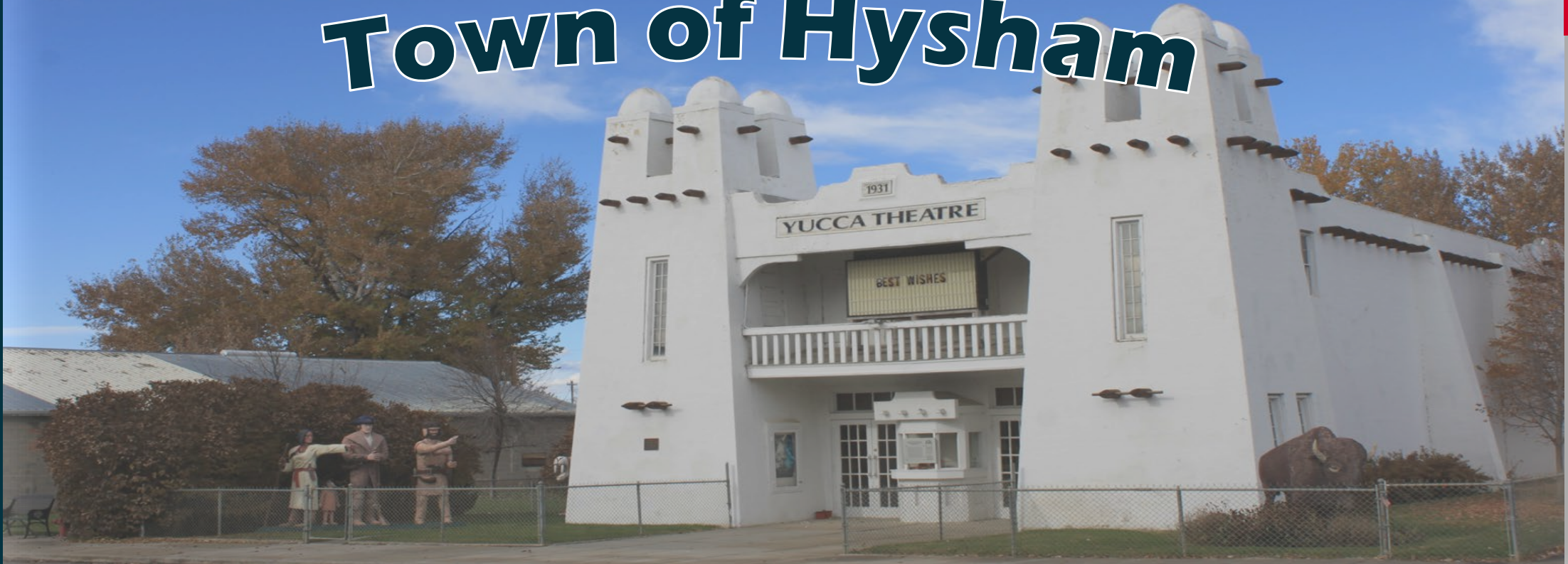


# Town of Hysham



## Water System Preliminary Engineering Report Alternatives Presentation – September 27, 2023

Crystal Bennett, PE  
Tyler Burns, EI



**\*\*\*\*DO NOT CONSUME THE WATER\*\*\*\***

**DRINKING WATER WARNING**

**Town of HYSHAM Public Water Supply System**

**MT0000428**

**Potential Acute Health Effects**

**Due to Unknown Condition of the Drinking Water**

*On 4/30/2023 the town of HYSHAM had a loss of filtration treatment. This situation may have led to the introduction of multiple contaminants in the drinking water; these contaminants may include total coliform bacteria, fecal coliform bacteria and various chemicals. Manganese has been measured in the distribution system at levels that exceed recommendations, so this DO NOT CONSUME advisory is being issued.*

