



WATER SYSTEM MASTER PLAN

FOR THE

BLUE VALLEY METROPOLITAN DISTRICT



MAY 2019



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JVA Project No. 3032c

MAY 2019

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EXECUTIVE SUMMARY

Established in 1975, the Blue Valley Metropolitan District (BVMD, District) provides roads, storm water, and water service to a residential community located approximately 10 miles south of Kremmling, CO, in Grand County. BVMD owns and operates a community water system that currently serves 117 taps. The water system consists of an infiltration gallery in the Blue River, a duplex raw water pumping system, a surface water treatment facility (WTF) with filtration and disinfection, a 150,000-gallon water storage tank, and a water distribution system consisting of 4-inch, 6-inch, and 8-inch cast iron and PVC pipe. The District encompasses approximately 223 acres with a total buildout capacity of 150 residential units. The District is currently about 78 percent built out and provides water to approximately 375 people. BVMD also provides water to five residential taps located outside of the District service area.

In 2018 a moratorium was placed on new water taps within the District. This was due to concerns about the viability of the water system to meet the potable water demands of the community. This Water Master Plan was prepared to serve as a comprehensive assessment of the water treatment infrastructure to facilitate sufficient planning and funding for capital improvement projects and maintenance over a ten-year planning period.

Water use records (2007 to 2018) identify that, on average, the District produces approximately 6.8 million gallons of treated water per year or 160 gallons per day per tap. Assuming a population of 375 people this equates to 50 gallons per person. Potable water is used for irrigation of lawns and gardens during the summer months. The average water demand during the irrigation season (June through August) is double the average water use during the non-irrigation season (December through February).

Combining the historic max month flows (1,366,000 gallons in July 2014) with the buildout of 150 taps results in a projected max month water demand of 1,751,000 gallons, or 383 gallons per tap. If the existing BVMD Water Treatment Facility was run at 80 gallons per minute (gpm) it would be able to meet this demand by producing water 12 hours per day. The existing infrastructure is designed, permitted and installed to run at 80 gpm. However, the infiltration gallery may not be able to consistently produce water at this rate year-round even though it has water rights in excess of 80 gpm.

The Master Plan provides recommendations for capital improvement projects over a 10-year planning period. The proposed projects include, but are not limited to, mapping updates, infiltration gallery improvements and water meter replacements. The total amount of improvements over the planning period is \$876,000.

SECTION 1 – INTRODUCTION

BACKGROUND

Established in 1975, the Blue Valley Metropolitan District (BVMD, District) provides roads, storm water, and water service to a residential community located approximately 10 miles south of Kremmling, CO, in Grand County. BVMD owns and operates a community water system that currently serves 117 residences. The water system consists of an infiltration gallery in the Blue River, a duplex raw water pumping system, a surface water treatment facility (WTF), a 150,000-gallon water storage tank, and a water distribution system consisting of 4-inch, 6-inch, and 8-inch cast iron and PVC pipe. The District encompasses approximately 223 acres with a total buildout capacity of 150 residential units and is located in the SW ¼ of Section 34, Township 1S, Range 90W, of the 6th Prime Meridian. The District is currently about 78 percent built out and provides water to approximately 375 people. BVMD also provides water to five residential taps located outside of the District service area.

The District maintains the water system and uses local contractors to conduct necessary repairs. The District contracts with Water Solutions, Incorporated to operate the raw water supply, pumping system, treatment facility, water storage tank, and distribution system. The WTF requires a minimum “Class D” certification and the distribution system requires a minimum “Level 1” certification. The Operator for the water system, Matthew Willitts, currently holds a “Class A” operation license for water treatment, and a “Level 4” license for water distribution system, which is a higher level license than is required. The District provides water to residential customers within the service area for potable, irrigation, and fire protection uses. The District currently provides water to approximately 117 residential taps, 112 in-district, and five out-of-district. The WTF has a rated capacity of 432 gpm or 0.622 million gallons per day (MGD).

PROJECT PURPOSE AND GOALS

The purpose of this Water System Master Plan is to assess the condition of the existing water system and develop a road map for future improvements to the system. Major goals of the Master Plan are as follows:

- Review historical and current water demands
- Estimate future water demands through District buildout
- Evaluate the condition of the existing water system infrastructure
- Prepare a process flow schematic and determine limiting components of the system
- Outline capital improvement projects
- Outline potential funding sources for implementation of capital improvement projects

The planning period for this Water System Master Plan is 10 years. Buildout will occur when all existing developable land within the service area has been developed. Due to the current moratorium on the issuance of water taps, it is difficult to estimate when buildout will occur.

DISTRICT CONTACTS

Table 1 includes a summary of the relevant District contacts for this project with their associated contact information.

Table 1 – District Contacts

Name	Company	Title	Email	Phone
Buck McNichols	Blue Valley Metro District	Board of Directors	buck@bvmd.biz	970-409-8143 (c)
Mark Nelson	Blue Valley Metro District	Board of Directors	mark@bvmd.biz	970-389-2311 (c)
Andrea Buller	Blue Valley Metro District	Administrative Assistant	bluevalleyacres@gmail.com	970-724-3502 (o)
Matthew Willitts	Water Solutions Inc.	Operator	mwillitts@wsicolorado.com	970-262-0217 (o) 970-390-8615 (c)
Simon Farrell	JVA, Inc.	Engineer	sfarrell@jvajva.com	303-565-4974 (o) 720-459-0211 (c)
Henry Broadhurst	Alpine Surveyors	Surveyor	alpsurv@gmail.com	970-724-0851 (o)
Lawrence Green	Balcomb & Green	Water Law Attorney	larry@balcombgreen.com	970-945-6546 (o)

SECTION 2 – PLANNING CONDITIONS

SERVICE AND PLANNING AREA

BVMD owns and operates a community water system permitted under PWSID# CO-0125148. The District possesses a variety of outdated and/or incomplete maps of the service area. The maps developed include a tabulation of lots and taps located in the District’s service area, a preliminary GIS map of the service area, and two distribution system piping maps located in the WTF. All four maps are included for reference in Appendix A. While the District indicated that four of the five out-of-District taps are found east of Highway 9, it is unclear where these taps are located based on the existing service area maps.

PLANNING PERIOD

The planning period for this Master Plan is approximately 10 years. The development rate has been stagnant since a moratorium on tap sales was imposed in April 2018. Based on interest from developers and residents, growth is expected to increase once the moratorium on tap sales is lifted.

GROWTH AREAS AND POPULATION TRENDS

The District currently has 117 active residential taps and provides drinking water to approximately 375 year-round residents, which is a housing density of approximately 3.2 people per household. According to the 2002 Service Plan, the District’s service area consists of a total of 155 lots for residential development, but the water rights allow for residential usage from only 150 lots. Full buildout is assumed to occur when 150 platted lots within the service area boundary have been developed. The District’s 2002 Service Plan estimates a housing density of 3.5 people per household, which will be used to estimate the projected population and buildout water demand. The estimated population that will be served at buildout (including the five out-of-District taps already served) is approximately 525 people. Full population and demand projections are provided in Appendix B.

HISTORICAL DEMAND

Treated water production is metered as the water leaves the water treatment plant. The table in Appendix B shows the total residential water production from 2007 to 2018 by month.

Typically, the amount of production during the maximum month is used to analyze the system’s water demand. Based on the data provided by the District, the maximum month was June of 2017 with a total production of 1,745,903 gallons. This gallon per month total is a bit of an outlier, however; so, the next highest maximum month total of 1,365,829 gallons from July of 2014 was used for this analysis. Using this maximum month total, the historic maximum month average daily demand is calculated at 44,781 gallons per day (gpd), and at 62 gallons per minute (gpm) if it is assumed that production is limited to 12 hours each day. The treated water production data was analyzed based on household usage per tap. The current 117 residential taps were assumed for

the 2007- to 2018-year range. Based on the current 117 residential taps, the maximum month average daily demand per residential tap is calculated at 383 gpd/tap. And using the estimated 3.2 people per tap from the current estimated population of 375 people, the service area has a maximum month average daily demand per person of 120 gallons per capita per day (gpcd).

In order to develop an estimate for the amount of produced water that is used for irrigation, an analysis of the average water demand during the winter months was performed. The winter month average demand from 2007- to 2018-year range is 434,363 gallons, or 14,241 gpd. Subtracting the average winter month demand from the summer maximum month demand provides an estimate of the water used for irrigation in the warmer months. The historic irrigation demand was calculated to be 30,540 gpd. Based on the current 117 residential taps, the average irrigation demand per residential tap is calculated at 261 gpd/tap. And using the estimated 3.2 people per tap from the current estimated population, the service area has an average irrigation demand per person of 81 gpcd. This means that irrigation accounts for approximately 68 percent of the demand.

WATER LOSS

The assumptions above do not take into account water loss throughout the system. The District noted that there have been approximately 2-3 water main leaks or breaks in the distribution system each year over the past few years. When a leak occurs, water production increases and the Operator notifies the District. The District then reacts by contacting a local contractor and fixing it.

PROJECTED BUILDOUT DEMAND

The buildout demand of the system is projected using the maximum month average daily demand calculated from the historic water data as described above. The historic maximum month average daily demand per tap of 383 gpd/tap is used to project the buildout demand of 150 residential taps. The projected buildout maximum month average daily demand is therefore 57,412 gpd, or 80 gpm if 12 hours of production is assumed.

SECTION 3 – EXISTING FACILITIES EVALUATION

The District’s water system consists of raw water supply, treatment, disinfection and storage, and distribution. A process flow schematic of the existing water system is shown as Figure 1. This section first examines the water quality of the source water, then summarizes a detailed description and facility evaluation for each major system. Each evaluation is based on discussions with District members and the Operator, a site visit, and record drawings. Capital improvement projects have been identified for each major system to address limiting factors and recommended improvements. These projects are described in Section 3 and summarized in Section 4.

SOURCE WATER SUPPLY AND WATER QUALITY

The District currently draws raw water from the Blue River through an infiltration gallery. The District has water rights to withdraw up to 250 gpm from the Blue River. Major characteristics of the infiltration gallery are summarized in Table 2.

Table 2 – Summary of Water Source

Water Source	Infiltration Piping Description	Infiltration Piping Location	Water Source Classification	Approved Production Rate
Infiltration Gallery	200-ft of 8-inch slotted PVC	15-ft below grade 65-ft from Blue River	GWUDI	250 gpm

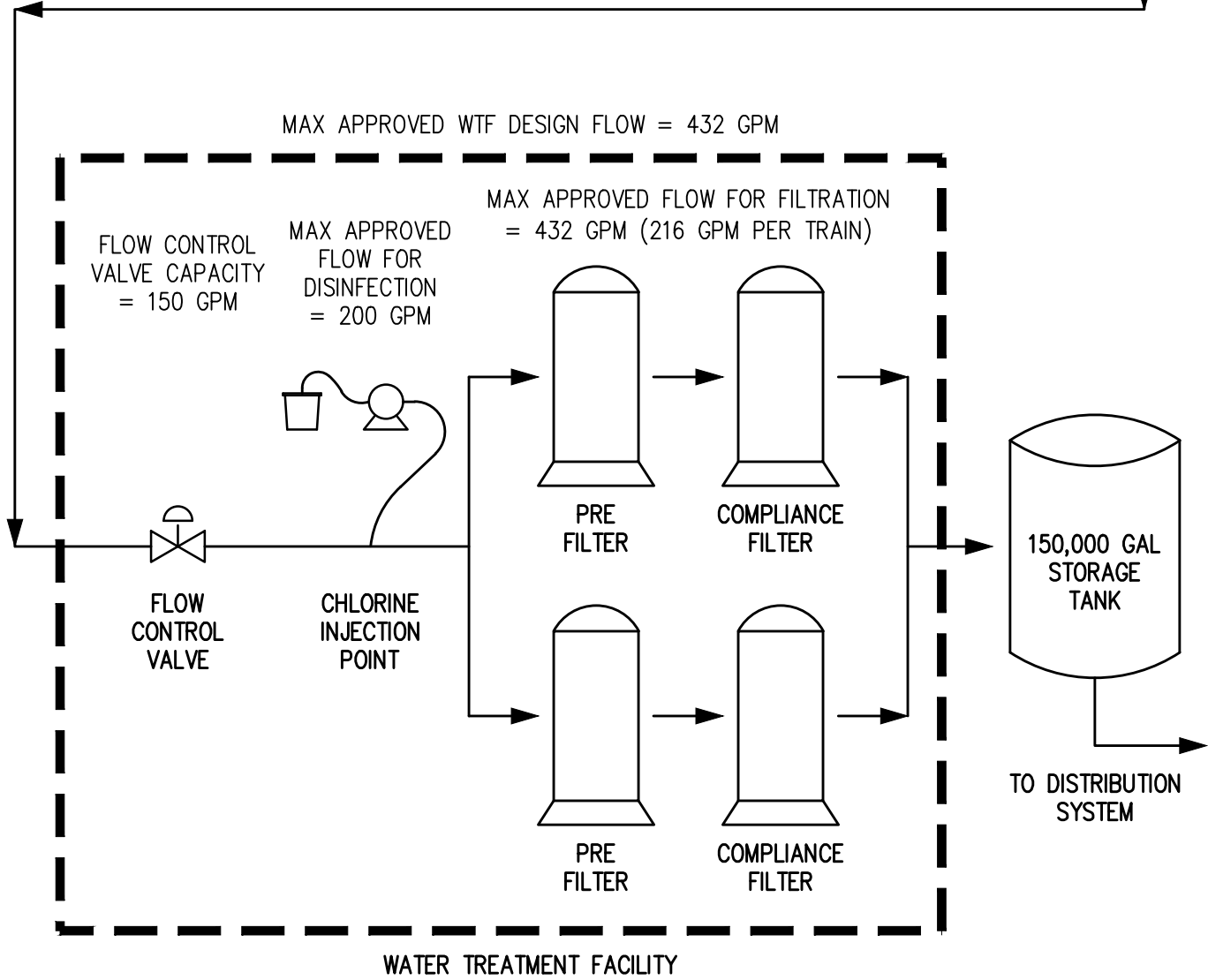
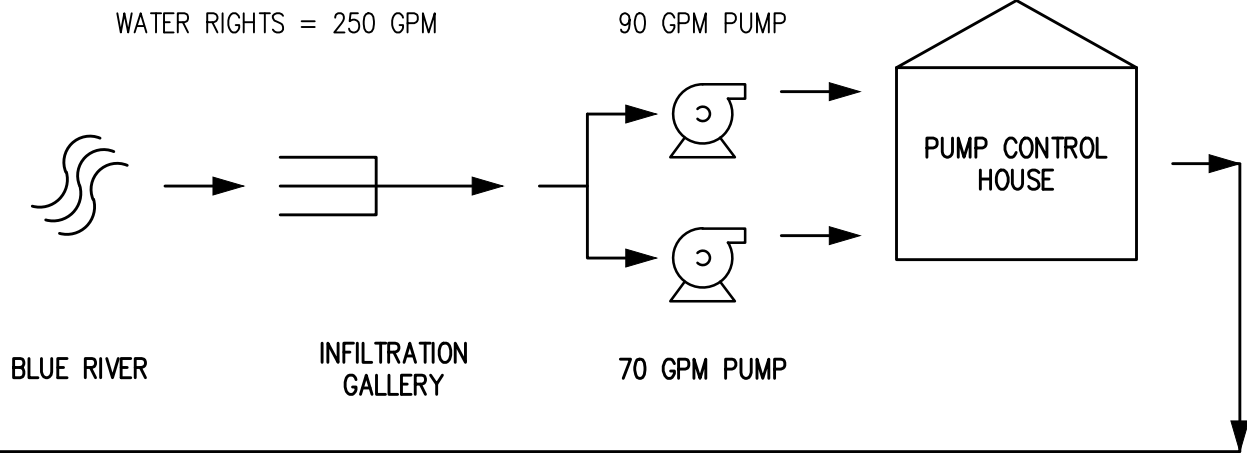
The District’s water source has been classified as groundwater under the direct influence of surface water (GWUDI). Water sources classified as GWUDI are considered hydraulically connected to surface water sources and require filtration prior to distribution. The District is equipped with sufficient filtration equipment to meet the surface water treatment requirements.

Primary drinking water standards include enforceable maximum contaminant levels (MCLs) and not enforceable maximum contaminant goals (MCLGs). Primary contaminants are defined in the Colorado Primary Drinking Water Regulations (CPDWR) along with their respected limits. The district must meet all MCLs to maintain compliance with the CPDWR.

