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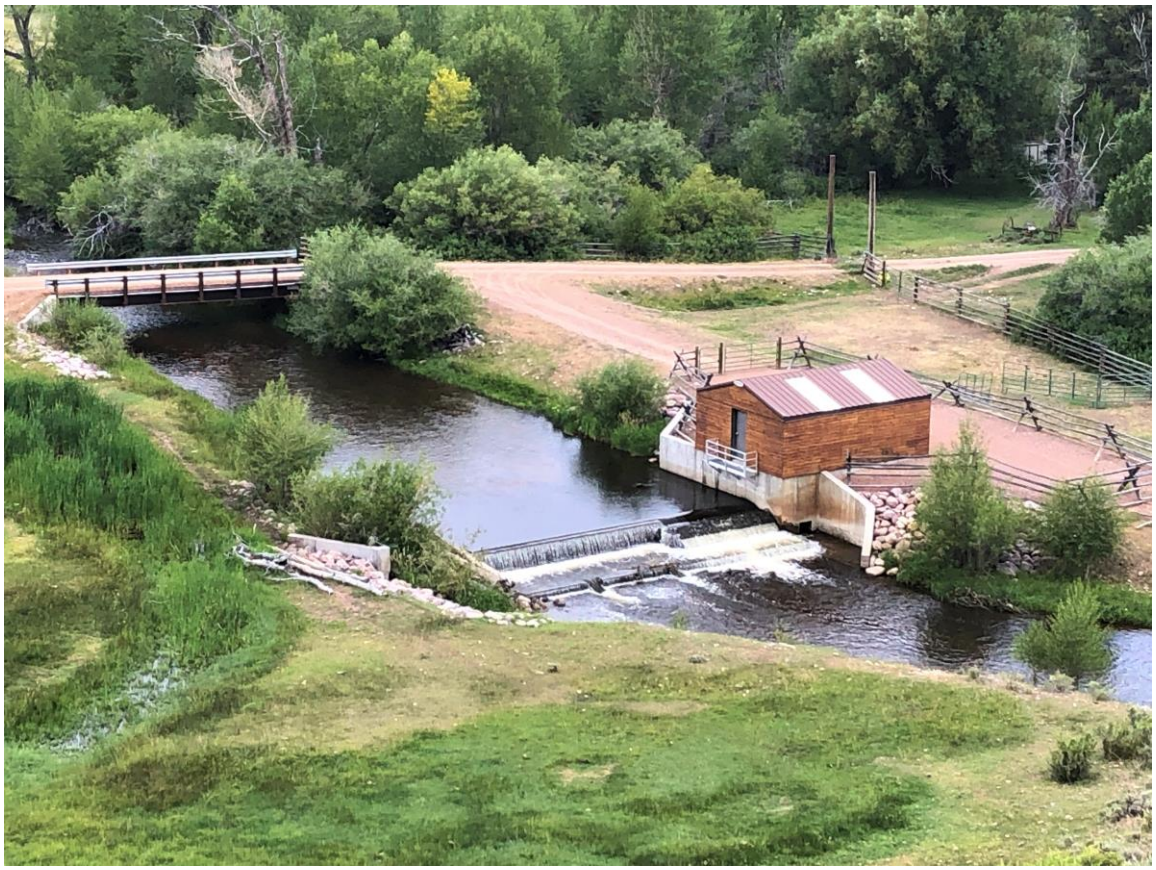

EXECUTIVE SUMMARY
BRIDGER VALLEY REGIONAL WATER MASTER PLAN LEVEL I STUDY

Wyoming Water Development Commission

SUNRISE ENGINEERING

Executive Summary

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Wyoming Water Development Commission

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1 INTRODUCTION

The Bridger Valley is in Uinta County in the southwestern corner of the State. Bridger Valley encompasses several communities and many farms and ranches located in rural settings.

The communities receive their water supply through a system operated by the Bridger Valley Joint Powers Water Board (BVJPB). The system serves over 6,000 people. The towns of Mountain View and Lyman have approximately 667 and 783 connections respectively. The unincorporated areas of the county outside these communities consist of an additional 613 connections. The unincorporated areas include the Towns of Ft. Bridger and Urie. There are many other homes and businesses outside the service area of the BVJPB which rely on shallow domestic wells for a water source.