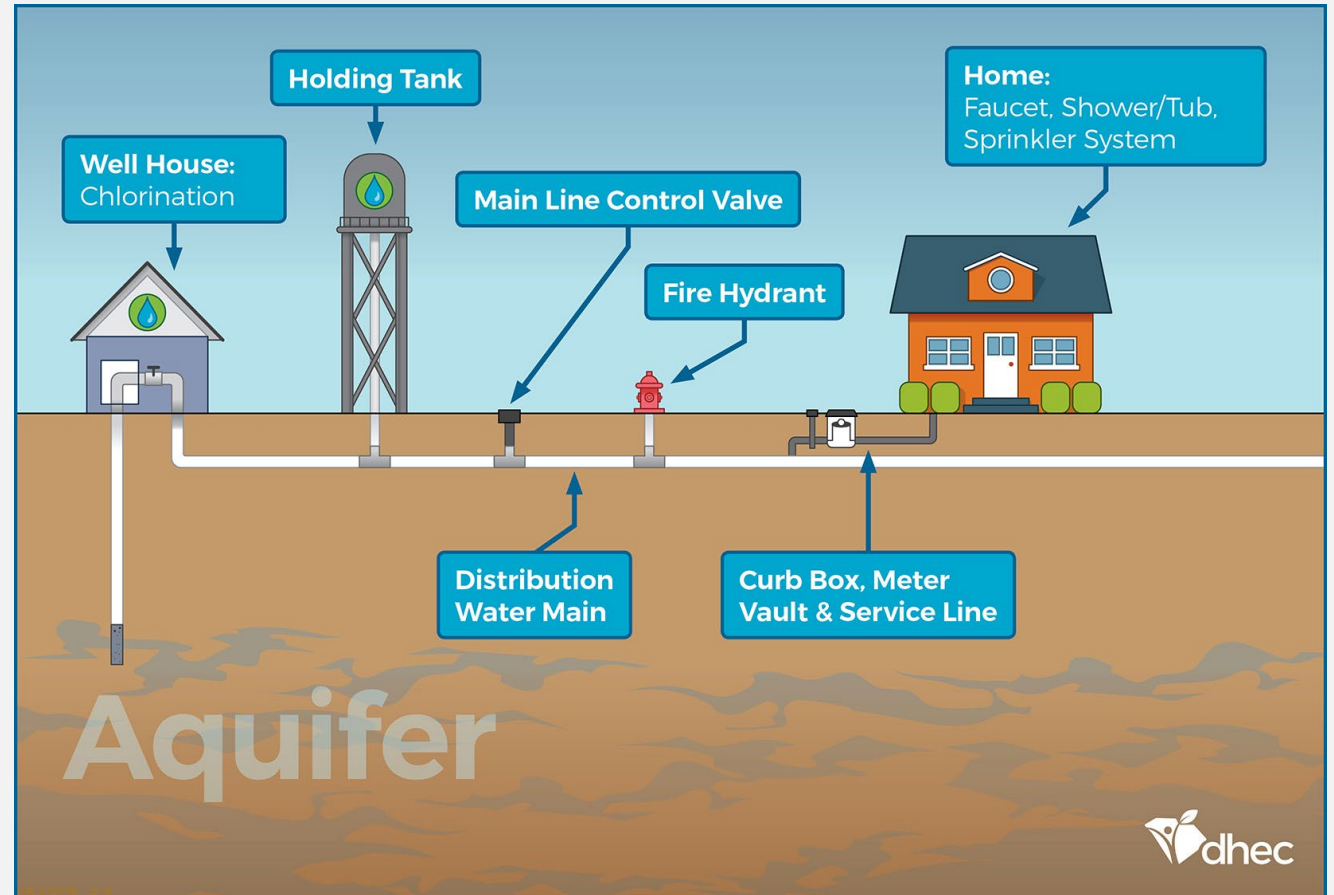


# Timeline of Major Milestones within Last Year

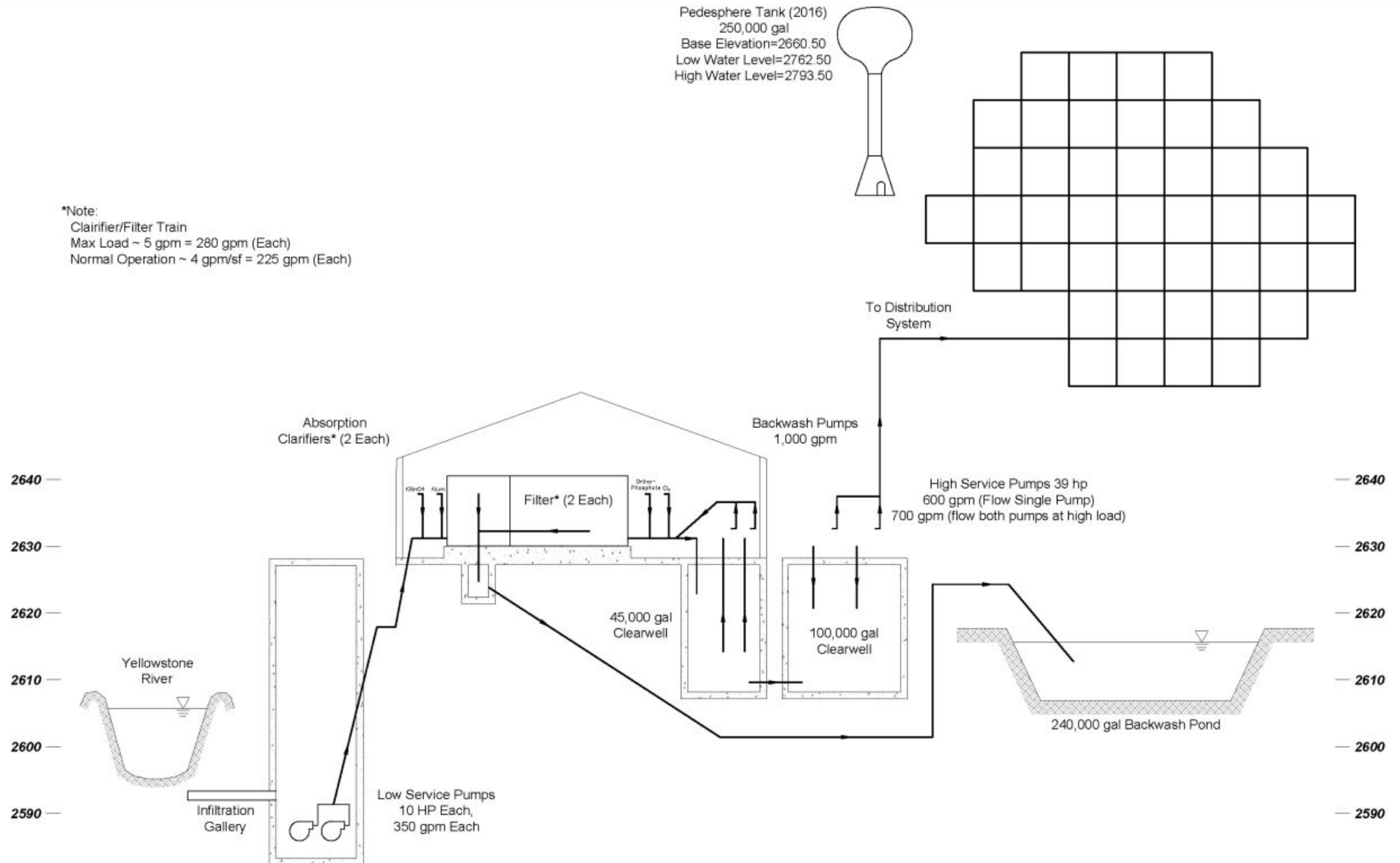


# WHAT IS A PER?

- *Preliminary Engineering Report*
- *Evaluation of entire system for existing and future conditions*
- *Required by grant/loan funding agencies*