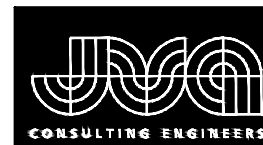
The District currently tests for total coliform bacteria (TCR), free chlorine, disinfection byproducts (DBPs) consisting of TTHMs and haloacetic acids (HAA5s), lead and copper, turbidity, fluoride, inorganics, organics, nitrate, nitrite, uranium, radium, and gross alpha. The testing frequency is described in the monitoring schedule in Appendix C. Consumer Confidence Reports (CCR) provide test results for these constituents, but the District’s website is currently inoperable, and it was not possible to review any archived CCRs.

TURBIDITY

Turbidity data was provided by the Operator, so an analysis of the turbidity monitoring results has been performed. To maintain compliance with the CPDWR, the District must provide filtration and disinfection of surface water that meets the treatment technique requirements of turbidity. The



PROCESS FLOW SCHEMATIC
BLUE VALLEY MD MASTER PLAN
JANUARY 2019



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applicable turbidity limits are 1 nephelometric turbidity unit (NTU) as a 95th percentile limit, and 5 NTU as a maximum limit. Table 3 presents the most recent District monitoring results for finished water turbidity. All reported results were below the 1 NTU limit established by the CPDWR.

Table 3 – Finished Water Monthly Maximum Turbidity (NTU) Data from 2015 to 2018

Month	Year			
	2015	2016	2017	2018
January	0.135	0.156	0.361	0.083
February	0.071	0.123	0.092	0.078
March	0.123	0.109	0.042	0.095
April	0.099	0.084	0.052	0.112
May	0.092	0.088	0.049	
June	0.123	0.110	0.056	
July	0.160	0.094	0.063	
August	0.113	0.115	0.054	
September	0.123	0.103	0.074	
October	0.137	0.113	0.067	
November	0.120	0.103	0.076	
December	0.128	0.089	0.074	

A search of the Environmental Protection Agency (EPA) Enforcement and Compliance History online database indicated that the District has maintained compliance with the primary drinking water regulations for at least the last five years. If more sampling results are provided, a thorough review of each constituent compared to the CPDWR can be performed.

INFILTRATION GALLERY & WET WELL

The infiltration gallery consists of an 8-inch diameter slotted PVC pipe that connects to a 12-inch PVC header which feeds the infiltration gallery wet well. The wet well holds approximately 1,500 gallons and has a dry pit above which houses two submersible pumps; Raw Water Pump No. 1 has a capacity of 70 gpm and Raw Water Pump No. 2 has a capacity of 90 gpm. The pumps are operated in a duty-standby configuration. Each pump discharges through a dedicated pipe to the Well Control House.

Raw Water Pump No. 2 was not operational during the site visit in November 2018. The pitless adaptor for the pump also needs to be replaced. The Operator is working with Maximum Services and Abbotts Well Services to conduct an in-kind replacement of Raw Water Pump No. 2 and the pitless adaptor.

The infiltration gallery intake piping may be a limiting factor for the District to withdraw raw water. The capacity of the



FIGURE 2 – INFILTRATION GALLERY DRY PIT INTERIOR

infiltration gallery could be reduced due to silica sand and sediment filling the slotted PVC piping over time. An assessment of the production rate of the infiltration gallery should be performed on an annual or semi-annual basis.

WELL CONTROL HOUSE



FIGURE 3 – WELL CONTROL HOUSE INTERIOR
road.

The well control house is an above-grade building that houses piping, valves, instruments, and the pump control panel for the infiltration gallery pumps. Raw water enters the well control house from each infiltration gallery pump through two separate pipes that each have a check valve, and a soft start motor operated butterfly valve. The two source water pipes then combine prior to an automatic air/vacuum release valve, a pressure gauge, a blowoff valve, and the discharge pipe that feeds the filters in the WTF. A valve vault equipped with an automatic air/vacuum release valve for the raw water supply to the WTF is located at the top of the well control house access

The well control house piping and equipment appear to be in good condition; however, there are operational issues with the pump controls. The pump control panel is configured with a Hand/Off/Auto (HOA) switch to operate each pump; however, all changes to the pump operating configurations must be made at the WTF using supervisory control and data acquisition (SCADA). Since there is no cell service at the well control house and the HOA is inoperable, all pump operations and troubleshooting are difficult and time consuming; the Operator must travel back and forth between the WTF and well control house to make changes, test, and confirm that the pumps are operating. It would be beneficial to retrofit the pump control panel to allow the infiltration gallery pumps to be operated in HAND mode for troubleshooting to occur in the well control house.



**FIGURE 4 – AIR/VACUUM RELEASE VALVE
VAULT INTERIOR**

WATER TREATMENT FACILITY



FIGURE 5 – WATER TREATMENT FACILITY INTERIOR

The WTF is an above-grade building that houses the disinfection, filtration, and flow metering systems; the SCADA system; compliance and sampling equipment; and instrumentation and controls. The WTF abuts and shares a common wall with the water storage tank to the south. The raw water piping from the well control house enters the WTF and is dosed with sodium hypochlorite for disinfection before being split into two redundant trains for filtration. Each train consists of a flow meter, a flow control valve, a pre-filter (3-micron), a sampling tap, a pressure transducer, and a compliance filter (1-micron), before combining back into a single pipe that feeds the water storage tank for chlorine contact time (CT). Potable water then exits the water storage tank through a 6-inch pipe back into the WTF prior to distribution.

Most of the piping and major equipment in the WTF was replaced in 2009 and appears to be in good working condition.

DISINFECTION AND CHLORINE CONTACT TIME

At the time of the condition assessment (November 2018), the District reported dosing approximately 1.5 mg/L of sodium hypochlorite for disinfection to maintain the minimum required chlorine residual of 0.2 mg/L at the end of the distribution system. At the time of the last sanitary survey (April 2016) the District was dosing approximately 1.51 mg/L at the WTF, resulting in a disinfectant residual of approximately 1.30 mg/L at the entry point sample tap, and a disinfectant residual of approximately 0.35 mg/L at the end of the distribution system. These values indicate a water system chlorine demand of approximately 1.16 mg/L.

In May 2014, the District received an approval letter from the Colorado Department of Public Health and Environment (CDPHE) for their cartridge filtration equipment operating in two scenarios to comply with CT requirements. The approval letter is attached for reference as Appendix D. to comply with the CT requirements the District can maintain a chlorine residual of 0.7 mg/L (at the entry point sample tap) at a flowrate of 200 gpm, or a residual of 0.3 mg/L (at the entry point sample tap) at 100 gpm. Both operating scenarios require the District to maintain a minimum tank volume of 95,000 gallons for adequate CT, which is approximately 63 percent of the water storage tank's full volume.

Since the water system chlorine demand is approximately 1.16 mg/L, the District must continuously maintain a chlorine residual of at least 1.36 mg/L at the WTF to meet the minimum 0.2 mg/L chlorine residual throughout the distribution system. While CDPHE approved chlorine residuals of 0.3 and 0.7 mg/L for CT, these scenarios do not reflect the actual chlorine demand of the system. Therefore, the system should continue to feed at the current rate of 1.5 mg/L.

The current system configuration is approved and functioning effectively for disinfection at the current dosing rate. However, the construction of a clearwell for CT would provide more flexibility in operations and more of a safety factor in times of distribution leaks or firefighting efforts. The addition of a clearwell would still require the same chlorine dose based on the observed water system chlorine demand but it would give the District flexibility to draw down the water storage tank volume to below 95,000 gallons.

WATER STORAGE TANK

In 1998 the District constructed a 28-foot diameter, 32-foot tall, unbaffled water storage tank with a capacity of approximately 150,000 gallons. The water storage tank is equipped with a tank level sensor that controls the infiltration galley well pumps when the water level drops to an Operator-indicated set point. The water storage tank is used for CT.



FIGURE 6 – ADJACENT TANK ENTRY AND EXIT PIPES

The water storage tank appears to be operationally functional, but the entry and exit pipes for the water storage tank are only located a few feet apart, which can lead to short-circuiting and a lack of adequate CT for disinfection. Water storage tank improvements recommended in the 2009

Improvements Project were removed from the scope for value engineering; many improvements are still applicable and are discussed in further detail in Section 4 of this Master Plan.

The Storage Tank Rule of the Colorado Primary Drinking Water Regulations requires comprehensive water storage tanks inspections be conducted at least every five years for finished water storage tanks. Since the District's water storage tank is utilized for CT as part of the treatment process, it is not considered a finished water storage tank and is exempt from the Storage Tank Rule. While the District is exempt from the periodic and comprehensive inspection requirements, it is still recommended to conduct inspections, maintenance, and cleaning on a regular basis.

DISTRIBUTION SYSTEM

The distribution system piping consists of 4-, 6-, and 8-inch water mains and laterals with service lines ranging from $\frac{3}{4}$ -inch to 2-inch. The water distribution system is equipped with 28 fire hydrants. Most of the water distribution system piping is cast iron pipe buried approximately 8-feet below grade. All service lines in the District are copper or polyethylene. The Operator noted that two to three line breaks a year are caused by improperly bedded pipe.

Each service is equipped with manual reading water meters, which are read quarterly by a local resident and reported to the District for billing purposes. The Operator expressed concern that the water meters are not being read correctly. The person assigned to read the water meters reported that some are not functioning properly. The Operator investigated the reported water meters and found those to be operational. It is recommended to implement a basic water meter training

program to ensure that the meters are being read correctly. A more accurate inventory of water meters is also needed at this time.

Most of the water meters in the District are the Badger Record-all Model 25 legacy series, which are no longer manufactured. BVMD must purchase after-market and used parts to repair water meters as they fail. Approximately ten percent of the water meters in the District are out of service.

FIRE FLOW REQUIREMENTS

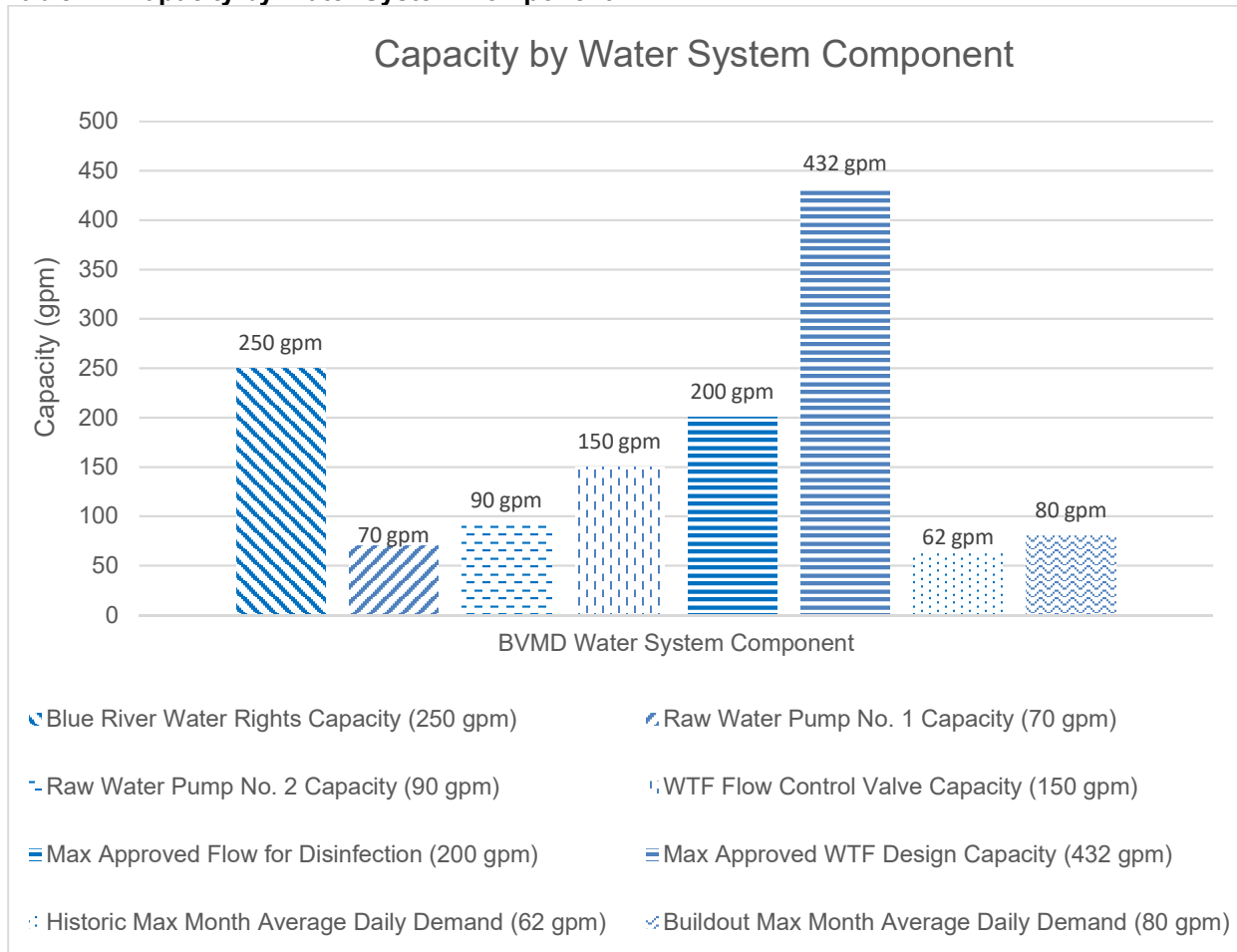
The District has 28 fire hydrants installed, but it is currently unclear what flow and pressure can be conveyed through each fire hydrant. Typical fire flow for residential is 1,500 gpm for a minimum of 2 hours. Minimum pressure is 20 psi residual pressure. Based on the volume of the water storage tank (150,000-gallons), 1,500 gpm of fire flow could only be maintained for about 35 minutes. Also, the pressure in the distribution system drops as water is drained from the tank, so the amount of water actually available during an emergency is very limited.

BVMD is located within the Kremmling Fire Protection District. It is recommended to contact the local fire marshal to inform them of the restrictions for fire flow at BVMD.

SYSTEM CAPACITY LIMITING FACTORS

A moratorium of tap sales has been implemented by the District due to concern that the system will not be able to produce enough treated water with more taps added to the distribution system. The following analysis has been completed in order to determine the system's limiting factors. Table 4 shows a breakdown of each of the system's components and its capacity.

Table 4 – Capacity by Water System Component



The District has the water rights to draw 250 gpm from the Blue River Alluvium for residential use of up to 150 taps and fire protection. The Blue River infiltration gallery is equipped with two submersible pumps with a capacity of 70 gpm and 90 gpm to supply the WTF. The WTF has a maximum approved design flow of 432 gpm and a maximum approved flow for disinfection of 200 gpm but is limited by the flow control valve capacity of 150 gpm.

The historical water demand was discussed earlier in this section, and the historic maximum month average daily demand was calculated at 44,781 gpd. If it is assumed that the supply pump is producing water for 12 hours a day, then the historic maximum month average daily demand is calculated at 62 gpm.

The projected buildout water demand was also discussed earlier in this section, and the buildout maximum month average daily demand was calculated to be 57,412 gpd. If the same assumption is made and the supply pump is producing water for 12 hours a day, then the buildout maximum month average daily demand is calculated at 80 gpm.

From this analysis, it does not appear that the water system is currently limited by any of its components. The 70 gpm supply pump has the capacity to supply the system for the existing

demand, but it has the possibility of being a limiting factor as the water demand increases towards the buildout maximum month daily average demand.

There are a number of safety factors built into this analysis. First, the District's water demand does not take into account any water loss due to breaks or leaks in the distribution system. In addition, although the maximum month of production from June 2017 (1,745,903 gallons) was excluded as an outlier, the second highest maximum month of production from July 2014 that was used in this analysis (1,365,829 gallons) is still much higher than the average production from all of the months of July from 2007 to 2018 (926,139 gallons). Also, it is assumed that the production of the supply pumps are limited to 12 hours a day. If that assumption is changed to 24 hours a day, then the buildout maximum month daily average demand changes from 80 gpm to 40 gpm. Each of these matters contribute to a more conservative estimate of the maximum month daily demand.

The main limiting factor in the system is the ability to consistently draw sufficient water from the Blue River infiltration gallery year-round. It was noted by the Operator that the supply pumps will occasionally run dry due to insufficient flow from the Blue River. A turbidimeter reads the turbidity level in the wet well, and if too high of a level is recorded it will shut off the supply pump and alarm the Operator. This helps to protect the pump from damage, but it does pose an issue for the District's supply capacity. It is recommended that a yield test be performed on the existing infiltration gallery to determine its output, which may be higher or lower depending on the time of year. It is possible that some maintenance and cleaning could be performed on the existing gallery to help increase the yield from the Blue River. And/or it may be possible that another infiltration gallery may be necessary in order to meet the District's demand as it approaches buildout. This issue will be discussed further in Section 4.