2 MEETINGS AND INFORMATION REVIEW

Existing information gathered and reviewed during this Study included the following documents:

1. WWDO Bridger Valley Water Supply Level I Study 1991-Forsgren Associates
2. WWDO Bridger Valley Water Supply Level II Study 1995-Forsgren Associates
3. WWDO Bridger Valley Water Treatment Analysis, Addition of Pioneer Water and Sewer BVJPB 1993-Forsgren Associates

PREVIOUS RESERVOIR STUDIES

Between the years 2003 to 2008 the BVJPB with the aid of the WWDC conducted a series of studies focused on how to provide additional raw water storage and better utilize the existing storage rights held in Stateline Reservoir. These studies included the following:

- ECI. (2004). Bridger Valley Reservoir Level II Study
- Gannett Flemming, Inc. (2006). Bridger Valley Reservoir Level II, Phase II Study
- Short Elliot Hendrickson, Inc. (2008). Bridger Valley Reservoir Project, Level II Study

SUMMARY OF PREVIOUS STUDIES

As a result of the studies in the early to mid 1990s the BVJPB embarked on and successfully completed several large capital projects to secure source capacity, treatment capacity and storage. These projects included construction of the current WTP (2003), the bolted storage tank at the WTP (2003), the 22-inch transmission line between the river diversion (2003) and the plant and a bag filtration plant on the Lyman Springs pipeline near Highway 414.

Outstanding Needs

Alternative source capacity remains an outstanding need identified in previous studies. The reliance on the river diversion for most water presents risks that surface contamination, sediment, or other natural

river processes could interrupt supplies. Another source; most likely groundwater; remains uncompleted at this time.

Line looping into Lyman and Ft. Bridger reviewed in previous studies also remains to be completed. This looping could also result in system expansion by the addition of new connections in areas where the lines are looped and also addresses concerns with low pressure in some areas.

3 INVENTORY, EVALUATION, AND GIS

A thorough review of the design drawings from the various projects that constructed the system was completed to verify and proof the existing GIS mapping and to make an inventory of the system. Major system components were also visited on the ground. The existing GIS was converted into the template format mandated by the WWDO. Features constructed since the last GIS update were visited in the field and observed with a sub meter grade handheld survey unit to obtain feature coordinates. The new data was then added to the existing GIS dataset.

Water Source

The only plant water source is the diversion on Smiths Fork located about 1.6 miles south of the WTP.

The diversion is a concrete weir with an overshot screen and trough located on a portion of the weir. The trough directs river flow into the diversion house where it encounters additional screens. The diversion can also divert flow directly from the bank through the wall and into the diversion house. Careful operation of the withdrawal level helps reduce entrainment of moss which can be a challenge in late season. The configuration does have sluicing ability relied on to reduce ice in the structure. The operator had no specific ideas or requests for repairs or configuration changes within the diversion structure. Electricity is provided by a small on-site gas generator. Electrical reliability could be improved by a permanent service drop however it is not critical to the operation. A resistance heater could also be provided if an electrical connection was available.

From the diversion location the 14-inch and 22-inch transmission pipelines begin their route to the WTP located about 8,300 feet northward.

Table 3.1 Water Source Pipeline Capacity Compared to Maximum Day Demand

22-inch HDPE Capacity	8,208,000 gpd	5,700 gpm*
14-inch AC Pipeline Capacity	2,160,000 gpd	1,500 gpm*
-Maximum Daily Demand (2040)	2,136,000 gpd	1,483 gpm
Excess Pipeline Capacity =	**8,232,000 gpd**	**5,717 gpm**

**Based on pipe flowing full.*

Water Treatment

The Joint Powers Board operates a traditional filtration plan with the following processes:

- Intake Screening
- Rapid Mix
- Flocculation
- Sedimentation
- Sand Filtration with Air Scour
- UV Disinfection
- Chlorination
- Sludge Drying Beds

The new plant (2002) is an Actiflow system with two parallel clarifier sections with two sand filters per section. Under the current configuration each side of the plant can operate in parallel with the ability to send flow to any one of the four sand filters from either clarifier. The 1991 permit to construct contained design report attachments indicating that each Actiflow train is capable of 3.25 MGD per the proprietary design of the process by Kruger/U.S. Filter. This capacity however requires three of the four filters meaning in actual practice, the combined capacity of the plant is limited to the filter capacity of three filters.