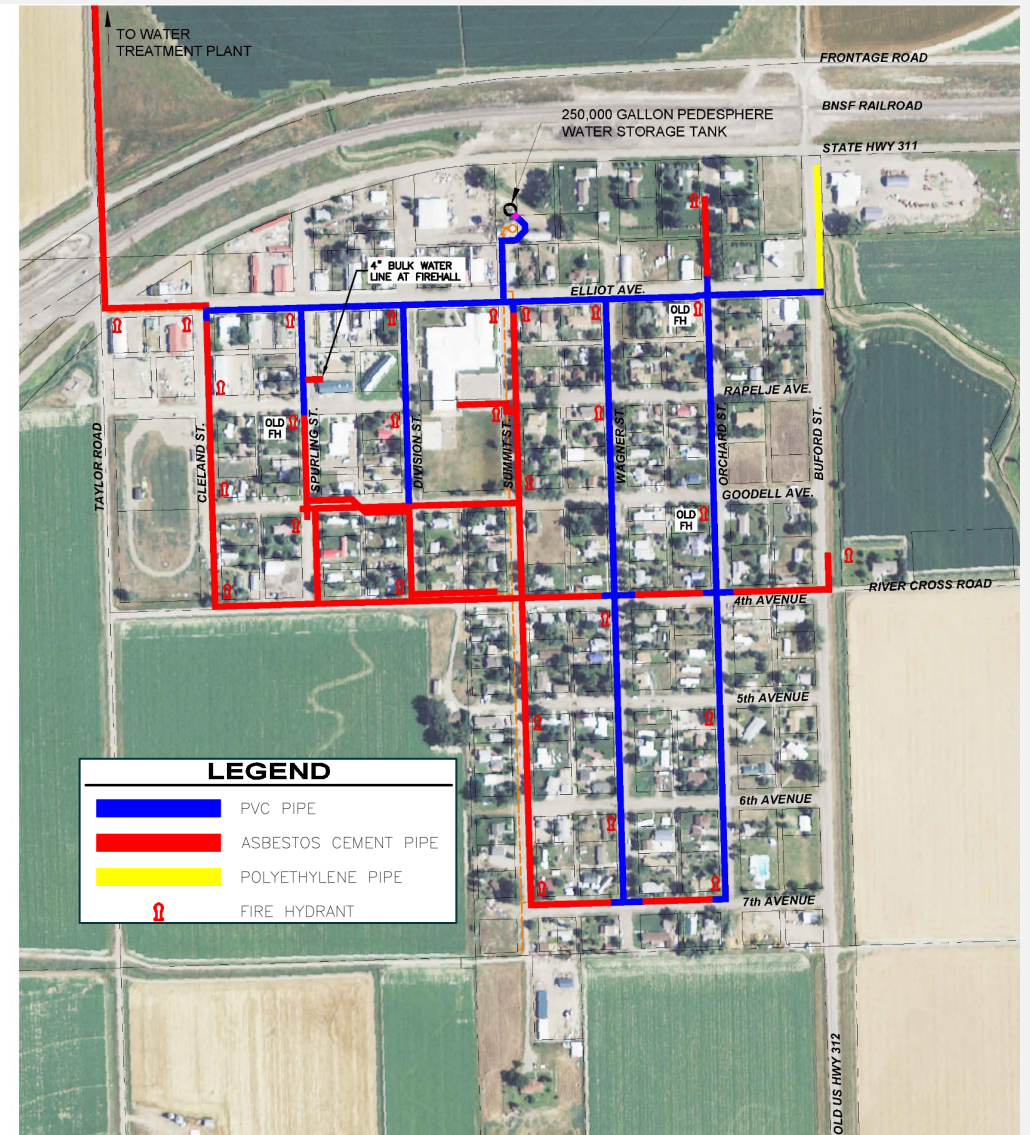
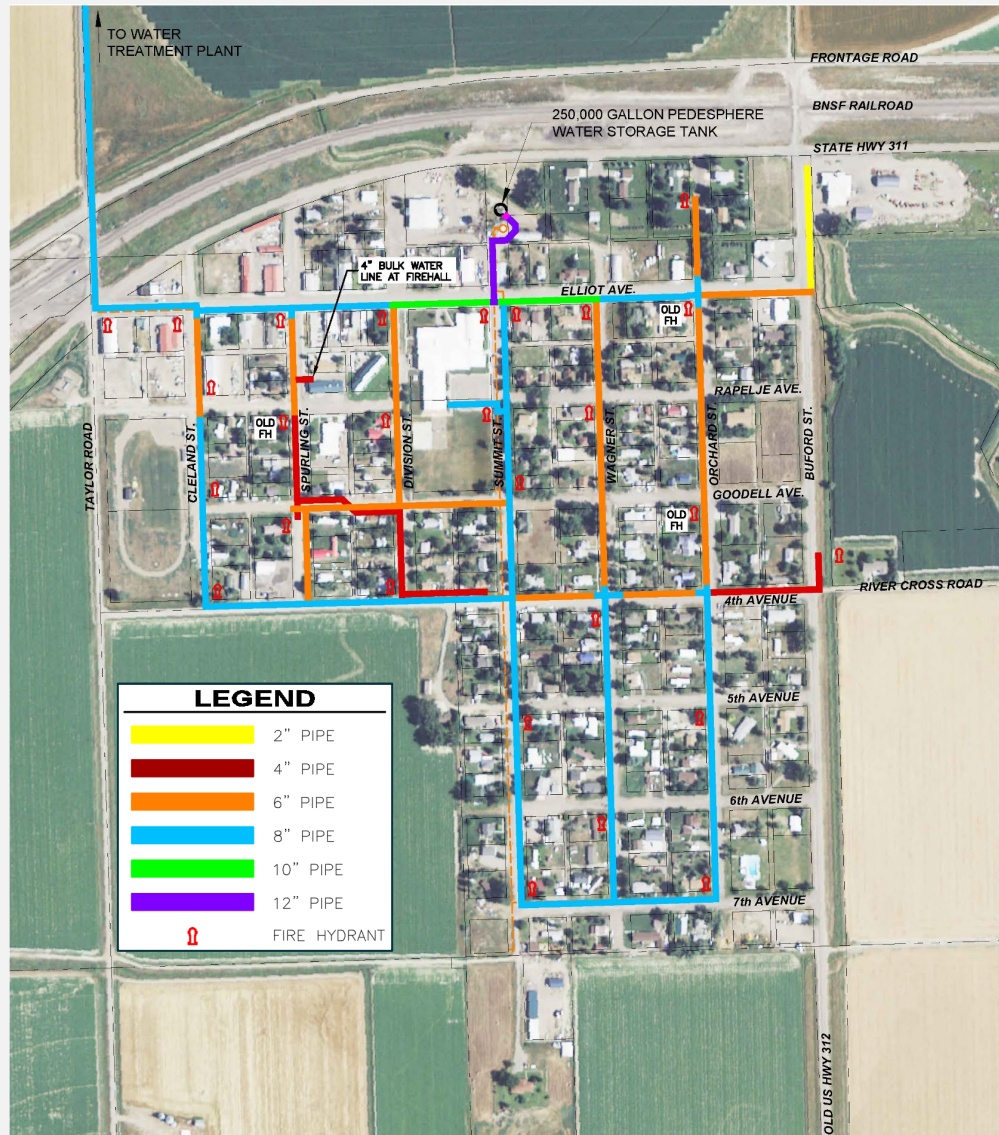
# OVERVIEW OF HYSHAM'S WATER SYSTEM



# EXISTING INFILTRATION GALLERY/TRANSMISSION MAIN



# EXISTING DISTRIBUTION SYSTEM



# OVERVIEW OF PAST IMPROVEMENTS

## 1977

- Construction of original infiltration gallery
- Transmission main replaced
- Distribution mains were replaced

## 1991

- Construction new water treatment plant and building
- Added 45,000 gallon clearwell storage tank
- Distribution system improvements along Spurling St, Division St, Orchard St, and Wagner St

## 2008

- Infiltration gallery extended approximately 750 feet
- SCADA installed at tank
- High service pumps replaced
- Water treatment filters replaced

## 2013

- Orthophosphate was added to chemical treatment to reduce lead and copper

## 2016

- New 250,000-gallon elevated steel water tank constructed

## 2018

- Water main replacements on Orchard St, Wagner St, and Elliot Ave.
- Backup generator installed at WTP