SECTION 4 – CAPITAL IMPROVEMENT PROJECTS

The capital improvement projects outline in this section are not provided in order of recommended priority. An opinion of probable cost (OPC) has been developed for each recommended improvement project presented in this Master Plan. Itemized OPCs for the proposed improvements are included in Appendix E.

OPCs are based upon recent experience with construction costs for similar work in the region and assume improvements will be accomplished by general contractors. Cost estimates represent opinions of costs only, acknowledging that final costs of individual projects will vary depending on actual labor and material costs, site conditions, market conditions for construction, regulatory factors, final project scope, project schedule, and other factors. Each OPC includes contractor overhead and profit, contingency, permitting, design, and construction administration. All project costs are presented in 2019 dollars and should be adjusted for future use. This section should be utilized as a planning and budgeting tool for necessary future water treatment and water infrastructure projects.

PROJECT NO. 1 – SERVICE INFILTRATION GALLERY PUMP AND REPAIR PITLESS ADAPTER

At the time of the site visit (November 7th, 2018) the 70 gpm infiltration gallery raw water supply pump was out of service. Since then the electrical wiring and the run capacitor has been repaired and the pump is now functional. However, there are concerns about the motor starters for the infiltration pumps being in the pump gallery and they may be moved to the pump house for a more controlled environment. The pitless adaptor for the 70 gpm is also loose/damaged. It is recommended that the pitless adapter be replaced when the pump is either serviced or replaced to ensure reliability and longevity. The raw water pumps are a limiting aspect of the overall system so it is important to have both pumps reliably operational in order to provide redundancy.

Anticipated Cost: \$19,000 total (for pump replacement and pitless adapter)

PROJECT NO. 2 – CONDUCT SERVICE PLAN EVALUATION AND RATE STUDY

The BVMD Service Plan was last updated in March 2002, and is provided for reference as Appendix F. The District has not yet conducted a rate study to confirm that the current water service rates are sufficient to sustainably offset water system expenses. The District should hire a financial consultant to help evaluate monthly water rates, analyze operation and maintenance expenses, and recommend bonding and other financial strategies to fund future improvements.

Anticipated Cost: \$18,000

PROJECT NO. 3 – PRODUCE WATER MODEL

A hydraulic model of the distribution system is required to determine fire flow and capacity restrictions throughout the distribution system. The primary benefit of a water model would be to assess fire flow available throughout the District. Once a water model has been developed, it can provide a digital framework to store other data associated with the water system. Pipe and

component conditions can be documented in conjunction with a leak detection program to help prioritize system repairs.

Anticipated Cost: \$24,000

PROJECT NO. 4 – CONDUCT WATER SERVICE METER AUDIT

The District does not currently have a system to accurately track which water meters are out of service. It is recommended to conduct a water meter audit to determine and document the functional status of each water meter to prioritize repairs and upgrades. It may be useful to concurrently implement a basic water meter training program to ensure that the meters are being read correctly by the administrative contact responsible for this role.

Anticipated Cost: \$1,800

PROJECT NO. 5 – REPLACE OUTDATED WATER SERVICE METERS

Since the District currently utilizes manual reading water meters that are no longer manufactured, BVMD must purchase after-market parts to repair water meters as they fail. Modern water meters are more reliable and accurate than many of the water meters currently installed. It is recommended to replace the outdated water meters with accurate and consistent water meters. While remote-reading water meters may be financially infeasible, there are touch read meters available that reduce reading time and improve accuracy.

Anticipated Cost: \$144,000

PROJECT NO. 6 – ESTABLISH WATER ENTERPRISE FUND

The District currently utilizes a single General Fund to manage all revenue and expenses. Under the current model, it is difficult to identify, track, and project water-system revenue and spending. Furthermore, many funding agencies require a utility enterprise fund to award grants and loans. It is recommended to designate a separate enterprise fund specific to the water system to manage the finances and to ensure funding eligibility requirements are met.

Anticipated Cost: \$12,000

PROJECT NO. 7 – ACQUIRE PH PROBE FOR WTF

The WTF is not currently equipped with a pH probe. The Design Criteria for Potable Water Systems require each public water system to have equipment for process control and compliance testing. It is recommended to purchase a pH probe for the WTF in order to be able to accurately monitor pH.

Anticipated Cost: \$400

PROJECT NO. 8 – CONDUCT INFILTRATION GALLERY YIELD TEST

The infiltration gallery yield appears to be the most limiting factor in the water system to supply raw water to the WTF and in turn, treated water to the District’s community. The capacity of the infiltration gallery piping may be reduced from sediment buildup clogging the slots in the PVC piping over time. It is recommended to hire a professional hydrologist to conduct a yield test on the infiltration gallery to determine the highest flow that the infiltration gallery can consistently produce. The results of the yield test will help guide the next step towards rehabilitating, replacing, or supplementing the infiltration gallery. It should be noted that the season of the year when the test is performed will affect the production limits observed. It may be necessary to conduct multiple yield tests to obtain a comprehensive understanding of seasonal variations in raw water availability.

A proposal was received on April 23rd, 2019 from Bishop-Brogden Associates, Inc. (BBA) in the amount of \$10,500 for the following scope of work: interview the District’s Operator, complete a site visit of the gallery structure, review District production information, perform pumping test, and prepare and provide technical summary memorandum. BBA suggests that the gallery be tested before the end of June, if possible, to avoid higher stream flow conditions in the Blue River. A copy of the BBA proposal can be seen in Appendix G.

Anticipated Cost: \$15,000

PROJECT NO. 9 – CONDUCT INFILTRATION GALLERY IMPROVEMENTS DETERMINED FROM YIELD TEST

The infiltration gallery yield test will help BVMD determine the best next step to improve the infiltration gallery. The District may implement a variety of improvements to increase the yield of the infiltration gallery, including but not limited to:

- Potentially modify stream morphology to increase water supply to infiltration gallery during times of low flow
- Construct Blue River diversion structure for direct surface water withdrawals
- Construct redundant raw water intake

Anticipated Cost: \$120,000

PROJECT NO. 10 – INSTALL RAW WATER SUPPLY PUMP CONTROLS

Under the current pump control configuration, the Operator must travel back and forth between the WTF and the well control house to implement, test, and confirm pump changes. The pump control panel could be retrofitted to allow the infiltration gallery pumps to be operated in HAND mode for troubleshooting and operator flexibility.

Anticipated Cost: \$15,000

PROJECT NO. 11 – CONSOLIDATE EXISTING MAPS TO MASTER GIS MAP

BVMD is currently working with Henry Broadhurst of Altitude Surveyors to create a master GIS map for the water system and District assets. Reliable mapping is critical for the continuity of water system knowledge as District contacts depart or retire and management responsibilities are transferred. It is recommended to continue this effort to develop a single master map for BVMD.

Anticipated Cost: \$18,000

PROJECT NO. 12 – DEVELOP INSPECTION AND MAINTENANCE PLAN FOR WATER STORAGE TANK

The last water storage tank inspection dates were not known at the time of the assessment. BVMD is currently exempt from the storage tank rule (which specifies periodic inspections every quarter and comprehensive inspections every five years) since the water storage tank is utilized for CT as part of the treatment process. It is still recommended to inspect the water storage tank on a regular basis to help plan future improvements and identify defects that require correction.

Once the first inspection has been completed, an inspection and maintenance plan should be developed. Preventative maintenance and routine cleaning help prolong the life of the tank and ensure early detection of needed repairs. Storage tank management should include inspection and repair of exterior coatings; inspection and clearing of overflow pipes; and routine flushing or mixing to prevent stagnation. The latest Sanitary Survey conducted on April 7, 2016 also identified these recommendations.

Anticipated Cost: \$5,000

PROJECT NO. 13 – LADDER GUARD

The water storage tank ladder is currently unsecured from trespassers. This presents a danger for tampering with the water supply, vandalism, and injury due to unauthorized use. It is recommended to install a lockable ladder guard to help prevent unauthorized access to the water storage tank. The Sanitary Survey conducted on March 8, 2013 also identified this recommendation.

Anticipated Cost: \$1,500

PROJECT NO. 14 – WATER SYSTEM MAINTENANCE PLANS

There are a variety of water system maintenance plans identified in the Sanitary Survey conducted on March 8, 2013 that may be implemented, which are described in further detail below. As maintenance plans are implemented, the information could be integrated with the master GIS map and/or water model for enhanced analysis and tracking purposes.



FIGURE 7 – UNSECURED LADDER ON WATER STORAGE TANK

Hydrant Flushing Program

The District currently conducts low-flow flushing of fire hydrants between the water main and the fire hydrant assembly. High-flow flushing is not conducted due to concerns with the structural integrity of the distribution system piping. It is recommended to continue hydrant flushing efforts with corresponding flows based on the confidence and condition of the distribution system piping.

Valve Exercise Program

The District does not currently have a valve exercising program. It is important to evaluate and exercise distribution system valves regularly to ensure that they operate properly, to prolong the life of the valves, and to identify inoperable valves that should be replaced.

Develop Line Flushing Program

The District does not currently have a line flushing program in place due to concerns with the structural integrity of the distribution system piping. While the distribution system is indirectly flushed during a water main break, the velocities experienced may not be sufficient to adequately scour settled materials from the distribution system piping. As distribution system piping is systematically replaced, it is recommended to begin implementing line flushing on the portions of the distribution system that can endure the high velocity flows required for proper flushing.

Leak Detection Program

The District experiences a significant number of line breaks and distribution system leaks. When a leak occurs, water production increases and the Operator notifies the District. The District then contacts a local contractor to identify and repair the leak.

Frequent line breaks potentially expose the water distribution system to contamination and increase the risk of introducing waterborne pathogens. The water storage tank can be drawn down quickly if leaks are not repaired in a timely manner limiting CT and fire flow. Frequent line breaks can indicate failing distribution system piping material. Small leaks can undermine the distribution system pipes, causing them to fail under the weight of the overbearing soil. The Sanitary Survey conducted on March 8, 2013 also identified this recommendation.

Professional leak detection companies are available to help pinpoint exact leak locations. Leak detection strategies usually involve the use of sonic leak-detection equipment which identifies the sound of water escaping a pipe. These devices can include pinpoint listening devices that make contact with valves and hydrants, geophones that listen directly on the ground, and correlator devices that listen at two points simultaneously to identify the specific location of leaks. A guidance document for Water Leak Detection and Repair Programs developed by the Georgia Watershed Protection Branch is provided for reference as Appendix H.

PROJECT NO. 15 – ANNUAL WATERLINE REPLACEMENT

Based on the condition of the existing water distribution system, and the number of water line breaks that occur each year, it is recommended to begin replacing the water distribution system piping. The existing infrastructure is likely not reliable enough to convey the pressures required

for fire flows. To make waterline replacements more manageable, it is recommended to replace portions of the distribution system each year to minimize shutdowns and upfront capital costs.

Anticipated Cost: \$300,000 total (\$30,000 per year over 10 years)

PROJECT NO. 16 – ANNUAL GIS MAP UPDATE

Once a master GIS map has been developed for the District, it will be important to keep the information updated. It is recommended to budget for annual updates as more water taps are sold, properties are transferred, and distribution system piping and water meters are replaced.

Anticipated Cost: \$30,000 total (\$3,000 per year over 10 years)

PROJECT NO. 17 – CONSTRUCT A CLEARWELL

The addition of a clearwell to the District’s treatment system will allow for more flexibility in operations and will allow the storage tank to be drawn down to less than 95,000 gallons in times of emergency such as leaks in the distribution system or for fire suppression in the event of a fire in the community. Due to space restraints, constructability issues, and cost limitations, it is recommended to construct a clearwell from serpentine pipes in the yard on the west side of the WTF building rather than building a tank. Additional design will be necessary for this project to determine the pipe size and length required for the volume of the serpentine pipe clearwell and to compile construction drawings for the layout.

Anticipated Cost: \$150,000

The Capital Improvement Projects are summarized in Table 5. Detailed OPCs are provided for each project in Appendix E.

Table 5 – Capital Improvement Projects

Project No.	Description	Opinion of Probable Cost
1	Replace Non-Operational Infiltration Gallery Pump and Pitless Adapter	\$19,000
2	Conduct Service Plan Evaluation and Rate Study	\$18,000
3	Produce Water Model	\$24,000
4	Conduct Water Service Meter Audit	\$1,800
5	Replace Outdated Water Service Meters	\$144,000
6	Establish Water Enterprise Fund	\$12,000
7	Acquire pH Probe for WTF	\$400
8	Conduct Infiltration Gallery Yield Test	\$15,000
9	Conduct Infiltration Gallery Improvements Determined from Yield Test	\$120,000
10	Install Raw Water Supply Pump Controls	\$15,000
11	Consolidate Existing Maps to Master GIS Map	\$18,000
12	Inspect Water Storage Tank & Develop Inspection and Maintenance Plan	\$5,000
13	Install Ladder Guard to Prevent Unauthorized Access to Water Storage Tank	\$1,500

Project No.	Description	Opinion of Probable Cost
14	Develop Water System Maintenance Plans (Hydrant Flushing, Valve and Exercising, Line Flushing, Leak Detection)	\$2,400
15	Annual Waterline Replacement	\$300,000
16	Annual GIS Map Update	\$30,000
17	Construct a Clearwell	\$150,000
Capital Improvement Projects Grand Total		\$876,000

SECTION 5 – FINANCIAL STATUS AND FUNDING OPTIONS

SUMMARY OF EXISTING FINANCIALS AND USER FEES

The District currently funds community water, road, and drainage improvements through a single general fund. An enterprise fund was established for the water storage tank and infiltration gallery improvement project in 1999, and the final bond payment was completed in 2017. Customers are currently billed quarterly with a base rate of \$200 for the first 15,000 gallons used. Additional usage beyond the 15,000-gallon base rate is billed on a tiered structure. The Service Plan notes that water system operations and maintenance costs including depreciation and repair are \$125 per quarter, and tap fees are currently set at \$8,100 each.

The District is currently debt-free, with financial reserves in place, and water and sewer rates covering operational and maintenance expenditures. BVMD has worked with DOLA to obtain funding in the past and is interested in pursuing additional grants and loans to help fund future projects. The District has not conducted a rate study to confirm that the current water service rates are sufficient to sustainably offset water system expenses. User fees and tap fees can be used as a funding opportunity for maintenance items and lower cost improvement projects. Conducting a rate study will help to determine if any changes to user rates or tap fees should be established in order to better help fund improvements to the District’s water system.

DEPARTMENT OF LOCAL AFFAIRS ENERGY AND
MINERAL IMPACT ASSISTANCE FUND (EIAF)



COLORADO
Department of Local Affairs

The purpose of the Energy and Mineral Impact Assistance Program is to assist political subdivisions that are socially and/or economically impacted by the development, processing, or energy conversion of minerals and mineral fuels. Funds come from the State severance tax on energy and mineral production and from a portion of the State's share of royalties paid to the federal government for mining and drilling of minerals and mineral fuels on federally-owned land.

The kinds of projects that are funded include, but are not limited to, water and sewer improvements, road improvements, construction/improvements to recreation centers, senior centers and other public facilities, fire protection buildings and equipment, and local government planning. The most successful applications into this program are those that: demonstrate urgency and local commitment to complete the project, show a high priority for the proposed application, are prepared to start work quickly, demonstrate a relationship to energy and mineral impact, and demonstrate a financial need.

Funds for this program are derived from Severance tax and Federal Mineral Lease (FML) dollars. The following must be taken into consideration when assigning these funds. Local governments must disclose whether they can receive Severance tax funds without impacting their TABOR limits. If Severance funds cannot be used, DOLA may assign FML dollars. An enterprise fund

may request Severance dollars, however, DOLA must evaluate the impact of these dollars to the enterprise status before these funds will be assigned.

EIAF grants are categorized into Administrative Grants, Tier I, Tier II, and Tier III. DOLA funds typically require a dollar-for-dollar match, with higher matching funds and projects ready-to-proceed more successful in receiving grant funding. Matching funds are considered to be any cash and/or in-kind dollars brought to the project by the applicant.