Plant Needs

The plant operates well but does have several operational and maintenance challenges associated with chemical handling:

- Stairs into the sodium permanganate room make delivery of drums to the room difficult. The jib hoist is over-taxed when lifting and rotating. A new frame hoist with trolley or a heavy-duty jib hoist is recommended.
- Delivery piping from the sodium hypochlorite room produces encrustation at glued and threaded joints. New piping with fewer joints will reduce the leakage.
- DC motors in mix room could be changed to AC to eliminate converter equipment.

Other general plant issues to address include the following:

- Air/Vac valve in UV room is problematic and should be reconfigured.
- Poly liner in main finished water storage tank has limited life. A replacement tank or major rehabilitation of the floor is needed.
- Process analyzers and controllers are aging and becoming difficult to maintain. Upgrading to current models is recommended.
- Insertion mag meters are aging and should be updated.
- Plant furnace controls need reconfiguration.
- SCADA could use some minor updates along with computer hardware.
- The pump discharge piping in the Backwash Pump House is unrestrained on several joints and has limited restraint on other joints. Restraint of this piping is a top priority. See figure at right exhibiting the movement of the pipe typical at several joints.
- Some suction and discharge lines have welded fittings making disassembly impossible.

Transmission Lines

The Joint Powers Board operates several pipelines classified as transmission lines. On the supply side there is currently a 14-inch AC pipe and a 22-inch HDPE transmission line between the river diversion and the WTP. There is also the 18-inch crossover pipe between the Blacks Fork and the Smiths Fork.

The finished water is transmitted from the plant to the Town of Mountain View and the Urie Tank via a 16-inch to 14-inch transmission line. In Urie, the transmission line bifurcates sending a portion of the flow to Lyman via a 12-inch pipeline and part to Ft Bridger via a 10-inch pipeline. Additional 10-inch pipelines extend northward from Urie to Emigrant Road and Northward from Lyman to Eagle Lane north of the I-80 corridor. All transmission lines are believed to be asbestos cement.

Finished Water Storage

The system presently operates with three storage tanks. Two of the tanks are located at the plant site and the third tank is located in Urie and is central to the distribution system.

Table 3.1.7 summarizes the system storage capacity having a total capacity of 2.0 MG.

WTP North Tank (Welded 1979) WTP South Tank (Bolted 2004) Urie Tank (Concrete)	0.5 MG 0.5 MG 1.0 MG
Total Storage Capacity	**2.0 MG**

Table 3.1.7 System Storage

DEQ Chapter 12, Section 13(a)(i)(c) states "Water systems serving in excess of 500,000 gallons on the design average daily demand shall provide clearwell and system storage capacity equal to 25 percent of the design maximum daily demand, plus added fire storage based on recommendations established by the State Fire Marshall or local fire agency."

Based on this DEQ criteria, the required storage capacity is estimated as follows:

Peak Day = Average Day x 3.0 = (0.592 MG + 0.18 MGD) x 3.0 = 2.316MG

Peak Day Storage = 0.25 x 2.316 MG = 0.579 MG

Fire Storage = 1,500 gpm x 4 hours x 60min/hr = 360,000 gallons or 0.36 MG

Backwash Water Storage 25,000gal/day x 4 filters = 100,000 gallons

Total Required Storage = 0.579 MG + 0.36 MG + 0.10MG = 1.039 MG

Current Excess Capacity = 2.0 MG-1.039MG = 0.96 MG

Future Storage

The future required storage capacity is projected to grow based on additional customers and having a larger peak day demand. The projected required storage capacity is 1.2 MG.

The existing storage capacity volume is adequate to meet these future projected volumes however the condition and configuration of the storage capacity is less than ideal with the Urie tank requiring pumping for most of the system users to access its volume and the welded steel tank at the plant expected to require continued major maintenance projects at regular intervals in the future.

A new storage tank located at the plant elevation to replace the welded steel tank is a solution to the steel tank maintenance demands.

The Urie Tank's future use and benefit to the system will be enhanced by installation of a stand-by generator at the booster pump building. It is recommended a 230 kVA

4 HYDRAULIC MODEL

The capacity of the BVJPB transmission and distribution system was examined by creating a water model. The water model software (InfoWater by Innovyze) analyzes the ability of the system to perform based on its given pipe sizes, pipe lengths, system elevations, tank locations and elevations, pumps, and pipe configurations.

The water model results show that during 2020 Maximum Day Demand (MDD) working pressure ranges are as follows:

- Mountain View: 61 psi (at J650) to 90 psi (at J778)
- Lyman: 50 psi (at J404) to 65 psi (J640)
- County: 38 psi (at J196 at the end of the 6" waterline on CR217 near Ft Bridger) to 122 psi (at J282 on CR238)

A junction report called BVJPB Junction Report (MDD 2020) is included in in the full report showing the system demands, elevations, and pressures.