# GROWTH/CAPACITY

Year	Population	Average Day Demand		Maximum Day Demand		Peak Hour Demand
		gpd	gpm	gpd	gpm	gpd
2023	281	101,441	70	202,882	141	282
2045	304	109,744	76	219,488	152	305

*\* Populations based upon information from the Montana Department of Commerce Census & Economic Center*

# WATER SUPPLY/INFILTRATION GALLERY

- Constructed in 1977
- Expanded in 2008
- Total of 1,500 feet
- Unknown pipe condition
- Manhole access has been damaged
- Inoperable valve
- Supply is mixture of surface water and groundwater
- High iron and manganese

## Recommendations:

- Replace manhole access
- Replace valve
- Perform video inspection



# WATER TREATMENT

## Surface Water Treatment Rule, includes:

- Giardia Lamblia/Virus/ Cryptosporidium Treatment
- Turbidity limits
- Microbial Disinfection

## WTP also provides (currently) optional manganese treatment

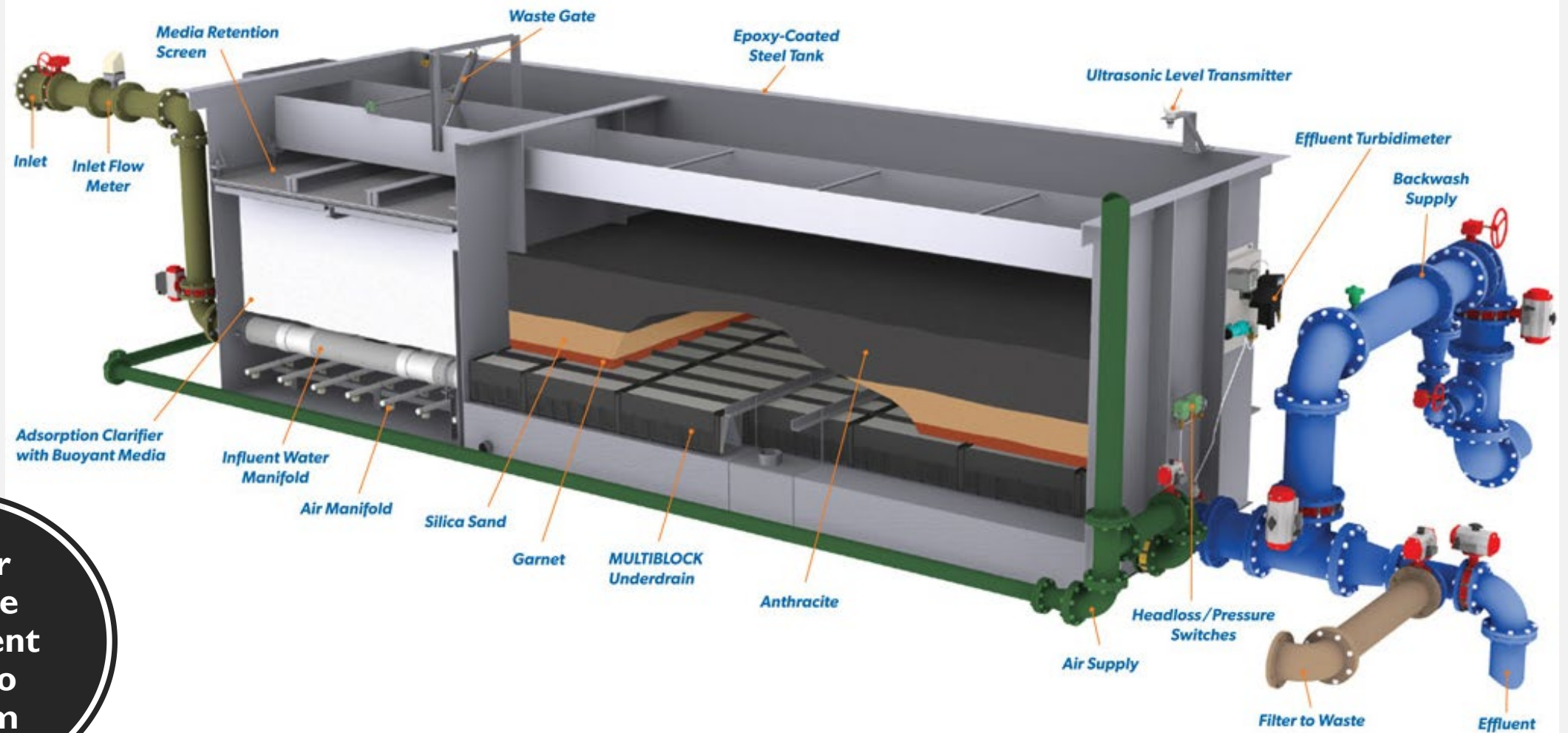
- Built in the 1970s and 1990s
- Lots of improvements needed

## Past Violations:

- Not maintaining disinfection
- Turbidity exceedances
- All led to initial Boil Advisory which was later upgraded to the Do Not Consume Advisory



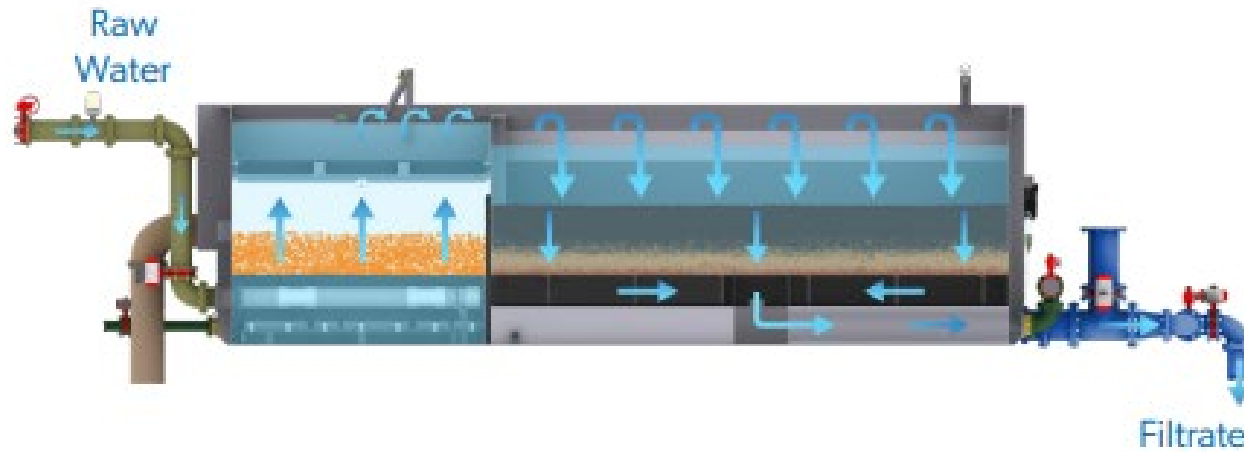
# WATER TREATMENT



Similar  
Package  
Treatment  
Plant to  
Hysham

# WATER TREATMENT

## Filtration Mode



The treatment process is started when chemically dosed raw water enters the Adsorption Clarifier near the bottom of the tank where an upflow treatment process combines flocculation and clarification. From the Adsorption Clarifier, flow continues over a weir into the collection trough where it is distributed into the mixed media filtration chamber, after which it is collected by the MULTIBLOCK® underdrain with Laser Shield™ media retainer and exits the tank.