ADMINISTRATIVE GRANTS

Administrative Grants are available for planning, preliminary engineering, and architectural design projects. The application process requires the local government to submit a detailed letter to the appropriate DOLA Regional Manager and signed by the Chief Elected Official. The letter should include information such as: the project description, budget, financial need, why the project is necessary, urgency of the project, how soon the project can begin, and how soon it can be completed. Applications for this grant are accepted year-round as long as funds are available. The maximum award for an Administrative Grant is \$25,000, and the total project cost should not exceed \$100,000. A dollar-for-dollar match is required for this grant.

TIER I GRANTS

Tier I grant funds can be used for a variety of public purposes including planning, engineering and design studies, and capital projects requiring a limited level of financial assistance. A Tier I grant awards up to \$200,000. A dollar-for-dollar match is required for this grant. Larger matching amounts are generally more competitive. Application deadlines are on April 1st, August 1st, and December 1st of each year. Applications will be reviewed and recommended for funding by DOLA staff. The Executive Director will make funding decisions three times per year.

TIER II GRANTS

The Tier II grant program is intended to support a wide variety of community development projects to improve quality of life in communities. A Tier II grant awards greater than \$200,000 up to \$1,000,000. A dollar-for-dollar match is required for this grant. Larger matching amounts are generally more competitive. Application deadlines are on April 1st, August 1st, and December 1st of each year. Applications will be reviewed and recommended for funding by DOLA staff. The Executive Director will make funding decisions three times per year.

TIER III GRANTS

The Tier III grant program is provided to help political subdivisions with regional or multijurisdictional projects in the range of \$2,000,000 to \$10,000,000. BVMD is not large enough to be competitive for a Tier III grant.

CDPHE STATE REVOLVING FUND PROGRAM

CDPHE's Drinking Water Revolving Fund (DWRF) provides low interest loans to governmental entities for the



construction of water projects for public health and compliance purposes. The DWRF can support the following types of projects:

- New Regional Water Treatment Facilities
- Improvement / Expansion of Water Treatment Facility
- Consolidation of Water Treatment Facilities
- Connect to Existing Facility Eliminate Individual Private Wells
- Distribution / Transmission Lines Construction / Rehabilitation
- Water Storage Facilities
- Water Supply Facilities (excluding reservoirs, dams and water rights)

Available loan types include:

- Direct Loans: up to \$2.5 million, current APR of 2.0 percent for 20 years.
- Leveraged Loans: generally provided to investment grade borrowers with larger projects greater than \$2.5 million, bond market interest rate for 20 years.

The CDPHE Water Quality Control Division (WQCD), Department of Local Affairs (DOLA), and the Colorado Water Resources and Power Development Authority (Authority) jointly administer the SRF. The WQCD administers the environmental reviews; engineering and design approval; and overall project management. The Authority manages the finances and loan approvals. DOLA staff works with applicants on credit reviews and reports.

DOLA considers median household income (MHI), median household value (MHV), and the latest 10-year jobs change (among other factors) to determine a communities disadvantaged status and whether they qualify for lower interest rates. BVMD is in Tract 1 of Colorado, which has an MHI of \$55,284 (88% of the State MHI), an MHV of \$236,100 (89% of the State MHI), and a 10-year jobs loss of 304. While these factors alone do not qualify BVMD as a disadvantaged community, if BVMD could demonstrate a 10-year population loss, and an assessed value per household lower than the average Colorado municipality, the District could potentially qualify for a 0% interest loan. If the District is not determined to be a disadvantaged community, BVMD can appeal to the DOLA staff to consider other factors for BVMD that are not reflected in county or tract data.

There are several milestones that need to be met in order for a project to be eligible for the DWRF.

- The entity must be included on the most current Drinking Water Intended Use Plan (IUP). To be included on the IUP, an eligibility survey must be submitted *each year* (typically in June) that indicates all projects that could possibly be constructed in the next calendar year. The Drinking Water Intended Use Plan does *not* renew automatically. The District is not currently included in the eligibility list for the 2018 IUP; it is highly recommended to submit an eligibility survey for the upcoming 2019 IUP when the application period opens.
- A Prequalification Application must be submitted to the Grants and Loans Unit.
- A Preapplication meeting with the WQCD, DOLA, and the Authority must be held.
- Eligibility for a \$10,000 Planning Grant is determined at the Preapplication meeting. This grant is typically available for disadvantaged communities only. Communities need to meet CDPHE's criteria to be considered disadvantaged.

- A Project Needs Assessment (PNA) and Environmental Determination for the project must be submitted to the WQCD Engineering Section for review.
- WQCD will provide an Environmental Determination (Categorical Exclusion or Environmental Assessment).
- If necessary, an Environmental Assessment shall be submitted and reviewed. If a Finding of No Significant Impact (FONSI) is determined it shall be published with a 30-day comment period.
- PNA and Environmental Approval must be obtained.
- Eligibility for a Design and Engineering Grant is determined after approval of the PNA. This grant is typically available for disadvantaged communities only. Communities need to meet CDPHE's criteria to be considered disadvantaged.
- A Technical, Managerial, and Financial (TMF) Capacity review must be completed and submitted to the WQCD a minimum of 30 days prior to the loan application.
- A public meeting must be held with a 30-day notice period, notifying the public of the project.
- The loan application shall then be submitted. There are numerous application submittal deadlines throughout the year.
- The Authority will then approve the loan.

The SRF loan process is a heavier commitment than a DOLA grant due to additional requirements such as the pre-qualification, PNA, and Environmental Assessment.

UNITED STATES DEPARTMENT OF AGRICULTURE RURAL DEVELOPMENT

The United States Department of Agriculture (USDA) Rural Development (RD) program provides loans and grants to rural communities with populations less than 10,000 people. Grants are only available to low- and moderate-income communities that have median household income (MHI) of less than 80 percent of the State average. The District is in Tract 1 of Colorado, which has an MHI of \$55,284 (88% of the State MHI), which does not qualify them as a low- or moderate-income community. The District would only qualify for USDA RD long-term and low-interest loans. The USDA RD program does require a full-time resident project representative (RPR) to be on-site during construction. This requirement, along with other requirements for compliance with USDA funding, increases the construction administration costs from those included in the attached opinion of probable costs. Additional costs may be 10 to 15 percent of the project cost.



APPENDIX A – CURRENT BVMD MAPS

BLUE VALLEY METROPOLITAN DISTRICT SERVICE AREA

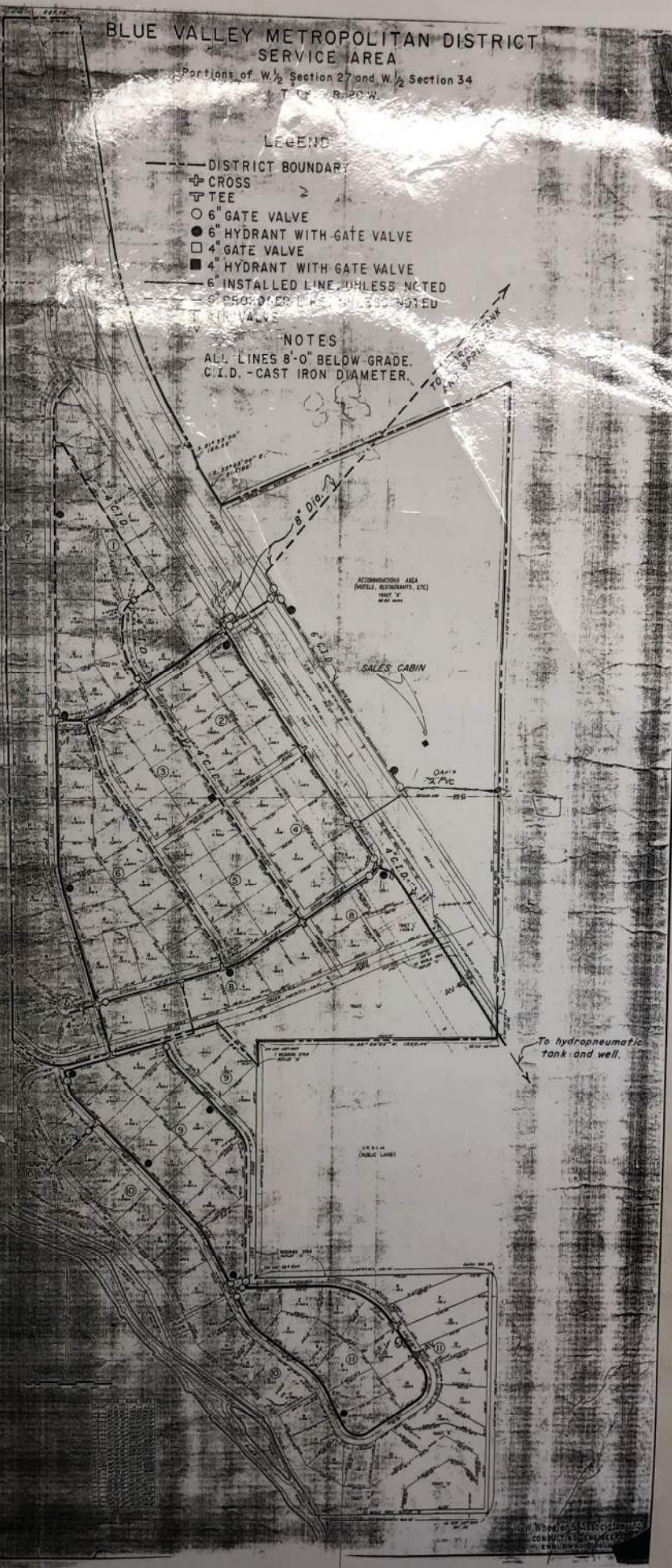
Portions of W. 1/2 Section 27 and W. 1/2 Section 34
T. 12 N. R. 20 W.

LEGEND

- DISTRICT BOUNDARY
- + CROSS
- T TEE
- 6" GATE VALVE
- 6" HYDRANT WITH GATE VALVE
- 4" GATE VALVE
- 4" HYDRANT WITH GATE VALVE
- 6" INSTALLED LINE, UNLESS NOTED
- - - 6" PROPOSED LINE, UNLESS NOTED

NOTES

ALL LINES 8'-0" BELOW GRADE.
C.I.D. - CAST IRON DIAMETER.



Information

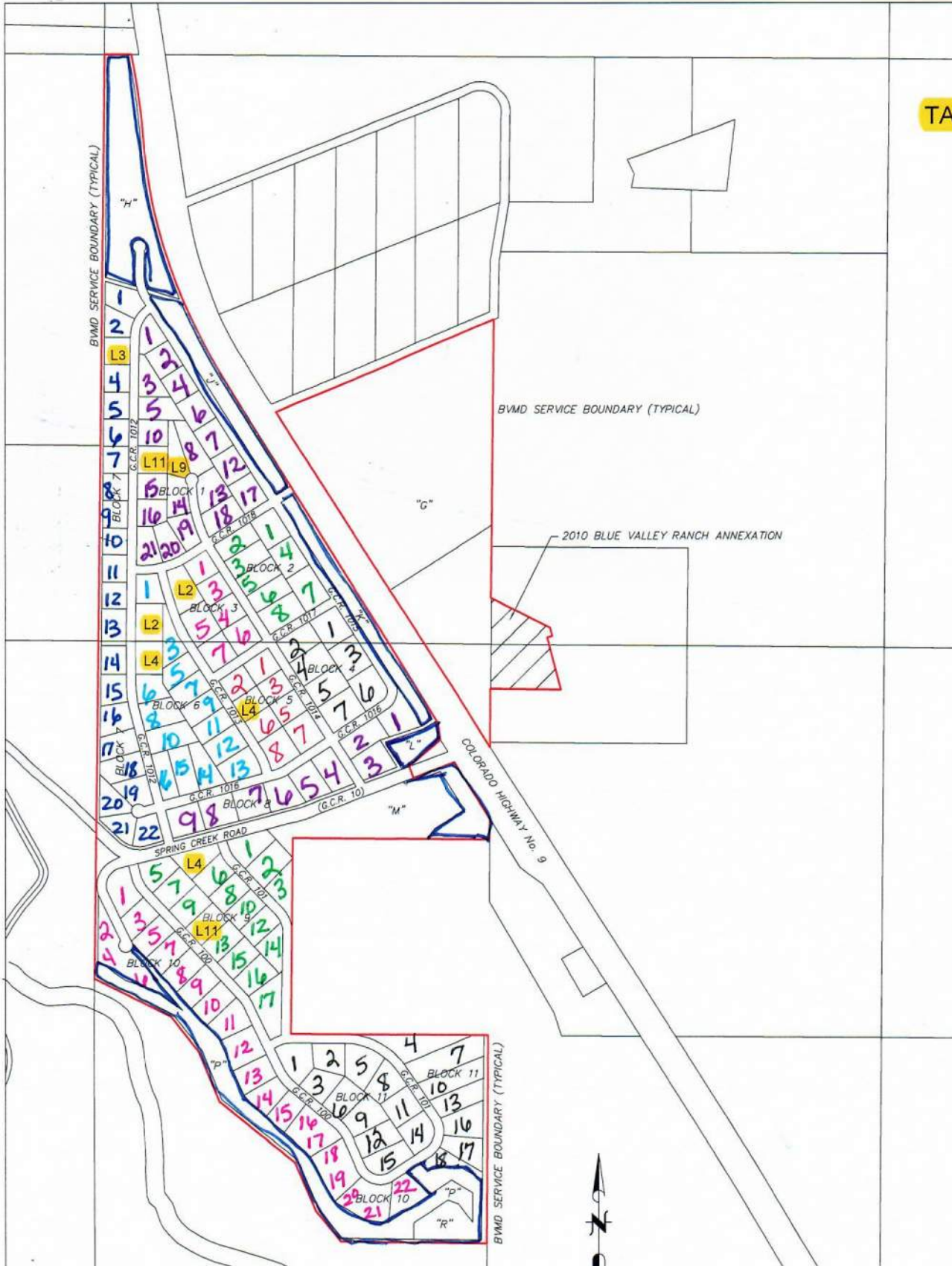
Call us at 877-867-3378
or go to our website at www.whitings.com
to get the price quote of your new building system with ease.

For the phone number on this plan to 476-734-4474

476-427-4624
476-531-1396 ext
476-531-7108 ext

www.whitings.com
CONSTRUCTION
ENR 10/1/00

TAP FEE NOT PAID

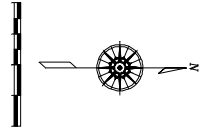


- Block 1 (21 lots)
- Block 2 (8 lots)
- Block 3 (7 lots)
- Block 4 (7 lots)
- Block 5 (8 lots)
- Block 6 (16 lots)
- Block 7 (22 lots)
- Block 8 (9 lots)
- Block 9 (17 lots)
- Block 10 (22 lots)
- Block 11 (18 lots)

- "H" - BVM D
- "J" - BVM D
- "K" - BVM D
- "L" - BVM D
- "M" - Ramos
- "P" - BVM D
- "R" - BVM D
- Block 8 - L2+3
- *L6 BVM D



ALPINE SUBDIVISIONS
 400 C.R. 101, P.O. BOX 1404
 970-762-0851
 DATE PLANNED _____
 REVISION _____
 DATE SURVEYED _____
 FILE NO. _____



