in Thick	382	CY	$	1,100.00	$	420,200.00
			4	Concrete Walls 18 in Thick	539	CY	$	1,500.00	$	808,500.00
				Subtotal Structural					**$**	**1,928,700**
D.	**Process**									
	1.0	**Division 40 - Process**								
		A.	**Process Improvements**							
			1	Rapid Mix system	1	ea	$	18,000.00	$	18,000
			2	Chemical Feed System	2	ea	$	15,000.00	$	30,000
			3	Chemical Storage System	1	ea	$	50,000.00	$	50,000
			4	Flocculator/Plate Settler System	2	ea	$	550,000.00	$	1,100,000
			7	Piping	1	LS	$	75,000.00	$	75,000
			8	Pumping System	1	LS	$	180,000.00	$	180,000
				Subtotal Process					**$**	**1,453,000**
G.	**Electrical**									
	1.0	**Improvements**								
		A.	1	Electrical Systems	1	LS	$	1,048,576.20	$	1,048,576
			2	HVAC Systems	5000	SF	$	4.00	$	20,000.00
			3	Plumbing Systems	5000	SF	$	7.00	$	35,000
				Subtotal Electrical					**$**	**1,048,576**
	SUBTOTAL CONSTRUCTION COSTS								$	4,998,230
		Contingencies (Market Conditions, Unknowns, etc.) 25%			1	LS	$	1,249,557.55	$	1,249,558
	TOTAL CONSTRUCTION COSTS								**$**	**6,248,000**
	1.0	**Non-Construction Costs**								
		A.	1	Administration/Legal/Permitting	2	%	$	124,960.00	$	124,960.00
			2	Floodplain Analysis	1	ea.	$	20,000.00	$	20,000.00
			3	Engineering Design/Construction Administration	20	%	$	1,249,600.00	$	1,249,600.00
		SUBTOTAL NON-CONSTRUCTION COSTS							**$**	**1,394,560**
	TOTAL OPINION OF PROBABLE PROJECT COSTS								**$**	**7,642,560**