Treatment  
Process



### Adsorption Clarifier System

Trident systems use less coagulant and polymer than conventional settling type clarifiers. Within the Adsorption Clarifier system it is not necessary to form a settleable floc, which means floc size and settling time are not factors. The buoyant media is rolled and scarified to greatly improve particulate removal. The compressible fiber media is used to capture more solids. The buoyant and compressible fiber media are NSF-61 certified and typically will last the life of the system.

# WATER TREATMENT

## MULTIBLOCK

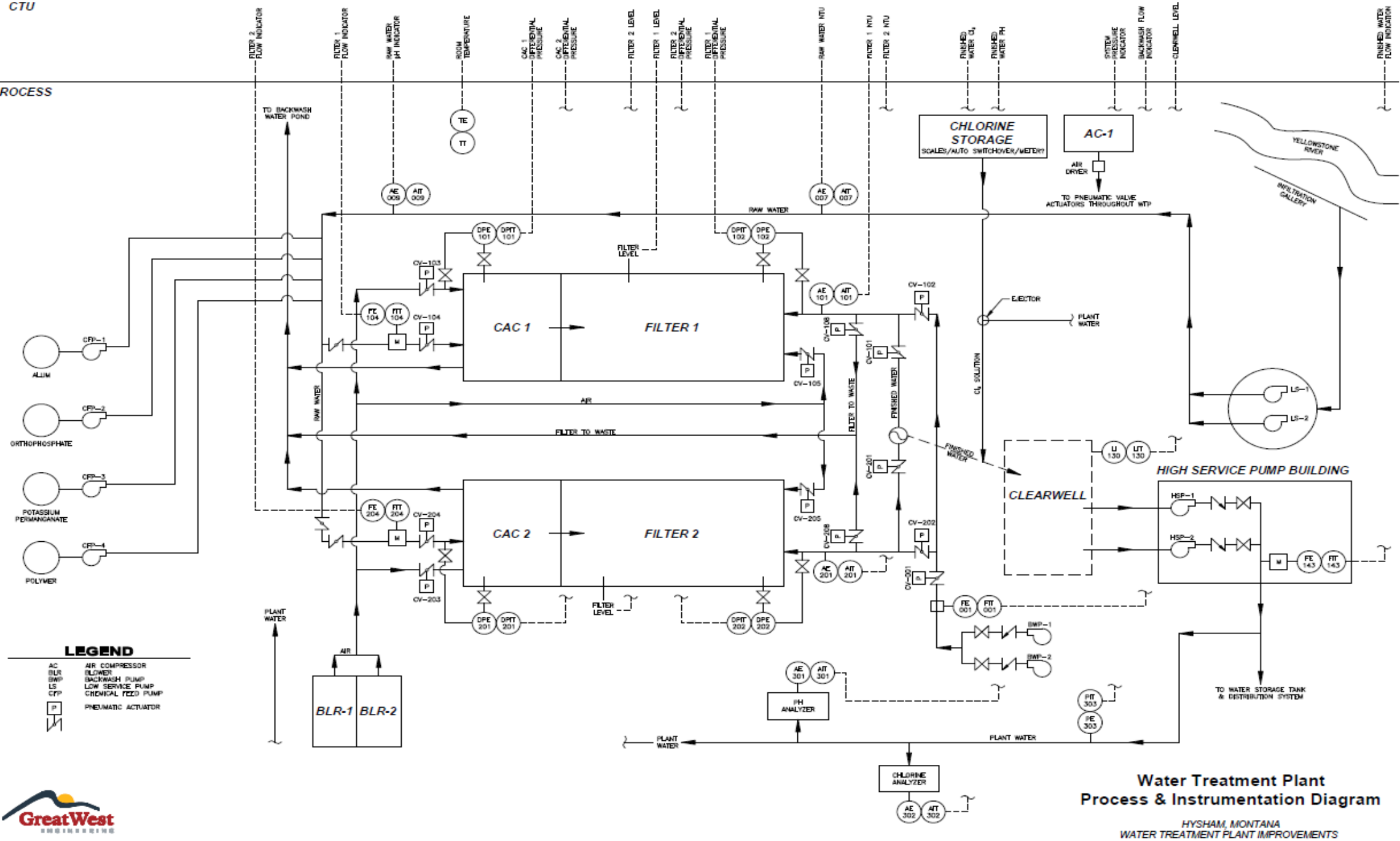
MULTIBLOCK underdrains provide a high-quality, low-cost, engineered product that is economical and versatile. MULTIBLOCK underdrains are fitted with the unique Laser Shield media retaining system that eliminates the need for support gravel. Combined air and water backwash is provided using this system.



Treatment  
Process

PROCESS

Y:\Share\Utilities Projects\2-23102-701-Improvements\2-23102-701-Improvements\2-23102-701-IMP P&ID.dwg



LEGEND

- AC AIR COMPRESSOR
- BLR BLOWER
- SWP BACKWASH PUMP
- LS LOW SERVICE PUMP
- CFP CHEMICAL FEED PUMP
- P PNEUMATIC ACTUATOR