APPENDIX B – POPULATION AND DEMAND PROJECTIONS



**BLUE VALLEY METROPOLITAN DISTRICT
WATER DEMAND PROJECTIONS**

Projected Buildout Population Based on Taps					
Line	Variable	Description	Value	Unit	Note
[1]	[T _R current]	Current Residential Taps (in District) = 112		taps	
[2]	[T _R current]	Current Residential Taps (out of District) = 5		taps	
[3]	[T _{tot} current]	Total Current Service Area Taps = 117		taps	[T _{tot}] = [T _R current] + [T _C current] + [T _C current]
[4]	[Popcurrent]	Estimated Current Population = 375		ppl	Estimate from BVMD
[5]	[P _{tap} current]	Current People per Tap = 3.2		ppl/tap	[P _{tap} current] = [Popcurrent] / [T _{tot} current]
[6]	[T _R buildout]	Buildout Residential Taps (in District) = 145		taps	
[7]	[T _R buildout]	Buildout Residential Taps (out of District) = 5		taps	
[8]	[T _{tot} buildout]	Total Buildout Service Area Taps = 150		taps	BVMD Service Plan
[9]	[P _{tap}]	Projected People per Tap = 3.5		ppl/tap	BVMD Service Plan
[10]	[Popbuildout]	Estimated Buildout Population = 525		ppl	[Popbuildout] = [P _{tap}] * [T _{tot} buildout]
Projected Buildout Water Demand Based on Treated Water Data from 2007 to 2018					
[11]	[Q _{MonthAvg}]	Historic Winter Month Daily Average Demand = 14,241		gpd	
[12]	[Q _{MonthAvg}]	Historic Winter Month Daily Average Demand per Tap = 122		gpd/tap	Based on Current Service Area Taps
[13]	[Q _{MonthAvg}]	Historic Winter Month Daily Average Demand per Person = 38		gpcd	Based on People Per Tap
[14]	[Q _{MaxMonthAvg}]	Historic Maximum Summer Month Daily Average Demand = 44,781		gpd	July 2014
[15]	[Q _{MaxMonthAvg}]	Historic Maximum Summer Month Daily Average Demand per Tap = 383		gpd/tap	Based on Current Service Area Taps
[16]	[Q _{MaxMonthAvg}]	Historic Maximum Summer Month Daily Average Demand per Person = 119		gpcd	Based on Current People Per Tap
[17]	[Q _{irrigation}]	Historic Irrigation Demand = 30,540		gpd	July 2014 - January 2014
[18]	[Q _{irrigation}]	Historic Irrigation Demand per Tap = 261		gpd/tap	Based on Current Service Area Taps
[19]	[Q _{irrigation}]	Historic Irrigation Demand per Person = 81		gpcd	Based on People Per Tap
[20]	[Q _{MaxMonthAvg}]	Projected Buildout Maximum Month Daily Average Demand = 57,412		gpd	Based on Total Buildout Service Area Taps
[21]	[Q _{MaxMonthAvg}]	Projected Buildout Maximum Month Daily Average Demand per Tap = 383		gpd/tap	Based on Total Buildout Service Area Taps
[22]	[Q _{MaxMonthAvg}]	Projected Buildout Maximum Month Daily Average Demand per Person = 109		gpcd	Based on Projected People Per Tap
Available Water Rights					
[23]	[WaterClaimed]	Amount of Water Claimed = 250		gpm	BVMD Service Plan
[24]	[WaterDecreed]	Decreed amount of Water = 154,645		acre feet	BVMD Service Plan
[25]	[TapsAllowed]	Number of Residential Taps Allowed = 150		taps	BVMD Service Plan



BLUE VALLEY METROPOLITAN DISTRICT
HISTORICAL TREATED WATER PRODUCTION FROM 2007 TO 2018

Month	Year												Average
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	
January	432,892	142,352	363,270	372,300	521,324	559,447	627,297	716,870	426,225	366,667	519,122	370,174	451,495
February	356,097	397,421	327,673	338,700	445,016	406,208	365,553	470,620	583,757	408,405	563,608	329,604	416,055
March	449,324	398,766	370,390	373,600	447,385	441,086	425,392	487,734	342,556	425,605	382,100	365,260	409,100
April	404,860	347,596	361,660	384,800	447,385	499,722	450,802	558,623	402,844	365,374	452,449	427,106	425,268
May	596,963	493,857	539,137	499,900	515,403	791,683	477,806	818,852	401,429	485,485	748,244	640,993	584,146
June	975,866	820,727	522,923	716,300	960,010	1,154,702	871,146	1,336,256	760,971	887,840	1,745,903	904,066	971,393
July	901,424	975,614	753,190	753,190	744,635	756,297	845,620	1,365,829	755,439	943,542	1,293,721	1,025,165	926,139
August	634,218	714,815	744,018	625,894	746,489	1,116,480	664,373	610,526	754,253	643,565	835,486	762,252	737,697
September	586,843	594,000	536,234	543,343	501,405	587,772	471,725	631,567	504,447	612,328	610,764	685,025	572,121
October	408,416	464,525	1,054,157	506,984	428,721	415,871	403,323	643,414	395,540	554,607	399,915	693,792	530,772
November	357,664	415,114	638,270	540,087	411,580	388,997	549,960	346,481	405,971	385,019	348,227		435,215
December	423,938	412,433	375,800	482,521	600,707	544,706	630,759	353,113	472,081	397,694	501,296		472,277
Total	6,528,505	6,177,220	6,586,722	6,137,619	6,770,060	7,662,971	6,783,756	8,339,885	6,205,513	6,476,131	8,400,835	6,203,437	6,856,055

APPENDIX C – MONITORING SCHEDULE

BLUE VALLEY MD
Calendar Year 2019 Monitoring Schedule
Mailing Address: PO BOX 192 SILVERTHORNE, CO 80498

Public Water System ID	Water System Name	Primary County	Federal System Type	State Source Type	Population
CO0125148	BLUE VALLEY MD	GRAND	Community	Groundwater UDI Surface Water	375
Minimum Certification Required for Treatment Operator		Minimum Certification Required for Distribution System Operator		Seasonal	Water Hauler
D		1		No	No

Contact Information			
<p>All public water systems are required to maintain an Administrative Contact, Treatment Operator (if applicable), Distribution System Operator (if applicable), and Owner. If the information below is incorrect or blank please send us a contact update form. This form is available by visiting http://wqcdcompliance.com. The contact update form is located under 'Facility Operator Certification'. For operator certification information please visit http://www.ocpoweb.com. You may search for individual operator certification levels/expiration by clicking on the 'Information' menu bar and selecting 'State Certified Operators'.</p>			
Administrative Contact	Treatment Operator	Distribution System Operator	Owner
MATTHEW WILLITTS	MATTHEW WILLITTS	MATTHEW WILLITTS	

General Information

Samples must be collected at the location specified in the Monitoring Plan or Record of Approved Waterworks.

- The Drinking Water Monitoring Schedule is provided for your reference (example schedule available at <https://wqcdcompliance.com/schedules>).
- Schedules are updated every Wednesday evening. Please contact your specialist with questions ([contact information](#)) or call us at 303-692-3556.
- Laboratory sampling results may be submitted using the Online Portal <https://wqcdcompliance.com/login>. Please do not email results or attachments to individuals.
- Please identify the Facility ID and Sample Point ID (listed below) when submitting sample results. Facility and Sample Point IDs are used to identify general sample site locations.
- Online records available at environmentalrecords.colorado.gov/HPRMWebDrawer/Record. Enter PWSID as the 'Title Word'.

Backflow Prevention and Cross-connection Control (BPCCC) Reminders:

- Annual BPCCC Reports need to be completed by May 1, 2019 for activities completed in 2018
- The required survey compliance ratio for 2018 is 0.80, unless you have a department approved alternate ratio.
- The required assembly testing ratio for 2018 is 0.70 and the required method inspection ratio is 0.90.
- Annual BPCCC reports should only be submitted to the department if a violation occurred. Annual BPCCC reports and supporting calculations will be reviewed during your next sanitary survey, however, please note that the department can request this information at any time.
- The 2019 required survey compliance ratio is 0.90, unless you have a department approved alternate ratio, which will need to be documented in the May 1, 2020 BPCCC annual report.
- The 2019 required assembly testing ratio is 0.80, and will need to be documented in the May 1, 2020 BPCCC annual report.

Storage Tank Reminders:

All storage tanks within the distribution must be inspected quarterly unless an alternative storage tank inspection schedule has been established and a justification included in the written inspection plan. Please note that an alternative storage tank inspection schedule is subject to department review and revision. Generally that review occurs during a sanitary survey but alternative inspection schedules can be subject to department review upon request at any time.

All storage tanks within the distribution are required to undergo a comprehensive tank inspection every five years. The first five-year cycle for completion of comprehensive tank inspections is due on or by December 31, 2021.

Monitoring Information

PWS ID: CO0125148
BLUE VALLEY MD

Report Generation Date: January 3, 2019

2019 Monitoring Schedule Page 1 of 6

This monitoring schedule is based on the system's current inventory and is subject to change. *Water systems are responsible for promptly reporting schedule errors or omissions.* Errors or omissions on monitoring schedules do not prohibit the Water Quality Control Division from enforcing monitoring requirements set forth by the Regulations.

Distribution System Sample Schedules

<u>Facility ID</u> DS001	<u>Facility Name</u> DISTRIBUTION SYSTEM	<u>Facility Type</u> Distribution System
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Microorganisms and Disinfectants

TOTAL COLIFORM BACTERIA (TCR) Sample Schedule: 1 sample(s) per Month during the collection period	Collection Period: January 1, 2019 to December 31, 2019
Sample Point ID(s) (Sample Point Name): RTOR (ROUTINE ORIGINAL) RPOT (REPEAT OTHER) RPOR (REPEAT ORIGINAL) RPDN (REPEAT DOWNSTREAM) RPUP (REPEAT UPSTREAM) For raw water source samples (i.e. non-distribution) use the Facility ID and Sample Point ID listed at the end of this monitoring schedule	

FREE CHLORINE Sample Schedule: Measure every time you collect a TOTAL COLIFORM BACTERIA (TCR) sample

Disinfection Byproducts

TTHMs and HAA5s (Stage 2) Sample Schedule: 1 dual sample(s) per sample point for a TOTAL of 1 dual sample(s) per Year	*Collection Period:* August 1, 2019 to August 31, 2019
Collection Restriction: Sample(s) must be collected between August 1 and August 31	
State Sample Point ID(s) (System Location ID(s)): DBP001 (GCR 1012)	

Lead and Copper

LEAD AND COPPER Sample Schedule: 5 sample(s) per Year	*Collection Period:* June 1, 2019 to September 30, 2019
Collection Restriction: Sample(s) must be collected between June 1 and September 30 Once results are received and processed the 90th percentile will be available by searching online records at http://environmentalrecords.colorado.gov/HPRMWebDrawer/Record . Enter PWSID as the 'Title Word'.	
Sample Point IDs for lead and copper begin with 'LCR' and are available at the end of the monitoring schedule. To manage sites visit https://wqcdcompliance.com/login . If sites not listed please contact us at https://www.colorado.gov/cdphe/dwcontact .	

Non-Distribution System Sample Schedules

<u>Facility ID</u> 004	<u>Facility Name</u> TREATMENT FACILITY	<u>Facility Type</u> Treatment Plant	<u>Sample Point ID</u> 004	<u>Sample Point Name</u> NOT ENTRY POINT	<u>Sample Point Type</u> Water System Facility
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Daily Schedules

TURBIDITY (CFE) Sample Schedule: 1 sample per Day during the collection period	Collection Period: While Operating
Note: Sample collected at a location representative of the <u>combined filtered water</u>	

Non-Distribution System Sample Schedules

<u>Facility ID</u>	<u>Facility Name</u>	<u>Facility Type</u>	<u>Sample Point ID</u>	<u>Sample Point Name</u>	<u>Sample Point Type</u>
006	BLUE VALLEY MD WTP STORAGE TANK	Storage	006	ENTRY POINT	Entry Point
Daily Schedules					
<u>FREE CHLORINE (MICROBIAL INACTIVATION AND ENTRY POINT RESIDUAL) Sample Schedule:</u>				<u>Collection Period:</u>	
1 sample(s) per Day during the collection period				While Operating	
Yearly Schedules					
<u>FLUORIDE Sample Schedule:</u>				<u>Collection Period:</u>	
1 sample(s) per Year				January 1, 2019 to December 31, 2019	
<u>INORGANICS GROUP Sample Schedule:</u>				<u>Collection Period:</u>	
1 sample(s) per Year				January 1, 2019 to December 31, 2019	
<u>NITRATE Sample Schedule:</u>				<u>Collection Period:</u>	
1 sample(s) per Year				January 1, 2019 to December 31, 2019	
<u>VOLATILE ORGANICS GROUP Sample Schedule:</u>				<u>Collection Period:</u>	
1 sample(s) per Year				January 1, 2019 to December 31, 2019	
Satisfied Schedules					
<u>SYNTHETIC ORGANICS GROUP Sample Schedule:</u>				<u>Collection Period:</u>	
1 sample(s) per 3 Years				January 1, 2017 to December 31, 2019 **Sample Result(s) Received**	
<u>COMBINED URANIUM Sample Schedule:</u>				<u>Collection Period:</u>	
1 sample(s) per 6 Years				January 1, 2014 to December 31, 2019 **Sample Result(s) Received**	
<u>GROSS ALPHA, WITHOUT RADON & URANIUM Sample Schedule:</u>				<u>*Collection Period:*</u>	
1 sample(s) per 6 Years				January 1, 2014 to December 31, 2019 **Sample Result(s) Received**	
Collection Restriction: Sample(s) must be collected at the same time as the COMBINED URANIUM sample(s)					
<u>COMBINED RADIUM (-226 & -228) Sample Schedule:</u>				<u>Collection Period:</u>	
1 sample(s) per 9 Years				January 1, 2011 to December 31, 2019 **Sample Result(s) Received**	
<u>NITRITE Sample Schedule:</u>				<u>Collection Period:</u>	
1 sample(s) per 9 Years				January 1, 2011 to December 31, 2019 **Sample Result(s) Received**	

This monitoring schedule is based on the system's current inventory and is subject to change. *Water systems are responsible for promptly reporting schedule errors or omissions.* Errors or omissions on monitoring schedules do not prohibit the Water Quality Control Division from enforcing monitoring requirements set forth by the Regulations.

Compliance and Public Notice Schedules

CCR Compliance Schedule

Your 2018 ***DRAFT*** CCR will be posted at <http://wqcdcompliance.com/> in March

Activity Name	Activity Due Date	Activity Completion Date
SUBMIT CCR REPORT TO STATE	June 30, 2018	April 30, 2018
SUBMIT CERTIFICATE OF DELIVERY	June 30, 2018	April 30, 2018

CCR Compliance Schedule

Your 2019 ***DRAFT*** CCR will be posted at <http://wqcdcompliance.com/> in March

Activity Name	Activity Due Date	Activity Completion Date
SUBMIT CCR REPORT TO STATE	June 30, 2019	Activity Not Completed
SUBMIT CERTIFICATE OF DELIVERY	June 30, 2019	Activity Not Completed

Lead Consumer Notification - Delivery to consumers is required **within 30 days** after receipt of data from laboratory

Activity Name	Activity Due Date	Activity Completion Date
SUBMIT ONE (1) LEAD CONSUMER NOTICE AND CERTIFICATE OF DELIVERY	December 31, 2019	Activity Not Completed

Facility Specific Levels

Facility ID	Facility Name	Facility Type
DS001	DISTRIBUTION SYSTEM	Distribution System
Analyte Name	Level	Level Type
FREE CHLORINE	0.2 mg/L	Minimum
FREE CHLORINE	4.0 mg/L	Maximum
Facility ID	Facility Name	Facility Type
004	TREATMENT FACILITY	Treatment Plant
Analyte Name	Level	Level Type
TURBIDITY	5 NTU	Maximum
TURBIDITY	1 NTU	95th Percentile
Facility ID	Facility Name	Facility Type
006	BLUE VALLEY MD WTP STORAGE TANK	Storage
Analyte Name	Level	Level Type
FREE CHLORINE (MICROBIAL INACTIVATION AND ENTRY POINT RESIDUAL)	0.7 mg/L	Minimum

Facility Information				Sample Point Information Visit https://wqcdcompliance.com/login to manage lead and copper sites.	
Facility ID	Active Status	Facility Name	Facility Type	Sample Point ID	Sample Point Name
004	A	TREATMENT FACILITY	Treatment Plant	004	NOT ENTRY POINT
005	A	INF GAL	Well	005	RAW
006	A	BLUE VALLEY MD WTP STORAGE TANK	Storage	006	ENTRY POINT
DS001	A	DISTRIBUTION SYSTEM	Dist System/Zone	DBP001	GCR 1012
				LCR001	GCR 100
				LCR005	GCR 100
				LCR006	GCR 101
				LCR007	GCR 1016
				LCR008	GCR 10
				LCR009	GCR 101
				LCR010	GCR 10
				LCR012	GCR 1018
				LCR013	GCR 101
				LCR014	GCR 100
				RPDN	REPEAT DOWNSTREAM
				RPOR	REPEAT ORIGINAL
				RPOT	REPEAT OTHER
RPUP	REPEAT UPSTREAM				
RTOR	ROUTINE ORIGINAL				

Time Period Definitions		
Time Period	Start Date	End Date
First Quarter	January 1, 2019	March 31, 2019
Second Quarter	April 1, 2019	June 30, 2019
Third Quarter	July 1, 2019	September 30, 2019
Fourth Quarter	October 1, 2019	December 31, 2019
First 6 Months	January 1, 2019	June 30, 2019
Second 6 Months	July 1, 2019	December 31, 2019
Year	January 1, 2019	December 31, 2019