The pressures in Ft Bridger near the cemetery are at a level that will create complaints during fire flow type events.

As demand in the systems increases over time the model shows that working pressure will not be significantly affected.

Water Age Simulation

Water age in the system in Mountain View is between 14 hours and 81 hours. In Lyman the water age is 54 hours to 215 hours. The oldest water in the system under a "low flow" scenario is in the area north of Lyman past I-80 with water ages of 1,700 hours to 2,000 hours (83 days). This analysis does not include flow from the Lyman Springs which may affect the results.

Redundant Transmission From Mountain View To Lyman

The model shows that adding a redundant transmission line would have a positive effect on available fire flow in Lyman. The affect is very similar to the Urie pumps. In other words, with the pumps off and the 12" redundant transmission line added to the model, the available fire flow in Lyman is about 400 gpm

higher than the current condition with the pumps not running which is the same affect that the Urie pumps have on the system.

HYDRAULIC MODEL FINDINGS SUMMARY

- The system can provide at least 35 psi at all services during Maximum Daily Demand for 2020 and 2040 demands. Pressures will not be greatly affected as demand increases up to the 2040 planning horizon of the study. Some areas may lose 2 psi working pressure during max day demand.

- Transmission line capacity is good with velocities during the 2040 MDD estimated at less than 3 ft per second.

- Fire flow in most areas of the system is very good with values greater than 1,000 gpm. There are some areas where fire flow is in the 700 to 1,000 gpm range. The only low spot is the dead-end line south of Ft Bridger at 260 gpm.

- The pump system at Urie is a benefit to the fire flow downstream of the pump. In Lyman the fire flow in most areas improve from the 800-1,000 gpm range to the 1,200-1,500 gpm range when the pumps are running.

5 WATER SOURCES

The river intake on the Smiths Fork is the only source of water for the WTP. This intake is subject to turbidity events as well as the potential for low flows in extreme drought years. The criticality of having a single water source for the WTP has been long recognized. Previous studies have identified this risk to the source water for the WTP and proposed mitigation thorough additional storage, and groundwater sources. Water rights are one of the major driving factors in operation decisions and flexibility.

WATER RIGHTS

The BVJPB has water rights in both the Smiths Fork and the Blacks Fork. The Town of Lyman has additional right associated with Lyman Springs. Water from the Blacks Fork constitutes the majority of the BVJPB rights. This water is diverted at the Highway 410 crossing of the Blacks Fork and routed east to the Highway 410 crossing of the Smiths Fork. The facility is called the “crossover line” and consists of a river intake, 18-inch pipeline and outfall structure. The 18” pipeline drops about 160 feet in elevation over its 13,400 foot length and has an estimated steady state capacity of 6,050 gpm provided the intake structure fills the pipe.

FUTURE RIGHTS

The total 1891 rights plus the allowed storage from State Line total 7.59 cfs. This total right compares with the peak 2019 August metered demand for finished water of 54,100,000 gallons or 2.7 cfs.

Assuming the delivery system experiences a 10% loss on conveyance; in order to deliver 2.70 cfs to the meters a total of 2.97 cfs is required. The pre 1891 rights cover 2.23 cfs of this demand leaving 0.74 cfs to be met by storage. By the year 2040 the demand is projected to be 3.35 cfs and 1.12 cfs or storage will be required to reach the plant intake.

This growth is based on in-fill along the existing system. If the system is expanded into new territory with existing homes wanting treated water this growth will occur more rapidly.

Groundwater rights are a second category of rights that could be further developed by the system. Depending on water quality the well may be able to pump directly to the distribution system or to the intake of the plant. Groundwater pumping may be a way to better use the required winter storage releases that are ill timed to provide benefit to the water supply.

BRIDGER VALLEY GROUNDWATER SUPPLY OPTIONS

The last WWDC project performed for the BVJPB was completed in 1995. Since that study was completed, regionalization has occurred. The current Level I Master Plan includes a reconnaissance-level investigation into the potential for developing a groundwater supply source.

Previous Groundwater Investigation

The Bridger Valley Water Supply Level II Study (Forsgren, 1995) included investigations performed by Trihydro for area residents into the potential for developing groundwater sources of supply for a regional water system. Seven potential sites were identified and considered. The sites are summarized in Table 1. Each of the site has challenges with water quality or quantity and cost. Consequently, none of the sources have been expanded.