**Water Treatment Plant  
Process & Instrumentation Diagram**

HYSHAM, MONTANA  
WATER TREATMENT PLANT IMPROVEMENTS

# WATER TREATMENT RECOMMENDATIONS

- **Filter #1 Rehabilitation**
- **SCADA System and Electrical**
  - The remaining items not included in the Phase 1 Emergency Improvements
  - Additional needed I/O
  - Upgrade controls for the water tower
  - Replace all electrical equipment and circuiting in both buildings, including the MCC
- **New Actuated Valves**
- **Automatically Controlled Chemical Feed Pumps**
- **Process piping replacement**
- **Instrumentation and meter replacements**
- **Yard piping**
  - Raw water line replacement
  - Finished water line replacement
  - Replace valves, as needed
- **Wet Well Improvements**
  - Replace older raw water (low service) pump
  - Rehabilitate wet well manhole
  - Replace valves and piping
- **Backwash pumps**
  - New pumps with VFDs
  - New intake piping
- **High Service Pumps**
  - Suction and discharge piping replacement due to scaling of Mn and Fe on pipes and ensure compliance with the Mn health advisory limits
- **Clearwell Repairs**
  - Old hatch removal
  - Repair new hatch
  - Replace ladder
  - Replace curtain/baffles
  - Replace all piping in clearwell
  - Repair/patch concrete areas
- **Chlorination system improvements**
  - Alarms
  - Electronic scale
  - Automatic switchover
  - Heating and ventilation improvements
- **Manganese treatment improvements**
  - Filter operation evaluation for chemical feed optimization, including the optimization of manganese and iron removal
  - ORP meters at CAC influent and filter effluent
  - High service pump suction and discharge piping replacement due to scaling of Mn and Fe on pipes and ensure compliance with the Mn health advisory limits
- **General Building Improvements**
  - Roof replacement
  - Chemical feed room
    - Drywall repairs
    - Move chemical tanks and clean, repair, and coat floor
  - Light replacements
  - Heating and ventilation



# WATER STORAGE

- **250,000-gallon tower**
  - Built in 2016
  - Good condition
- **100,000-gallon clear well**
  - Built in the 1950s
  - Some improvements needed
- **45,000-gallon clear well**
  - Built in 1991
  - Minor improvements needed
- Meets operational needs & residential fire flow needs
- **Recommendation: Rehabilitation of clear wells & continue regular inspections/cleaning**



# DISTRIBUTION SYSTEM

Size/Type	12-inch (ft)	10-inch (ft)	8-inch (ft)	6-inch (ft)	4-inch (ft)	Total
Asbestos Cement (ft)	0	0	13,544	2,292	380	16,216
PVC (ft)	298	757	3,030	3,746	0	7,831
<b>Total</b>	<b>298</b>	<b>757</b>	<b>16,574</b>	<b>6,038</b>	<b>380</b>	<b>24,047</b>

- Pressures good throughout
- Fire flows generally adequate
- Insufficiently spaced fire hydrants
- Large portion reaching its useful lifespan
- Significant water losses (approaching 80%)

## Recommendations:

- Create detailed inventory of existing leaks
- Replace mains based on severity of leak within Town
- Replace transmission main
- Work towards an AC, leak, and contaminant free system



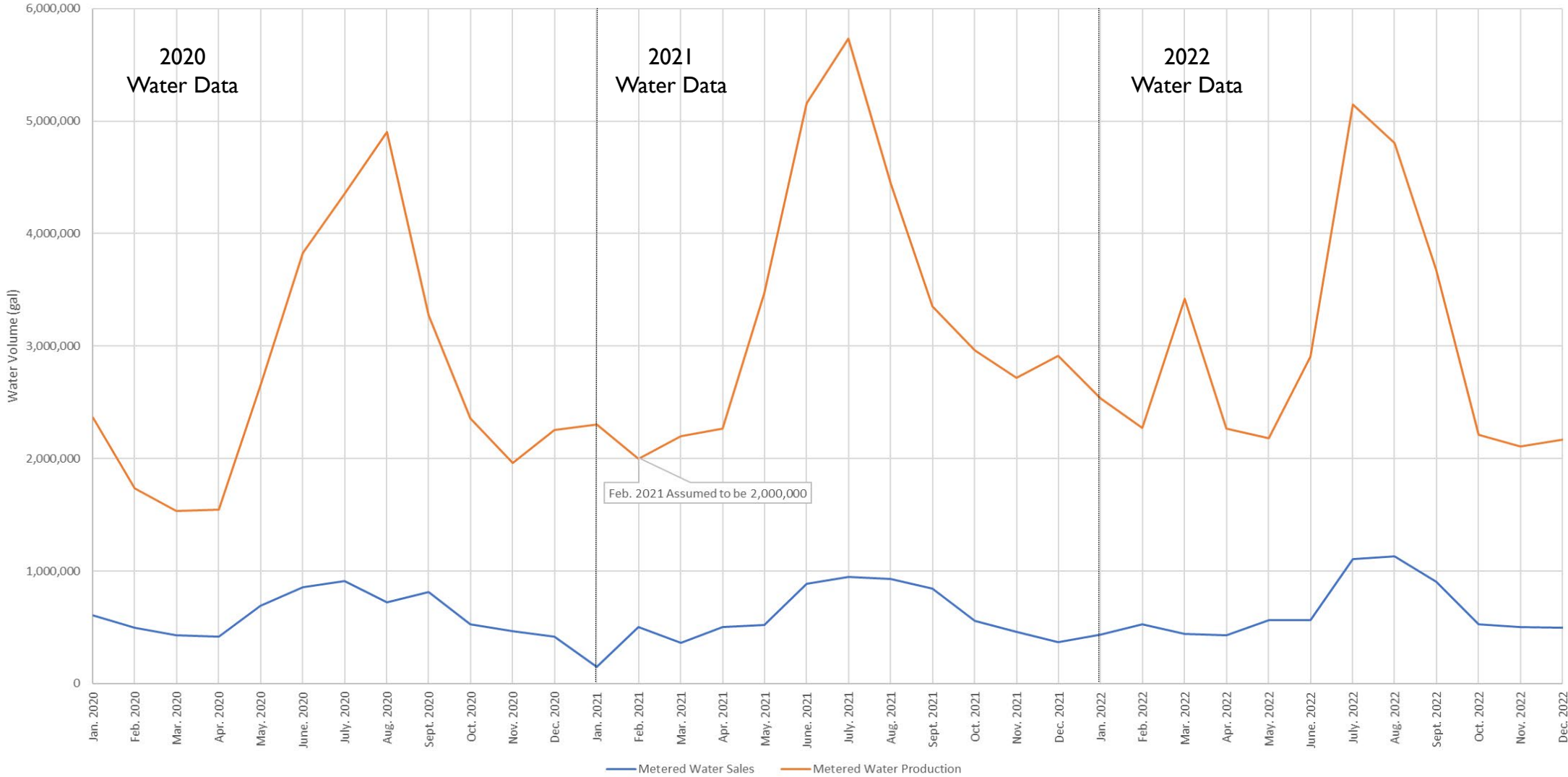
# WATER LOSS

Year	Production (gal)	Sold (gal)	Water Loss/ Not Sold (gal)	% Water Loss/ Not Sold
2020	32,762,393	7,358,861	25,403,532	77.5%
2021	41,525,673	7,034,676	34,490,997	83.1%
2022	35,700,432	7,632,198	28,068,234	78.6%
Average Yearly Produced (gal)	36,662,833			
Average Yearly Sold (gal)	7,341,912			
Average Yearly Lost (gal)	29,320,921			
Average % Water Loss/Not Sold	79.7%			
Population	275			
Average Water Usage (gpcd)	368			