Analyte Group Definitions		
Analyte Group Name	Analytes in Group	Number of Analytes in Group
INORGANICS GROUP	ANTIMONY ARSENIC BARIUM BERYLLIUM CADMIUM CHROMIUM MERCURY NICKEL SELENIUM SODIUM THALLIUM	11
SYNTHETIC ORGANICS GROUP	1,2-DIBROMO-3-CHLOROPROPANE 2,4,5-TP 2,4-D ALDICARB ALDICARB SULFONE ALDICARB SULFOXIDE ATRAZINE BENZO(A)PYRENE BHC-GAMMA CARBOFURAN CHLORDANE DALAPON DI(2-ETHYLHEXYL) ADIPATE DI(2-ETHYLHEXYL) PHTHALATE DINOSEB DIQUAT ENDOTHALL ENDRIN ETHYLENE DIBROMIDE HEPTACHLOR HEPTACHLOR EPOXIDE HEXACHLOROBENZENE HEXACHLOROCYCLOPENTADIENE LASSO METHOXYCHLOR OXAMYL PENTACHLOROPHENOL PICLORAM SIMAZINE POLYCHLORINATED BIPHENYLS (PCB) TOXAPHENE	31
VOLATILE ORGANICS GROUP	1,1,1-TRICHLOROETHANE 1,1,2-TRICHLOROETHANE 1,1-DICHLOROETHYLENE 1,2,4-TRICHLOROBENZENE 1,2-DICHLOROETHANE 1,2-DICHLOROPROPANE BENZENE CARBON TETRACHLORIDE CHLOROBENZENE CIS-1,2-DICHLOROETHYLENE DICHLOROMETHANE ETHYLBENZENE O-DICHLOROBENZENE P-DICHLOROBENZENE STYRENE TETRACHLOROETHYLENE TOLUENE TRANS-1,2-DICHLOROETHYLENE TRICHLOROETHYLENE VINYL CHLORIDE XYLENES (TOTAL)	21

APPENDIX D – CDPHE CT APPROVAL LETTER

STATE OF COLORADO

John W. Hickenlooper, Governor
Larry Wolk, MD, MSPH
Executive Director and Chief Medical Officer

Dedicated to protecting and improving the health and environment of the people of Colorado

4300 Cherry Creek Dr. S.
Denver, Colorado 80246-1530
Phone (303) 692-2000
Located in Glendale, Colorado

www.colorado.gov/cdphe



Colorado Department
of Public Health
and Environment

May 1, 2014

Matthew Willitts
Blue Valley Metropolitan District
P.O. Box 192
Silverthorne, Colorado 80498

RE: **UPDATED** Approval of Drinking Water Final Plans and Specifications
Blue Valley Metropolitan District, Filtration System for GWUDI Reclassification
Public Water System Identification (PWSID) No. CO0125148, Grand County

Dear Mr. Willitts:

The Water Quality Control Division (Division), Engineering Section has reviewed the Final Plans and Specifications for the Blue Valley Metropolitan District's filtration system for groundwater under the direct influence of surface water (GWUDI) reclassification in accordance with Article 1.11.2 of the *Colorado Primary Drinking Water Regulations* (CPDWR). The design meets or exceeds the requirements of the *State of Colorado Design Criteria For Potable Water Systems* (Design Criteria, 1997 Edition) and is hereby approved.

This approval is limited to the following:

- Treatment Plant (TP004)
 - Treatment for infiltration gallery source reclassified as GWUDI (WL005).
 - Pre-filter (P865):
 - Two parallel cartridge filter housings (design basis: Graver Technologies, Model 12MC3 stainless steel vessel with swing bolt enclosure) with twelve 30-inch cartridge pre-filters per housing (design basis: Graver Technologies, Model Stratum A, Stratum C, MBF, PMA, PMC, QMC, WaterTec).
 - Compliance filter (P341):
 - Two parallel cartridge filter housings (design basis: Graver Technologies, Model 12MC3 stainless steel vessel with swing bolt enclosure) with twelve 1-micron, 30-inch, QCR cartridge filters per housing (design basis: Graver Technologies, Model QCR 1-30P8E, rated at 18 gpm per cartridge filter, 216 gpm total per filter train).
 - Associated piping and appurtenances.

This approval acknowledges the previous installation of the following components (approval letter dated August 7, 2009). The acknowledgment does not constitute approval of the design, construction or installation of the components, processes, or additives against the Design Criteria. The Division may review the conditions of these existing system components during sanitary surveys and during system modifications that directly impact those components.

- One existing infiltration gallery source (WL005)
 - Source classified as GWUDI by the Division on May 17, 2013.
 - Present maximum flowrate with both infiltration gallery pumps operating of 200 gpm. Facility is designed for 432 gpm.

- Treatment Plant (TP004) - continued
 - Sodium hypochlorite treatment (D421 and D825)
 - Sodium hypochlorite feed pump (design basis: Prominent Gamma L metering pump).
 - Sodium hypochlorite injection point prior to contact time storage tank. Residual chlorine monitoring location is after contact time storage tank.
 - Treatment appurtenances: Check valve prior to filtration; butterfly valve, flow meter, flow control valve prior to filtration on each train; butterfly valve, pressure transducer and sample tap after filtration on each train; pressure transducer between pre-filter and compliance filter on each train; combined effluent turbidity sample tap.
- One existing contact time storage tank (ST006)
 - Storage tank 152,697 gallons (approximately 28.5 feet diameter and 32 feet tall). Normal operating range from 24 feet (114,500 gallons) to 29 feet (138,300 gallons).
- Distribution system (DS001).
- Associated piping and appurtenances.

The approval includes the following deviations from the Design Criteria:

- The *Revised Acceptance of the Graver Technologies Cartridge Filters Model QCR, QMA, ZTEC-B as an Alternative Filtration Technology to meet the Colorado Primary Drinking Water Regulations (CPDWR) requirements for Giardia lamblia and Cryptosporidium Removal*, dated February 14, 2012, states that per Graver Technologies recommendation, a check valve is required after the final filter vessel to prevent a backflow of filtered water into the final cartridge filter vessels and respective filters. Based on the information supplied, a check valve is installed just prior to the filter vessels and butterfly valves are installed before and after the pre-filter and compliance filter on each train so that the filters can be isolated as needed. Based on the information supplied, the Division accepts this deviation.
- Section 7.4.1 of the Design Criteria requires that at least two chemical feeders be provided. The information provided indicates that the operator will always have spare parts and/or pumps available. Based on the information supplied, the Division accepts this deviation and has approved a single chemical feeder. Please note that an operator change requires that the system will need to have spare parts and/or pumps readily available.

The approval is subject to the following conditions:

- The system must continuously meet the design, performance, and operations and maintenance requirements established in the *Revised Acceptance of the Graver Technologies Cartridge Filters Model QCR, QMA, ZTEC-B as an Alternative Filtration Technology to meet the Colorado Primary Drinking Water Regulations (CPDWR) requirements for Giardia lamblia and Cryptosporidium Removal*, dated February 14, 2012, or most recent version. A copy of the Acceptance Letter is attached to this approval letter for reference.
- The public water system is designated as a GWUDI system. Therefore, the system must maintain 4-log virus, 3-log *Giardia lamblia*, and 2-log *Cryptosporidium* removal and/or inactivation on a continuous basis.
 - In addition to the use of the Graver Technologies Model 12MC-3 cartridge filter housings and the final QCR cartridge filters, Model QCR 1-30P8E, which are credit with 2.5-log *Giardia lamblia* and 2-log *Cryptosporidium* removal, the system must also achieve 0.5-log *Giardia lamblia* inactivation and 4-log virus inactivation by disinfection. Therefore, to achieve 0.5-log *Giardia lamblia* inactivation and 4-log virus inactivation by disinfection, a minimum chlorine residual of 0.7 mg/L must be continuously maintained at the finished water sampling location (entry point located after the contact time storage tank and before distribution), assuming a maximum flow rate of 200 gpm, a maximum pH of 7.2, a water temperature at or greater than 3-degrees Celsius, and a minimum active storage volume of 95,000 gallons provided by the 152,000 gallon storage tank, assuming a baffle factor of 0.1.

- At a maximum flow rate of 100 gpm (normal flow rate), a maximum pH of 7.2, a water temperature at or greater than 3-degrees Celsius, and a minimum active storage volume of 95,000 gallons provided by the 152,000 gallon storage tank with a baffle factor of 0.1, a minimum chlorine residual of 0.3 mg/L must be continuously maintained at the finished water sampling location to achieve 0.5-log *Giardia lamblia* inactivation and 4-log virus inactivation by disinfection.
- The system is required to provide 0.5-log *Giardia lamblia* and 4.0-log virus inactivation through chlorine disinfection at all times, and based on changing influent water characteristics (flow, temperature, and pH) must adjust the chlorine dose accordingly. If the system desires to operate at a finished water chlorine residual lower than cited above (the 0.7 mg/L), the Compliance Assurance Section must be contacted to determine the type and frequency of data and/or additional information the system must measure and report to the Division.
- Part 1.2.11 of the Design Criteria requires all chemicals and materials that come in contact with water to be ANSI/NSF 60 and 61 certified, respectively, for potable water use.
- All wells, pipes, tanks and equipment shall be disinfected in accordance with AWWA procedures prior to start-up of the facility as required in Part 3.14 of the Design Criteria.
- All change orders or addenda that address treatment or piping must be submitted to this office in duplicate for review and approval by the Division.
- Article 1.12.3 of the CPDWR requires that systems submit any revisions to the Monitoring Plan within 30 days of the effective date of the change. Information on monitoring plans is available online at: <http://www.colorado.gov/cdphe/wqforms> on the Drinking Water page under the “Inventory/System Updates” heading.

The documents reviewed were:

- Plans Review Approval for Blue River Metro District Filtration System Upgrade Community Water System; PWSID No. CO0125148; Grand County, prepared by the Division, dated August 7, 2009.
- Miscellaneous correspondence.

The following notifications and requirements may apply to the project:

- Approval of this project is based only upon engineering design to provide safe potable water, as required by the CPDWR and shall in no way influence local building department or local health department decisions on this project. This review does not relieve the owner from compliance with all Federal, State, and local regulations and requirements prior to construction nor from responsibility for proper engineering, construction, and operation of the facility.
- In accordance with the current Colorado Operators Certification Board regulations, the Blue Valley Metropolitan District water supply system is required to be under the responsible control of a Class D water treatment operator and a Class 1 distribution system operator. According to our records, the water system is under the responsible charge of Matthew Willits. Our records state that Matthew Willits currently holds a Class A water treatment plant operator certification and a Class 4 distribution system operator certification. Therefore the operator certification requirements are being met.
- Any point source discharges of water from the facility are potentially subject to a discharge permit under the State Discharge Permit System. Any point source discharges to state waters without a permit are subject to civil or criminal enforcement action. If you have any questions regarding permit requirements contact the Permits Unit at (303) 692-3500.

Please direct any further correspondence regarding the technical approval (plans and specifications/design review) to:

Doug Camrud, P.E.
Colorado Department of Public Health and Environment
Water Quality Control Division – Engineering Section
4300 Cherry Creek Drive South
Denver, CO 80246-1530

Thank you for your time and cooperation in this matter. Please contact me by telephone at 303-692-3271 or by electronic mail at douglas.camrud@state.co.us if you have any questions.

The Engineering Section is interested in gaining feedback about your experience during the engineering review process. We would appreciate your time to complete a Quality-of-Service Survey regarding your experience during the engineering review process leading up to issuance of this decision letter. The Engineering Section will use your responses and comments to identify strengths, target areas for improvement, and evaluate process improvements to better serve your needs. Please take a moment to fill out our survey at the following website: <http://fs8.formsite.com/cohealth/form627710151/index.html>.

Sincerely,



Digitally signed by Doug Camrud,
P.E.

DN: cn=Doug Camrud, P.E., o, ou,
email=douglas.camrud@state.co.
us, c=US

Date: 2014.05.01 06:40:54 -06'00'

Doug Camrud, P.E.
Engineering Review Unit Manager
Engineering Section
Water Quality Control Division
Colorado Department of Public Health and Environment

Attachment: Revised Acceptance of the Graver Technologies Cartridge Filters Model QCR, QMA, ZTEC-B as an Alternative Filtration Technology to meet the *Colorado Primary Drinking Water Regulations* (CPDWR) requirements for *Giardia lamblia* and *Cryptosporidium* Removal, dated February 14, 2012

cc: Lurline Underbrink Curran, Grand County Manager
Scott Penson, Grand County Sanitarian
Drinking Water File PWSID CO0125148
Robert Pohl, WQCD CAS Compliance and Enforcement Unit
Andy Poirot, WQCD FSS Senior Field Engineer

APPENDIX E – OPINIONS OF PROBABLE COST



**OPINION OF PROBABLE COST
OF
CAPITAL IMPROVEMENT PROJECTS
FOR THE
BLUE VALLEY METROPOLITAN DISTRICT**

Project	Description	Quantity	Units	Unit Cost	Total	
1	Replace Non-Operational Infiltration Gallery Pump and Pitless Adapter (In Progress)					
	70 GPM Pump	1	EA	\$9,000	\$9,000	
	Pitless Adapter	1	EA	\$5,000	\$5,000	
	Subtotal				\$14,000	
	Contingency (20%)				\$2,800	
				Contractor's OH&P (15%)		
					\$2,100	
Project 1 Total					\$19,000	
2	Conduct Service Plan Evaluation and Rate Study					
	Service Plan Evaluation and Rate Study	1	LS	\$15,000	\$15,000	
	Subtotal				\$15,000	
				Contingency (20%)		
					\$3,000	
Project 2 Total					\$18,000	
3	Produce Water Model					
	Water Model	1	LS	\$20,000	\$20,000	
	Subtotal				\$20,000	
				Contingency (20%)		
					\$4,000	
Project 3 Total					\$24,000	
4	Conduct Water Service Meter Audit					
	Water Service Meter Audit	1	LS	\$1,500	\$1,500	
	Subtotal				\$1,500	
				Contingency (20%)		
					\$300	
Project 4 Total					\$1,800	
5	Replace Water Meters					
	Replace Water Meters	150	EA	\$600	\$90,000	
	Meter Reading Hardware	1	LS	\$10,000	\$10,000	
	Billing Software	1	LS	\$10,000	\$10,000	
	Subtotal				\$110,000	
				Contingency (20%)		
					\$22,000	
				Professional Engineering, Geotech and Surveying Fees		
					\$12,000	
Project 5 Total					\$144,000	
6	Establish Water Enterprise Fund					
	Establish Water Enterprise Fund	1	LS	\$10,000	\$10,000	
	Subtotal				\$10,000	
				Contingency (20%)		
					\$2,000	
Project 6 Total					\$12,000	
7	Acquire pH Probe for WTF					
	pH Probe	1	EA	\$300	\$300	
	Subtotal				\$300	
				Contingency (20%)		
					\$100	
Project 7 Total					\$400	
8	Conduct Infiltration Gallery Yield Test					
	Infiltration Gallery Yield Test	1	LS	\$10,000	\$10,000	
	Subtotal				\$10,000	
					Contingency (20%)	
					\$2,000	
				Professional Engineering, Geotech and Surveying Fees		
					\$2,500	
Project 8 Total					\$15,000	
9	Conduct Infiltration Gallery Improvements Following Yield Test					
	Infiltration Gallery Improvements	1	LS	\$75,000	\$75,000	
	Subtotal				\$75,000	
					Contingency (20%)	
						\$15,000
				Contractor's OH&P (20%)		
					\$15,000	
				Professional Engineering, Geotech and Surveying Fees (20%)		
					\$15,000	
Project 9 Total					\$120,000	