TABLE 1 BRIDGER VALLEY GROUNDWATER OPTIONS
FORSGREN (1995)

SOURCE	LOCATION	COMMENTS
Lyman Springs	Sec 16, T15N, R115W 6 miles SW of Lyman	125 - 208 gpm capacity. Good quality, but GWUDISW. Difficult to impossible to correct.
Lyman Well	T16N, R114W Near Lyman	Yields up to 250 gpm. Fair to poor water quality, with better quality expected from shallower intervals.
Cottonwood Creek Springs	T13N, R115W 13 miles South of Mt. View	No flow measurements or water quality data. Potential water rights conflicts. Long transmission line.
Mohawk Well Site	Sec 8, T14N, R115W 3.5 miles South of WTP	Well site with significant alluvial thickness. Not pursued due to lack of landowner support.
Union Pacific Springs	Sec 7, T14N, R116W Sec 31, T14N, R117W 13 miles SW of Mt. View	No MPAs for determining surface water influence. Potential for water rights conflicts. Railroad declined further analysis.

Robertson Well Sites	Sec 17 & 18 T14N, R115W	Moderate yields with good water quality potential.
Paleozoic Fm. In Uinta Mts.	30 miles South of Service Area Section 7, T2N, R14E in Utah	Limited consideration because of distance.

The local aquifers in and near the BVJPB are not conducive to development of stand-alone or supplemental public water supply. Development of any additional supply source would require investigations at distances more than 20 miles from the water system and significant investment in additional infrastructure and on-gong operations and maintenance costs. It is recommended that the surface water treatment plant continue to be used to meet the needs of the BVJPB and that water rights and stream flows at the diversion be reviewed on a regular basis to ensure adequate quantities of water are available.

6 GROWTH AND DEMAND PROJECTION

In recent years the BVJPB has installed between three and ten new meters per year with the average being about four. This compares with the total number of meters in 2020 of 635 in the BVJPB service territory and represents an average growth of 0.6%.

The Towns of Mountain View and Lyman also add meters internally downstream of the BVJPB master meters. In recent years the Lyman Town Clerk reports they install about five meters per year on a system with 783 meters. This is a 0.6% growth rate. Mountain view installed 14 new meters between 2016 and 2020 meters on a 667 meter system (as of 2020) for a growth rate of 0.5%.

Based on the new meter data in the County, Lyman and Mountain View, the existing water system is expected to experience in-fill growth of about 0.6 % over the next 20 years. In addition to infill growth, line extensions in certain areas by both the BVJPB and its master metered systems can provide additional growth by picking up existing homes.

Water Demand

Over the past three years the water sales of the BVJPB range from a low of 12 to 15 million gallons in the winter months to a peak of 48 to 60 million during July and August. Of these totals, the Lyman Springs produce between three and six million gallons per month with the remaining balance being diverted from the river and treated. At a 0.6% growth rate the BVJPB is projected to sell up to 17 million gallons during the winter months and up to 67 million gallons during the peak summer month by the year 2040. Table 6.2.2 illustrates the monthly water demands and the sources of the water for the year 2040.

Table 6.2.2 Projected 2040 Water Demands

Projected 2040 Water Demands*			
	WTP Production Including 5% Loss	Lyman Springs	Total 2040 Sales
July	45,547,900	4,934,000	48,078,000
August	55,188,800	6,064,000	58,336,000
September	37,866,050	5,710,000	41,501,000
October	16,929,550	5,468,000	21,331,000
November	11,446,050	5,544,000	16,181,000
December	12,024,700	5,021,000	16,234,000
January	11,292,850	6,071,000	16,537,000
February	13,903,500	4,881,000	17,890,000
March	9,601,550	5,047,000	13,951,000
April	11,341,450	4,985,000	15,549,000
May	14,654,150	5,236,000	18,943,000
June	25,477,750	5,366,000	29,375,000
Total Annual	**265,274,300**	**64,327,000**	**313,906,000**
**Growth Rate*	*0.6%*		

7 RECOMMENDATIONS AND COST ESTIMATES

ALTERNATIVES AND COST ESTIMATES

An Engineers Opinion of Probable Cost was prepared for each various project recommendations and is included in Appendix D. The estimated project costs are summarized in Table 7.1.