\*February 2021 water production was assumed to be 2,000,000 gallons

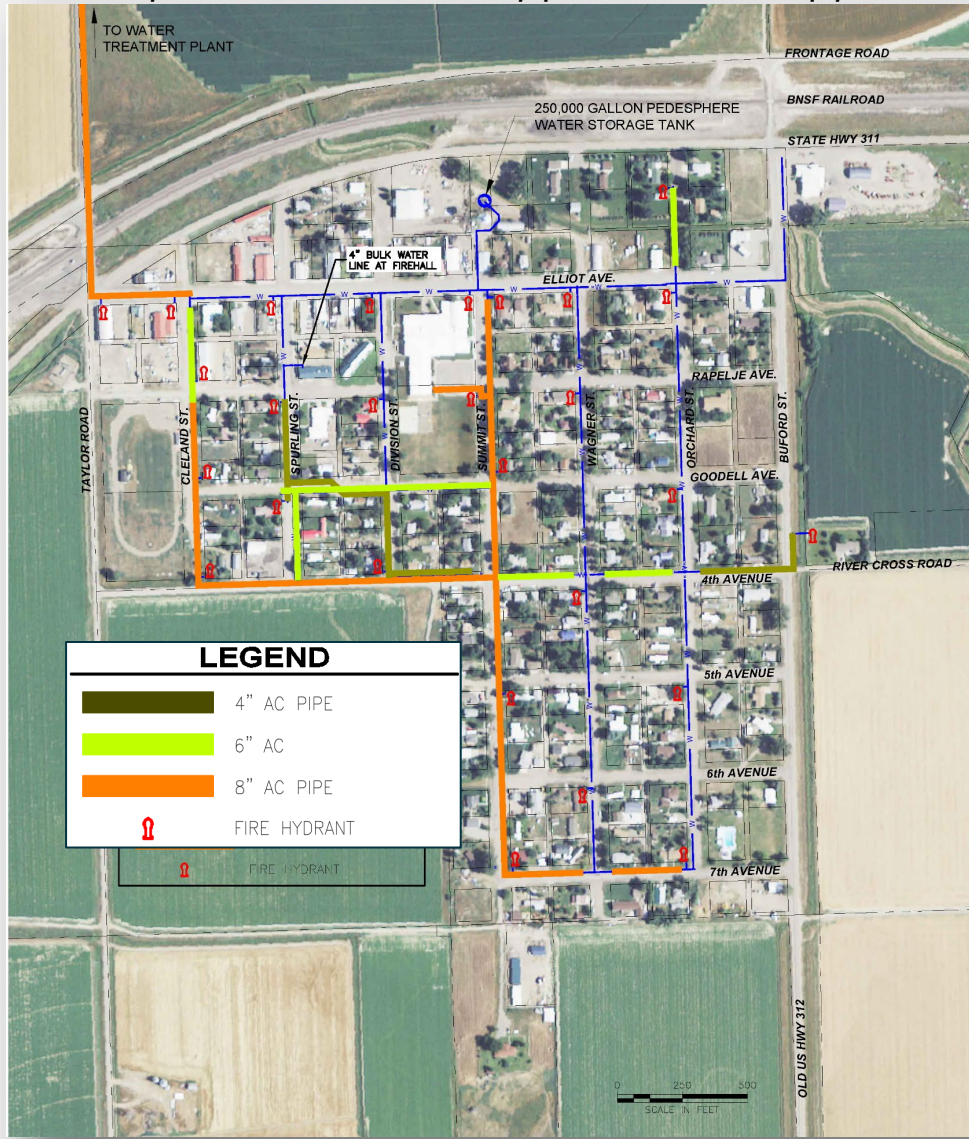
# WATER LOSS

Metered Sales Vs. Metered Produced

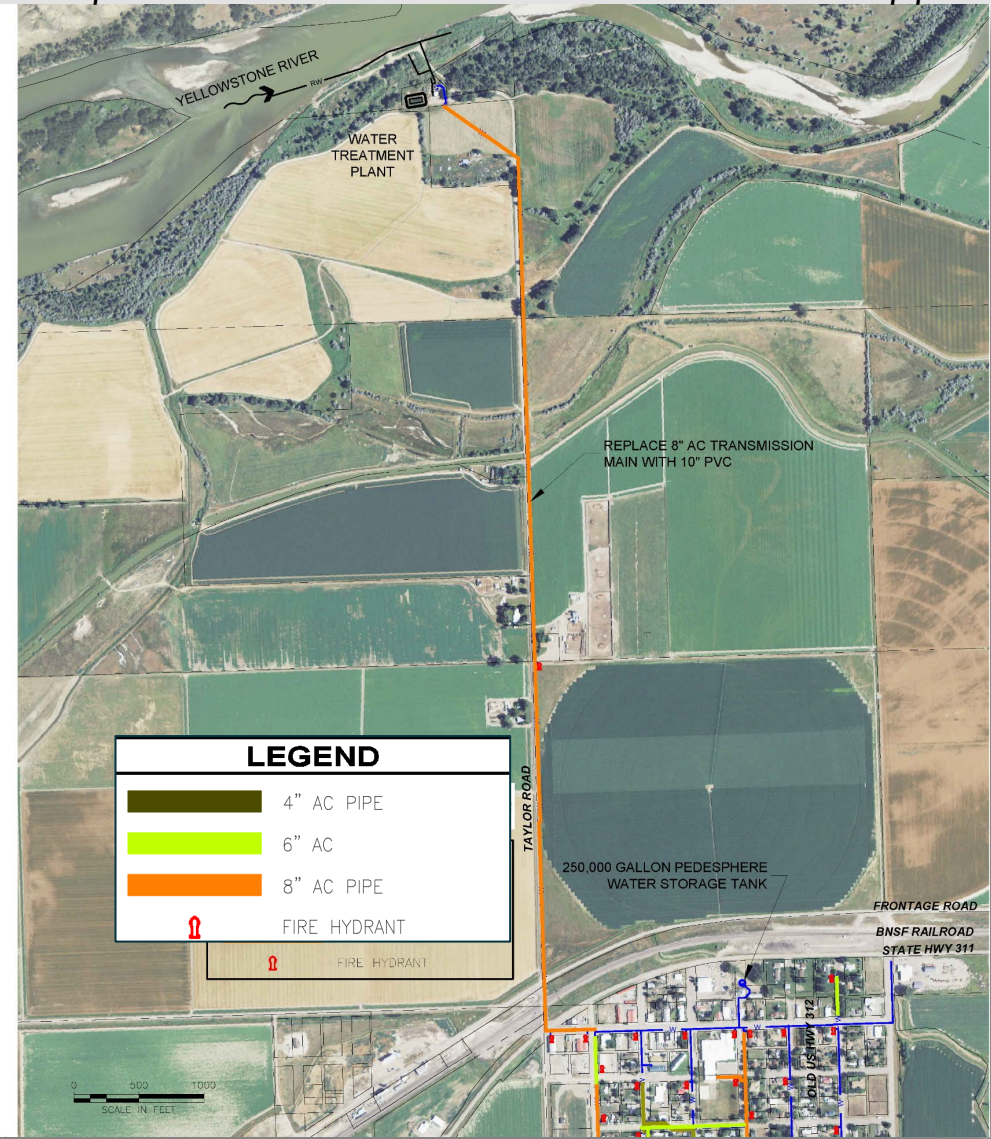


# DISTRIBUTION SYSTEM IMPROVEMENTS

Replace all asbestos cement pipe in town with 8" pipe



Replace asbestos cement transmission main with 8" or 10" pipe



# ALTERNATIVES CONSIDERED

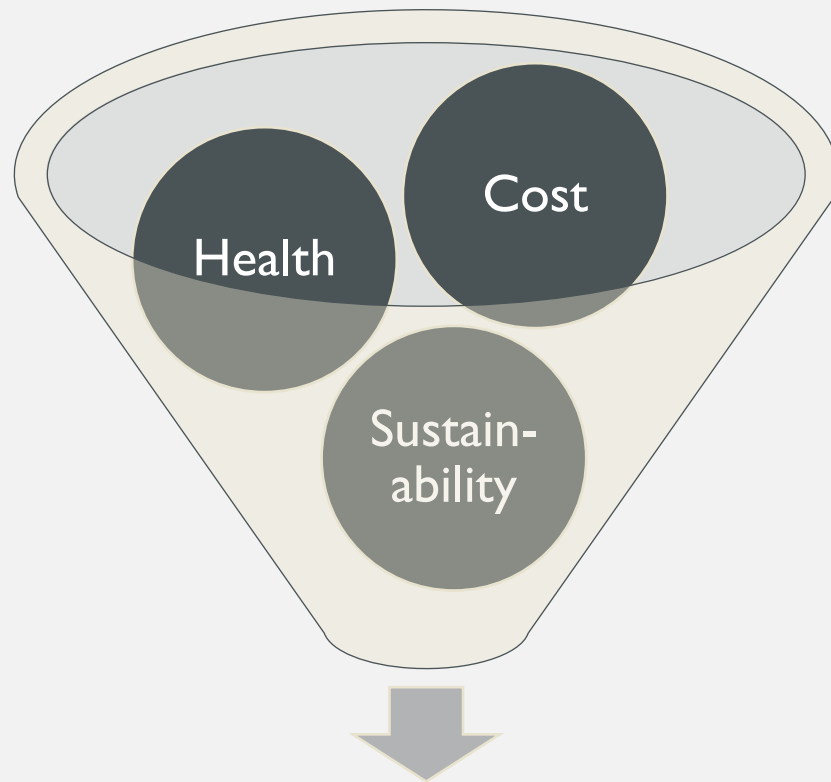
## ▪ **Water Supply and Treatment Alternatives Considered**

- ~~No Action~~ **Not Viable**
- Existing Supply with Existing Treatment → **Detailed consideration**
- Existing Supply with New Treatment → **Detailed consideration**
- ~~Develop New Groundwater Source~~ **Not Viable**
- ~~Connect to Nearby Water System~~ **Not Viable**
- ~~Decentralize Water System~~ **Not Viable**

## ▪ **Distribution System Alternatives Considered**

- ~~No Action~~ **Not Viable**
- Replace Asbestos Cement Distribution and Transmission Main with 8" PVC
- Replace Asbestos Cement Distribution Mains with 8" PVC and Transmission Main with 10" PVC

# SELECTING AN ALTERNATIVE



**Recommended  
Alternative**

DESCRIPTION	WEIGHTING FACTORS
Financial Feasibility/Life Cycle Cost	10
Public Health and Safety	7
Operations and Maintenance	7
Sustainability/Future Compliance	4
Permitting	4
Social Impacts	5
Environmental Impacts	5

# SELECTED ALTERNATIVES

Existing Infiltration Gallery and  
WTP Improvements

\$3,616,000

3 Phases

2026 Completion

Replace AC Distribution Main  
with 8" PVC and Transmission  
Main with 10" PVC

\$8,396,000

Multiple Phases

2028+ Completion