Project	Description	Quantity	Units	Unit Cost	Total
10	Install Raw Water Supply Pump Controls				
	Pump Control Improvements - Manual HOA	1	LS	\$11,000	\$11,000
				Subtotal	\$11,000
				Contingency (20%)	\$2,200
				Contractor's OH&P (15%)	\$1,700
				Project 10 Total	\$15,000
11	Consolidate Existing Maps to Master GIS Map				
	Consolidate Existing Maps	1	LS	\$15,000	\$15,000
				Subtotal	\$15,000
				Contingency (20%)	\$3,000
				Project 11 Total	\$18,000
12	Inspect Water Storage Tank & Develop Inspection and Maintenance Plan				
	Comprehensive Water Storage Tank Inspection	1	LS	\$3,600	\$3,600
	Develop Inspection and Maintenance Plan	1	LS	\$500	\$500
				Subtotal	\$4,100
				Contingency (20%)	\$900
				Project 12 Total	\$5,000
13	Install Ladder Guard to Prevent Unauthorized Access to Water Storage Tank				
	Ladder Guard	1	EA	\$1,200	\$1,200
				Subtotal	\$1,200
				Contingency (20%)	\$300
				Project 13 Total	\$1,500
14	Develop Water System Maintenance Plans				
	Develop Hydrant Flushing Program	1	LS	\$500	\$500
	Develop Valve and Exercising Program	1	LS	\$500	\$500
	Develop Line Flushing Program	1	LS	\$500	\$500
	Develop Leak Detection Program	1	LS	\$500	\$500
				Subtotal	\$2,000
				Contingency (20%)	\$400
				Project 14 Total	\$2,400
15	Annual Waterline Replacement				
	Waterline Replacement	10	YR	\$25,000	\$250,000
				Subtotal	\$250,000
				Contingency (20%)	\$50,000
				Project 15 Total	\$300,000
16	Annual GIS Map Update				
	GIS Map Update	10	YR	\$2,500	\$25,000
				Subtotal	\$25,000
				Contingency (20%)	\$5,000
				Project 16 Total	\$30,000
17					
	Excavation	1	LS	\$20,000	\$20,000
	Site Piping (Estimated Pipe Size and Length)	500	LF	\$200	\$100,000
	Valves, Fittings, and Appurtenances	1	LS	\$5,000	\$5,000
				Subtotal	\$125,000
				Contingency (20%)	\$25,000
				Project 17 Total	\$150,000
				Capital Improvement Projects Grand Total	\$876,000

APPENDIX F – BVMD SERVICE PLAN

BLUE VALLEY METROPOLITAN DISTRICT

AMENDED AND RESTATED **SERVICE PLAN**

Grand County, Colorado

March 2002

PREPARED BY

COLLINS COCKREL & COLE

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EXHIBITS

- A - Legal Description and Map of District
- B - Financial Plan

BLUE VALLEY METROPOLITAN DISTRICT
Grand County, Colorado

AMENDED AND RESTATED SERVICE PLAN

CHAPTER I - INTRODUCTION

A. General Overview

This Amended and Restated Service Plan (hereinafter "Service Plan") for the BLUE VALLEY METROPOLITAN DISTRICT (the "District") constitutes an amendment and restatement of the Blue Valley Metropolitan District Service Plan previously dated August 1975 for the purpose of outlining the proposed expansion of services and powers to accommodate the additional need for services within the area referred to as "Blue Valley". The District is located one mile east of the Blue River, eleven miles south of the City of Kremmling on Highway 9, and within Sections 27 and 34, of Township 1 South, Range 80 West. It presently consists of 223 acres of land, subdivided into 155 lots (of roughly 155 acres) for residential development, 48 acres for commercial use, and nine tracts of land for open spaces. The District provides water service to this area and to the residents. The 155 residential lots include 57 lots which were included effective June 4, 1981 as evidenced in the Grand County filing in book 293, page 966, reception number 184336. The District currently owns and operates water pumping, storage and distribution systems within the entire area.

The purpose of this Service Plan is to add additional powers and expand the services currently provided by the District to include anticipated needs that provide parks and recreation including trails, and road and drainage improvements. At the same time this Service Plan recognizes increases in costs for the public infrastructure which is the responsibility of the District, and acknowledges an increase in the general obligation debt authorization may be necessary in the future. Also, the Service Plan acknowledges the possibility of inclusions of additional property in the future, and the ability to further increase debt authorization to accommodate that infrastructure. Without the amendment and restatement of the District's Service Plan, the financing would be more expensive than necessary and ongoing operation and maintenance would be less certain.

The revised public infrastructure currently contemplated by the Metropolitan District includes a water production and storage system, a water distribution system, road and drainage improvements, and certain landscaping/recreational improvements. The

District's water functions currently contemplate additional construction of a building to house offices, administration, and operations functions, as well as provide for meeting facilities. This Service Plan addresses the improvements, which will be provided by the District and demonstrates how this District will serve the water, roads, and landscaping/recreational needs of the Blue Valley Metropolitan District.

Figure I - 1, at the end of this section, contains a general "Development Plan" for the community, followed by Table I - 1, containing development projections.

1. District Structure. This Amended and Restated Service Plan is submitted in accordance with Part 2 of the Special District Act (§ 32-1-201, *et seq.*, C.R.S.). It defines the powers and authorities of, as well as the limitations and restrictions on, Blue Valley Metropolitan District. It is intended that the District, as a Title 32 District, will provide certain essential public-purpose facilities for the use and benefit of its anticipated inhabitants and taxpayers. These persons include owners of real property located within the boundaries of the District as currently contemplated and as the same may be changed through the inclusion of additional territory and exclusion of territory.

The District will be responsible for managing the construction and operation of facilities and improvements needed for Blue Valley. The District will be responsible for providing the funding and tax base needed to support the Financial Plan for capital improvements. Various agreements are expected to be executed by the District clarifying the nature of the functions and services to be provided. The agreements will be designed to help assure the orderly development of essential services and facilities resulting in a community which will be both an aesthetic and economic asset to Blue Valley. Additionally, any intergovernmental agreements ("IGA's") which may be entered into between District and others are not now known, but may occur in the future.

This Amended Service Plan for the District will help assure proper coordination of the powers, authorities, and purposes of the District. Unless otherwise specifically noted herein, general provisions of this Service Plan apply to all of the Blue Valley Metropolitan District powers and services. Where possible, however, specific reference is made to an individual service to help distinguish the powers and authorities of each service. The "Financial Plan" discussed in Chapter V refers to a financial plan for all services.

The establishment of a modified Blue Valley Metropolitan District will generate the tax revenue sufficient to pay the costs of the capital improvements and maintenance, will create several benefits for the inhabitants of the community and Blue Valley. In general, those benefits are: (a) coordinated administration of construction and operation

of public improvements, and delivery of those improvements in a timely manner; (b) maintenance of reasonably uniform mill levies and reasonable tax burdens on all areas of Blue Valley through proper management of the financing and operation of public improvements; and (c) assured compliance with state laws regarding taxation in a manner which permits the issuance of tax exempt debt at the most favorable interest rates possible. Each of these concepts is addressed in greater detail in the following paragraphs.

2. Benefits of Metropolitan District Structure.

- a. Coordinated Services. As presently planned, development of Blue Valley will require the extension and maintenance of public services and facilities. The establishment of this modified metropolitan district structure to finance, acquire, construct, and operate the public facilities described in this Service Plan, whether within or without the District. Use of a Metropolitan District as the entity responsible for construction and maintenance of each phase of improvements and for management of operations will facilitate a well-planned financing effort.
- b. Mill Levy. Allocation of the responsibility for paying debt for capital improvements will be managed through a unified financing plan for those improvements and through development of an integrated operating plan for long-term operations and maintenance.
- c. Bond Interest Rates. The District structure will allow bonds or other obligations to be issued to finance public improvements at lower rates than if no District existed.

3. Configuration of District. A map showing the boundaries of the District is provided in Exhibit A. The District contains approximately 223 acres. Legal descriptions and a map of the property within the boundaries of the District are attached to the end of this Service Plan as part of Exhibit A. The boundaries of the District will change through inclusions and exclusions. The entire District is within the boundaries of Grand County.

The “service area” (the area legally permitted to be served) for the District will consist of the entire Blue Valley community. This area may be expanded to serve new development. The District will have power to impose taxes only within its legal boundaries, but will be permitted to provide public services to property or individuals outside of Blue Valley. The District will have power to assess taxes and other charges permitted by law. Additional revenue for the District will come in the form of tap fees and service charges for users of District’s services provided outside of the District.

It is currently anticipated that 152 residential units will be located within District, and that at build-out the District will include additional open space uses, although additional development could occur at some future date. The projected population of Blue Valley at full build-out is 456 persons, and the projected total valuation is approximately \$30,000,000, at \$200,000 per single-family unit and no multi-family unit currently planned. With inflation at 3% over time, in 15 years the total value will be approximately \$31,000,000.

It is possible that additional property may be included in the District. Under Colorado law, the fee owner or owners of one hundred percent of any property proposed for inclusion may petition the Board of Directors of the District for inclusion, or annexation, of property into the District. The District also has the authority to exclude property, potentially resulting in a substantial reconfiguration of District boundaries. Additionally, less than one hundred percent (100%) of the owners of an area may petition the District for an inclusion election, or the Board may adopt a resolution calling for an election on inclusion of the property. The Board of Directors will have discretion to permit inclusions without amending this Service Plan. The District acknowledges that if property is included within its boundaries, the construction of improvements therein shall be subject to approval by the Board of Directors and possibly the voters. In the event of the expansion, the electorate of the District may be asked to increase the debt authorization, none of which shall constitute a material modification of the Service Plan.

4. Long Term District Plan. After all bonds or other debt instruments have been issued by the District and adequate provision has been made for payment of all debt of the District, the electorate of the District may consider the dissolution of the District in accordance with state law. The District may only consider dissolution at the time the District's debt has been paid or defeased and adequate provision has been made for operation of all District facilities. Control of these decisions rests with the electorate in the District.

5. Existing Services and the District. There are currently no other entities in existence in this area which have the ability and/or desire to undertake the design, financing, construction and maintenance of improvements needed for the community. The amendment and restatement of the Service Plan for the District is necessary for provision of these public improvements in this area.

It is possible that key operations and maintenance services may be provided by other entities by appropriate agreements with the District. Consequently, while the

District will exist to finance capital improvements and coordinate the provision of services, it is expected to utilize existing entities and personnel as much as possible.

6. Property Owner Associations. The District will work with the property owner association.

B. General Financial Information and Assumptions

The 2001 certified assessed valuation for tax collection in 2002 of all taxable property within the boundaries of Blue Valley was approximately \$2,623,400.

The anticipated cost of improvements is contained within Chapter IV. The District may obtain financing for the capital improvements needed for Blue Valley through the issuance of general obligation bonds or other debt instruments and from revenue bonds or other instruments issued by the District. General obligation debt will be payable from revenues derived from ad valorem property taxes and from other sources. The District will issue general obligation debt after determination that the assessed valuation is sufficient to pay debt service with reasonable mill levies, thereby reducing risk to property owners. The preliminary financial forecast for the District is contained in Exhibit B to this Service Plan. This "Financial Plan" demonstrates one method which might be used by the District to finance the cost of infrastructure. At the time bonds or other debt instruments are proposed to be issued, alternate financing plans may be employed and may be utilized by the District.

The cost of infrastructure described herein can be provided with reasonable mill levies. The District will attempt to pay for improvements and infrastructure without an increase in the expected 2002 mill levy of 2.42 mills. The figures contained herein depicting costs of infrastructure and operations will not constitute legal limits on the financial powers of the District; provided, however, that the District shall not be permitted to issue bonds which are not in compliance with the bond registration and issuance requirements of Colorado law. Additionally, any future general obligation debt must be approved by the voters.

C. Contents of Service Plan

This Service Plan consists of a financial analysis and development plan showing how the facilities and services for Blue Valley can be provided and financed by the District. Numerous items are included in this Service Plan in order to satisfy the requirements of law for a special District. Each of the requirements of law is satisfied by this Service Plan.

The assumptions contained within this Service Plan were derived from a variety of sources. Information regarding the present status of property within the District, as well as the current status and projected future level of similar services was obtained from property owners. Construction cost estimates were developed by the District Board. This Amended and Restated Service Plan was prepared by the law firm of Collins Cockrel & Cole, District counsel, which represents numerous special districts.

D. Modification of Service Plan

This Amended and Restated Service Plan has been designed with sufficient flexibility to enable the District to provide required services and facilities for Blue Valley under evolving circumstances without the need for numerous amendments. While the assumptions upon which this Service Plan are generally based are reflective of current zoning for the property within Blue Valley, the cost estimates and Financial Plan are sufficiently flexible to enable the District to provide necessary services and facilities without the need to amend this Service Plan as zoning changes. Modification of the general types of services and facilities, and changes in proposed configurations, locations, or dimensions of various facilities and improvements shall be permitted to accommodate development needs consistent with then current zoning for the property.

FIGURE I - 1

Development Plan for the Budget Year 2001

The District has 90 finished units as of December 31, 2000. The District anticipates the completion of 4 additional units in the year 2001 and 4 to 5 additional units each year thereafter.

The assessed valuation for the Budget year 2000 was \$1,584,210, and the operating costs for the year 2000 were \$80,000; water sales were \$28,000; and tap fees were \$24,000. The operating mill levy of 3.679 mills yielded \$5,500.

The current assessed valuation for the Budget year 2001 is \$1,815,800, and the operating costs for the year 2001 have been estimated at \$120,000; water sales are \$35,000; and tap fees are \$40,000. The operating mill levy of 3.344 mills yielded \$6,000.

The current debt repayment obligation for the year 2001 is \$41,500 resulting in a debt mill levy which could be 22.855 mills.

At an assessed valuation of \$2,623,400 in Collection year 2002 for 90 units, the assessed value projection is expected to increase at a rate of \$29,148 for each new unit (with no inflation).

Debt Service is expected in the future to be paid from a 15.5 mill levy which is anticipated to be levied each year in addition to the Operating Mill levy and other revenue.

**Table I-1
Development Projections**

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Number of Units: Beginning	90	94	98	102	106	111	115	120	124	129	133	138	142	147	152	152	152	152	152	152
Number of Units: Built	4	4	5	4	5	4	5	4	5	4	5	4	5	5						
Total Units: Year End	94	98	102	106	111	115	120	124	129	133	138	142	147	152						
Total Assessed Valuation at \$29,148 Per Unit at Start of Year (In Millions)	2.6	2.7	2.8	2.9	3.1	3.2	3.4	3.5	3.6	3.8	3.9	4	4.1	4.3	4.4	4.4	4.4	4.4	4.4	4.4
Expected Operating Property Tax (In \$1,000)	6	6.6	7.3	8	8.7	9.6	10.6	11.7	12.8	14	15.4	16.9	18.6	20.4	22	22	22	22	22	22
Expected Service Charge Revenue at \$125 Per Quarter Per Unit for 15,000 Gallons, Plus \$3.00/1000 Over 15,000 Gallons to 20,000 Gallons, Plus \$4.00 per 1000 Over 20,000 Gallons (All Increasing 5% Per Year) (In \$1,000)	35	40	44	49	54	59	65	71	77	84	91	98	106	114	123	130	136	143	150	157
Expected Tap Fee Revenue at \$8,100 Per Unit Built (\$1,000)	32	32	40	32	40	32	40	32	40	32	40	32	40	40	0	0	0	0	0	0

CHAPTER II - NEED FOR DISTRICT AND GENERAL POWERS

A. Need for Metropolitan District

The property in the Blue Valley Metropolitan District is partially developed. Additional construction and expansion in the future is contemplated. No other entities exist which will finance the construction of the facilities contemplated herein. Operations and maintenance of some facilities will be assumed by the District as stated herein.

B. General Powers of District

The District will have power and authority to provide the services and facilities described in this Chapter both within and outside its boundaries in accordance with law. The District shall have authority to provide the following services and/or facilities:

1. Water. The design, acquisition, installation, construction, operation, and maintenance of a complete **potable water system**, including but not limited to, water rights, water supply, treatment, storage, transmission and distribution systems for public or private purposes, together with all necessary and proper reservoirs, treatment works and facilities, wells, water rights, equipment and appurtenances incident thereto which may include, but shall not be limited to, transmission lines, distribution mains and laterals, storage facilities, land and easements, together with extensions of and improvements to said systems. The water functions also contemplate future construction of a building to house their offices, administration, and operations functions, as well as provide for meeting facilities.

2. Roads and Drainage. The design, acquisition, construction, relocation, completion, installation and/or operation and maintenance of **road and drainage improvements**, together with all necessary, incidental, and appurtenant facilities, land and easements, together with extensions of and improvements to said facilities.

3. Streets. The design, acquisition, construction, relocation, completion, installation and/or operation and maintenance of **street improvements**, including culverts, and other drainage facilities, pedestrian ways, paving, lighting, grading, landscaping, irrigation, and structures; and street-related electric, telephone, and gas; together with all necessary, incidental, and appurtenant facilities, land and easements, together with extensions of and improvements to said facilities within and without the boundaries of the District. All roadway improvements will be constructed to Grand County standards and may be retained by the District for perpetual ownership and maintenance.