Table 7.1 – Estimated Project Costs

Improvement 1 Alternative 1	218 Looping Line To Ft Bridger	$1,908,000
Improvement 1 Alternative 2	Second Transmission Line to Lyman	$2,270,000
Improvement 2	500,000 Gallon Storage Tank	$968,000
Improvement 3	Stand-By Generation at Urie Booster Station	$184,000
Improvement 4	Priority 1 WTP Improvement	$120,000
	Priority 2 WTP Improvement	$74,000
	Priority 3 WTP Improvement	$35,000
Lyman	South Main Street	$502,000
Mountain View	414 4th to 6th	$189,000

8 WATER SYSTEM FINANCING

INCOME AND EXPENSES

Two years of financial data were received from the BVJPB for fiscal years 2018 and 2019 along with their 2021 budget and are included in Appendix E. The BVJPB Income and Expenses are summarized in Table 8.2. Of particular note on the Table is the implementation of a reserve fund in the current year which was not there in previous years. The BVJPB generally operates on a budget of about 1 million dollars per year.

PROJECT FUNDING ANALYSIS

Project funding scenarios determine the effects on user rates and fees required to support the project. The financing terms and rates were based on current program criteria at the date of this report. The funding scenarios for each Alternative are provided in Table 8.5 of the main report. In each scenario the user rates will remain below AWWA guidelines.

9 CONCLUSIONS

Maintenance

The BVJPB system is in generally good condition. The Ft. Bridger area does have distribution pipe maintenance challenges related to pipe age, and construction deficiencies. Ft. Bridger also lacks transmission capacity adequate to sustain pressures under fire flow conditions.

Thus far break history has not indicated the asbestos cement pipe needs immediate replacement. However, it will need replacement in the future as its age is approaching the design life and within two decades will exceed the expected life of 65 years. Building a knowledge base of pipe condition during maintenance will allow the BVJPB to focus the first replacement projects in the most critical area. Also sampling for fiber content in the water can be conducted as a non-destructive indication of pipe status.

Source

The reliance on a single river intake for all plant water places the plant source water at risk during high turbidity events or upstream contaminant spills that reach the river. The storage in State Line Reservoir is critical to meeting summer/fall demands. Restrictions on when this stored water can be used and the lack of carry-over have been cited in previous reservoir studies as an area of potential improvement on the administrative side.

The crossover pipe from Blacks Fork to Smiths Fork is a key system feature allowing access to the territorial and other senior water rights on Blacks Fork. This 18-inch pipe is adequate for the physical amount of water the BVJPB uses and has about 20% remaining capacity from the water rights perspective.

If a suitable groundwater source could be found, two wells could be sufficient to meet demand. If groundwater quality is poor the wells should be located upstream of the plant and as near to the plant as possible. An extensive review of the hydrogeology of the region did not find any good existing groundwater alternatives. Much of the area is likely to produce relatively low amounts of questionable water quality. The Mohawk well option has still not been fully exhausted. A horizontal collection network could be further investigated in a level II study. The distant Union Pacific Springs are a more costly option but an option none the less.

Storage

The system currently has adequate storage even with one of the 500,000 gallon tanks out of service. The booster configuration at the Urie tank does rely on power to run the pumps and allow this storage to be used by Lyman, Mountain View and Ft. Bridger. Installation of a back up power source at this site is recommended to allow pumping during power outages.

Transmission

The linear layout of the transmission main does increase risk of outages due to line breakage or major maintenance as one moves toward the north. The Ft. Bridger area also suffers from low transmission pressures and introduction of air during fire flows. A looping secondary transmission main to Ft. Bridger will eliminate the low pressure issues but provide limited redundancy to the rest of the system.

Water Losses

Water loss in the BVJBP system are believed to be in line with other water systems; perhaps in the 5% range. Comparison of the plant master meter records with customer meter data was inconclusive with the plant master meter reading lower than the total of the customer meters.

Additional investigation of the Ft Bridger master meter was conducted and it appears water loss in the area of Ft. Bridger is on the order of 200,000 gallons per month.

Finances

Water rates, income and expenses of the BVJPB were reviewed as part of this report. The BVJPB's income essentially matches expenses over multiple year averages and is adjusted periodically based on projected costs. The BVJPB has recently begun budgeting for a reserve fund. The base rates and user fees are in line with or slightly above surrounding systems but still below AWWA guidelines based on median household income. Impact fees are another potential income source the BVJPB should consider to address growth related impacts. The BVJPB should continue to build funds to address future water source, maintenance, and system reliability improvements.