**Note: Phases and schedule will be dependent upon success of grants and other funding**



# PHASING THE PROJECT

## Phase 1B \$1,099,000

SCADA Upgrades

Filter 1 Rehab

Valve Replacement

Backwash Pump Replacements

Backwash Inlet Piping Replacement

WTP Building Roof Replacement

### Proposed Funding:

- \$750,000 CDBG
- \$349,000 WIIN

## Phase 2 \$2,186,000

SCADA Panel Additions

Wet Well Rehab

Raw Water Pump Replacement

Process Piping Replacement

Chemical Room Improvements

Building Improvements

Infiltration Gallery Improvements

Clear Well Improvements

### Proposed Funding:

- \$625,000 MCEP
- \$125,000 RRGL
- \$750,000 CDBG
- \$250,000 Coal Board
- SRF or RD Grant/Loan Combo

## Emerging Contaminants \$3,799,000

Manganese Treatment Improvements

Transmission Main Replacement

### Proposed Funding:

- SRF or EPA Grant

## Future Phases >\$3,000,000

Distribution System Improvements

Miscellaneous Improvements

### Proposed Funding:

- TBD

# TARGET RATES

System	MHI	Percentage (%)	Target Rate	Existing Rate
MDOC: Water Only	\$41,964	1.4%	\$48.96	\$90.63
MDOC: Waterwater Only	\$41,964	0.9%	\$31.47	\$17.90
MDOC: Combined Target Rate	\$41,964	2.3%	\$80.43	\$108.53
Percentage of Target Rate	---	---	---	134.9%

# PHASE 1B – FUNDING & IMPACTS TO USER RATES

Potential Funding Sources	Amount	Notes
CDBG	\$750,000	Targets low to moderate income communities
EPA WIIN	\$349,000	Targets small, underserved, and disadvantaged communities

- Goals for Phase 1B Project:
  - 100% grant funding project
  - No rate increase related to this phase of the project
- Future projects will likely impact user rates



WATER TREATMENT PLANT TOUR  
OCTOBER 7<sup>TH</sup> @ 11:30AM

QUESTIONS?  
COMMENTS?