4. Parks and Recreation. The design, acquisition, construction, relocation, completion, installation and/or operation and maintenance of **parks and recreation facilities** including, but not limited to, parks, bike paths and pedestrian ways, open space, landscaping, cultural activities, community recreational facilities, irrigation facilities, and other active and passive recreational facilities and programs, and all necessary, incidental and appurtenant facilities, land and easements, together with extensions of and improvements to said facilities within and without the boundaries of the District.

5. Legal Powers. The powers of the District will be exercised by its Board of Directors to the extent necessary to provide the services contemplated in this Service Plan. The foregoing improvements and services, along with all other activities permitted by law, will be undertaken in accordance with, and pursuant to, the procedures and conditions contained in the Special District Act, other applicable statutes, and this Service Plan, as any or all of the same may be amended from time to time.

6. Other. In addition to the powers enumerated above, the Board of Directors of the District shall also have the following authority:

- a. To amend this Service Plan as needed, subject to the appropriate statutory procedures, including, by written notice to Grand County pursuant to § 32-1-207, C.R.S., notice of actions which the District believes are permitted by this Service Plan, but which may be unclear. In the event the County elects not to seek to enjoin any such activities under said statute, such election shall constitute agreement by the County that such activities are within the scope of this Service Plan. The District shall have the right to amend this Service Plan; and
- b. To forego, reschedule, or restructure the financing and construction of certain improvements and facilities, in order better to accommodate the pace of growth, resource availability, and potential inclusions of property within the District, or if the development of the improvements and facilities would best be performed by another entity; and
- c. To provide all such additional services and exercise all such powers as are expressly or impliedly granted by Colorado law, and which the District is required to provide or exercise or, in its discretion, choose to provide or exercise; and

- d. To exercise all necessary and implied powers under Title 32, C.R.S., in the reasonable discretion of the Board of Directors of the District; and
- e. If the District Board identifies a need to amend this Service Plan with respect to the construction of improvements or the provision of additional services, it shall be subject, in all circumstances, to the general provisions of the Service Plan, or if beyond the Service Plan, such amendments would require the approval of the District and the County.

CHAPTER III - DESCRIPTION OF FACILITIES AND IMPROVEMENTS

The District will be permitted to exercise its statutory powers and its respective authority set forth herein to finance, construct, acquire, operate and maintain the public facilities and improvements described in Chapter II of this Service Plan either directly or by contract. Where appropriate, the District will contract with various public and/or private entities to undertake such functions.

The descriptions contained in this Chapter show the conceptual plan for the facilities and improvements described in Chapter II hereof. Detailed information for each type of improvement needed for the District is set forth in the following pages. It is important to note that the descriptions contained in this Chapter are conceptual in nature only, and that modifications to the type, configuration, and location of improvements will be necessary as development proceeds. All facilities will be designed at a minimum in accordance with the regulations of Grand County and in such a way as to assure that the facility and service standards will be compatible with those of District and of other entities which may be affected thereby.

The following sections contain general descriptions of the contemplated facilities and improvements, which will be financed by the District.

A. General

Construction of all planned facilities and improvements will be scheduled to allow for proper sizing and phasing to keep pace with the need for service. All descriptions of the specific facilities and improvements to be constructed, and their related costs, are estimates only and are subject to modification as engineering, development plans, economics, the County's requirements, and construction scheduling may require.

B. General Design Standards

Improvements within the District will be designed and installed by the District in general conformance with current standards adopted by the District and County. Designs and contract documents prepared for improvements must be reviewed and approved by the District and the County if the improvements are to be dedicated to the County.

C. Water Infrastructure

1. General. The District will continue to provide community level water service, including major facilities sized for development throughout the Blue Valley area. The plan identifies infrastructure needed to support proposed development within the Metropolitan District. The District will retain the facilities for ownership, operation and maintenance. The District's water functions currently also contemplate future construction of a building to house their offices, administration, and operations functions, as well as provide for meeting facilities.

Historically, the majority of residential landscapes have been irrigated with treated water because it was readily available. The District is encouraging the use of raw water for irrigation.

2. Water Demand. Water demand and water rights data is provided by the water law firm of Balcomb & Greene, P.C. See Table II-1.

3. Water Infrastructure. The existing domestic water system owned, operated and maintained by the District provides water to the Blue Valley area and areas located to the south of the District. In order to meet the demands of all future water users, the existing system will need to be upgraded to include additional supply wells, booster stations and distribution lines. The infrastructure plan includes major facilities and includes the 6" main lines within the individual development areas.

The proposed water system is designed to provide domestic demand and fire flows to the individual development areas via water storage and booster stations. The water distribution and well supply lines are sized based on peak hour flows.

D. Roads and Drainage Improvements.

1. General. The District proposes to improve existing roads, provide minor drainage improvements and construct other drainage facilities as needed for the District. All roadway and drainage improvements and facilities will be designed to meet Grand County standards.

2. Roadway and Minor Drainage Improvements. The majority of the existing roadway infrastructure within the District is gravel. This includes Eagle Nest Trail, Eagle Nest Trail East, Spring Creek Drive, Short Road, Sheephorn Road, Blue

River Drive, Blue River Drive East, Badger Road, and Haystack Road. The District also has access to State Highway 9 and Spring Creek Road, a county road. As roadway improvements become necessary, categories of roadway improvements will be established with Grand County as required.

3. Drainage Improvements. The drainage plan is for major culvert crossings.

E. Street Landscape Improvements and Park and Recreation Improvements (Open Space)

1. General. This Service Plan proposes that the District take control and oversee the design, acquisition, installation, and ownership of certain Street Landscape Improvements as may be determined by the Board of Directors.

2. Parks and Recreation. The District reserves the right to exercise park and recreation district powers and authorities as it may provide recreational trails and trail improvements for the Blue Valley area. Other parks and open space areas may be proposed in the future as funding allows.

TABLE II - 1

Water Demand and Water Rights Data

(see Letter Attachment)

BALCOMB & GREEN, P.C.
ATTORNEYS AT LAW

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OF COUNSEL:
KENNETH BALCOMB

September 5, 2001

Via Facsimile (303) 986-1755 and U.S. Mail

James P. Collins, Esq.
Collins, Cockrel & Cole, P.C.
390 Union Boulevard, Suite 400
Denver, CO 80228-1556

Re: Blue Valley Metropolitan District Water Rights

Dear Jim:

Pursuant to your request, we are writing to briefly describe the Blue Valley Metropolitan District's water supply plan.

The District adjudicated the Blue Valley Metropolitan District Pump and Pipeline water right in Case No. 96CW286. This water right was decreed by the District Court, Water Division 5, on March 11, 1998.

The decree in Case No. 96CW286 entitles the District to pump up to 250 gallons per minute (g.p.m.) from an infiltration gallery (essentially, an underground water collection structure) constructed in the alluvium of the Blue River. The water right is decreed to provide domestic water service for up to 150 residences within the District, for fire protection purposes, for municipal purposes, and for the irrigation of 0.4 acres of lawns and landscape at each of the 150 residential sites (approximately 60 acres total). The projected annual depletion to the Blue River from these uses is approximately 150 acre feet of water per year.

The Blue Valley Metropolitan District Pump and Pipeline water right is relatively junior in priority and therefore is subject to being called by other senior rights on the Blue and Colorado River systems. In order to ensure the availability of an adequate year-round water supply, the District has entered into a water supply contract with the U.S. Bureau of Reclamation to lease 150 acre feet of water from Green Mountain Reservoir each year. This contract water is used to replace depletions to the river when the District's water right is out

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September 5, 2001
Page 2

of priority. Replacement of out-of-priority depletions using the Green Mountain Reservoir water was approved by the water court and made part of the decree in 96CW286.

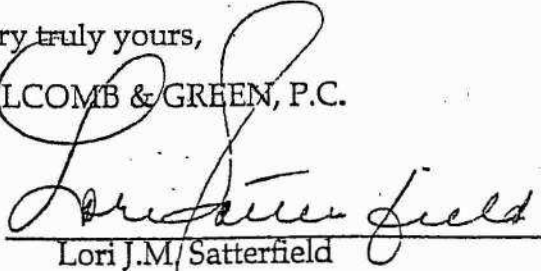
In Case No. 98CW27, the District adjudicated the Blue Valley Metropolitan District 1998 Well Nos. 1 and 2 water rights as alternate points of diversion of the Pump and Pipeline. The Water Court for Water Division 5 entered a decree for these water rights on August 10, 1998. The decree allows the District to use the wells in conjunction with, or in place of, the Blue Valley Metropolitan District Pump and Pipeline as a means of diverting the water decreed to the pump and pipeline in Case No. 96CW286. Total cumulative diversions through the Blue Valley Metropolitan District Pump and Pipeline and the Blue Valley Metropolitan District 1998 Well Nos. 1 and 2 are limited to the 250 g.p.m. originally decreed in Case No. 96CW286. The wells rely upon the same source of water as the pump and pipeline, and are also decreed to be augmented pursuant to the District's contract with the Bureau of Reclamation for water releases from Green Mountain Reservoir. Uses of the water diverted through the wells is also limited to the purposes previously decreed in Case No. 96CW286.

Please do not hesitate to contact me if you have any questions about the District's water supply plan.

Very truly yours,

BALCOMB & GREEN, P.C.

By


Lori J.M. Satterfield

cc: Jo Ann Read
LJS:kc

FIGURE II - 1

Water System

Shown on map attached as Exhibit A.

CHAPTER IV - COSTS AND REVENUE SOURCES

A. Cost of Construction and Operation

1. Water System - Capital Costs. This is not applicable as the system has been fully built out.

2. Road and Drainage Development - Capital Costs. The roads and drainage system is complete for current District requirements. No road and drainage development costs are estimated at this time. As additional road and drainage projects are necessary, these projects will be developed and paid for depending upon available resources.

3. Open Space (Parks and Recreations) Landscaping Development – Capital Costs. It is anticipated that the District will undertake additional projects to develop landscaping, parks and recreation, and open space landscaping. These projects will be developed and paid for depending upon available resources.

4. Annual Operation and Maintenance Costs. The annual operational and maintenance costs of the water system, road and drainage, and landscape maintenance (exclusive of bond payments) are expected to total \$100,000.

5. Debt Service. The District has \$450,000 of 1998 Water Bonds. Any future debt will be subject to voter approval.

B. Revenue Sources

1. Property Taxes. A mill levy of 2.42 mills is assessed now and is proposed to be assessed in the future, raising approximately \$75 per year from the average single-family residence. This property tax will be in lieu of any homeowners' association dues or fees, will be income tax deductible to the property owner, and from which will have all landscape maintenance and District operation expenses paid.

2. Domestic Water Service Charges. The actual cost of operations and maintenance of the domestic water system, including a reasonable amount for depreciation and repair, is currently \$42.00 per month. These service charges will fluctuate from time to time based upon actual operation, maintenance and depreciation allowance required.

3. Water Plant Investment Fees. The average water plant investment fee ("tap fee") is \$8,100 per SFE.

4. Specific Ownership Taxes and Interest Income. These revenue sources are, of course, expected to be received; but, for conservative estimating purposes, are not shown.

CHAPTER V - FINANCIAL PLAN SUMMARY

Attached to this Service Plan as Exhibit B is a Financial Plan which shows how the proposed services and facilities may be financed and operated by the District. The Financial Plan includes the proposed operating revenue derived from ad valorem property taxes to be used by the District.

The Financial Plan currently includes no additional debt issuance by the District. The Financial Plan also shows how the financial operations of the District will be coordinated. The District anticipates the possibility of issuing future general obligation debt supported by ad valorem mill levies. However, the District believes its current mill levy of 2.42 mills is sufficient to meet the District's current operating needs.

The balance of the information contained in this Chapter of this Service Plan is preliminary in nature. All dollars are stated in 2001 uninflated dollars. Upon approval of this Service Plan, the District will continue to develop and refine cost estimates contained herein and prepare for bond issuances. All cost estimates will be inflated to current dollars at the time of bond issuance and construction. Engineering and other contingencies, as well as capitalized interest and other costs of financing will be added. All construction cost estimates assume construction to applicable local, state or federal requirements.

The maximum general obligation indebtedness for the District is not expected to exceed its current levels. The District shall have authority to finance and construct all facilities contemplated herein without the need to seek approval of any modification of this Service Plan. The District shall also be permitted to seek debt authorization from their electorates in excess of this amount to account for contingencies. Reasonable modifications of facilities and cost estimates shall likewise be permitted. Final determination of the amount of debt for which approval will be sought from the District's electorate from time to time will be made by the Board of Directors based on then-current estimates of construction costs, issuance costs, and contingencies. Authorization to issue bonds and enter into various agreements described herein will be sought from the District's electorate pursuant to the terms of the Special District Act, and the Colorado Constitution as amended from time to time.

In addition to ad valorem property taxes, and in order to offset the expenses of the anticipated construction and the District's operations and maintenance costs, the District will also rely upon various other revenue sources authorized by law. These will include the power to assess fees, rates, tolls, penalties, or charges as provided in § 32-1-1001(1), C.R.S., as amended. The Financial Plan assumes various sources of revenue, including ad

valorem property taxes, specific ownership taxes, water plant fees, and user charges, together with interest earnings on retained amounts. It is possible that a metered system of user charges will be established.

The Financial Plan does not project any significant accumulation of fund balances which might represent receipt of revenues in excess of expenditures under the TABOR Amendment. It is anticipated that the operations of the District will qualify as "enterprises" under the TABOR Amendment. If its operations do not qualify as enterprises under TABOR, revenues from all sources which exceed the permitted level of expenditures in a given year, will be refunded to taxpayers, unless a vote approving the retention of such revenues is obtained. To the extent annual District revenues exceed expenditures in this manner, the District will comply with the provisions of TABOR and either refund the excess or obtain voter approval to retain such amounts.

The maximum voted interest rate for bonds is currently set at twelve percent (12%). The proposed maximum underwriting discount will be voted at three percent (3%). It is estimated that the general obligation bonds, obligation revenue bonds, or notes, when issued, will mature not more than forty (40) years from date of issuance, with the first maturity being not later than three (3) years from the date of their issuance, as required by statute.

In the discretion of the Board of Directors, the District may set up other qualifying entities to manage, fund, construct and operate facilities, services, and programs. To the extent allowed by law, any entity created by the District will remain under the control of its Board of Directors.

The Financial Plan demonstrates that the District will have the financial capability to discharge the proposed indebtedness with reasonable mill levies assuming reasonable increases in assessed valuation and assuming the rate of build-out estimated in the Financial Plan.

CHAPTER VI - PROPOSED AGREEMENTS

A. Agreements/Authority

To the extent practicable, the District may enter into intergovernmental and private agreements better to ensure long-term provision of the improvements and services and effective management. Agreements may also be executed with other service providers. All such agreements are authorized to be provided by each, pursuant to Colorado Constitution, Article XIV, Section 18 (2) (a) and Section 29-1-201, et seq., Colorado Revised Statutes.

CHAPTER VII - OTHER REQUIREMENTS AND CONCLUSIONS

A. Requirements

The District shall be subject to the following additional requirements:

1. Submission of annual reports as described in §§ 32-1-207(3), C.R.S., in the form prescribed by Grand County.

2. Material modifications of this Service Plan, except as contemplated herein, shall be subject to approval by Grand County in accordance with the provisions of § 32-1-207, C.R.S.

B. Conclusions

It is submitted that this Service Plan for Blue Valley Metropolitan District as required by § 32-1-203(2), C.R.S., has established that:

1. There is sufficient existing and projected need for organized service in the area to be served by the District;

2. The existing service in the area to be served by the District is inadequate for present and projected needs;

3. The District is capable of providing economical and sufficient service to the area within its boundaries;

4. The area included in the District does have, and will have, the financial ability to discharge the proposed indebtedness on a reasonable basis;

5. Adequate service is not, and will not be, available to the area through Grand County, or other existing municipal or quasi-municipal corporations, including existing special District, within a reasonable time and on a comparable basis;

6. The facility and service standards of the District are compatible within which the District is to be located and each municipality which is an interested party under §§ 32-1-204(1), C.R.S.;

7. The proposal is in substantial compliance with a master plan adopted pursuant to § 30-28-108, C.R.S.;

8. The proposal is in compliance with any duly adopted county, regional, or state long-range water quality management plan for the area; and

9. The ongoing existence of the District is in the best interests of the area proposed to be served.

Therefore, it is requested that the Board of County Commissioners for Grand County, Colorado, which has jurisdiction to approve this Amended and Restated Service Plan by virtue of §§ 32-1-204.5, C.R.S., et seq., as amended, adopt a resolution which approves this consolidated "Amended and Restated Service Plan for Blue Valley Metropolitan District" as submitted.

Respectfully submitted,

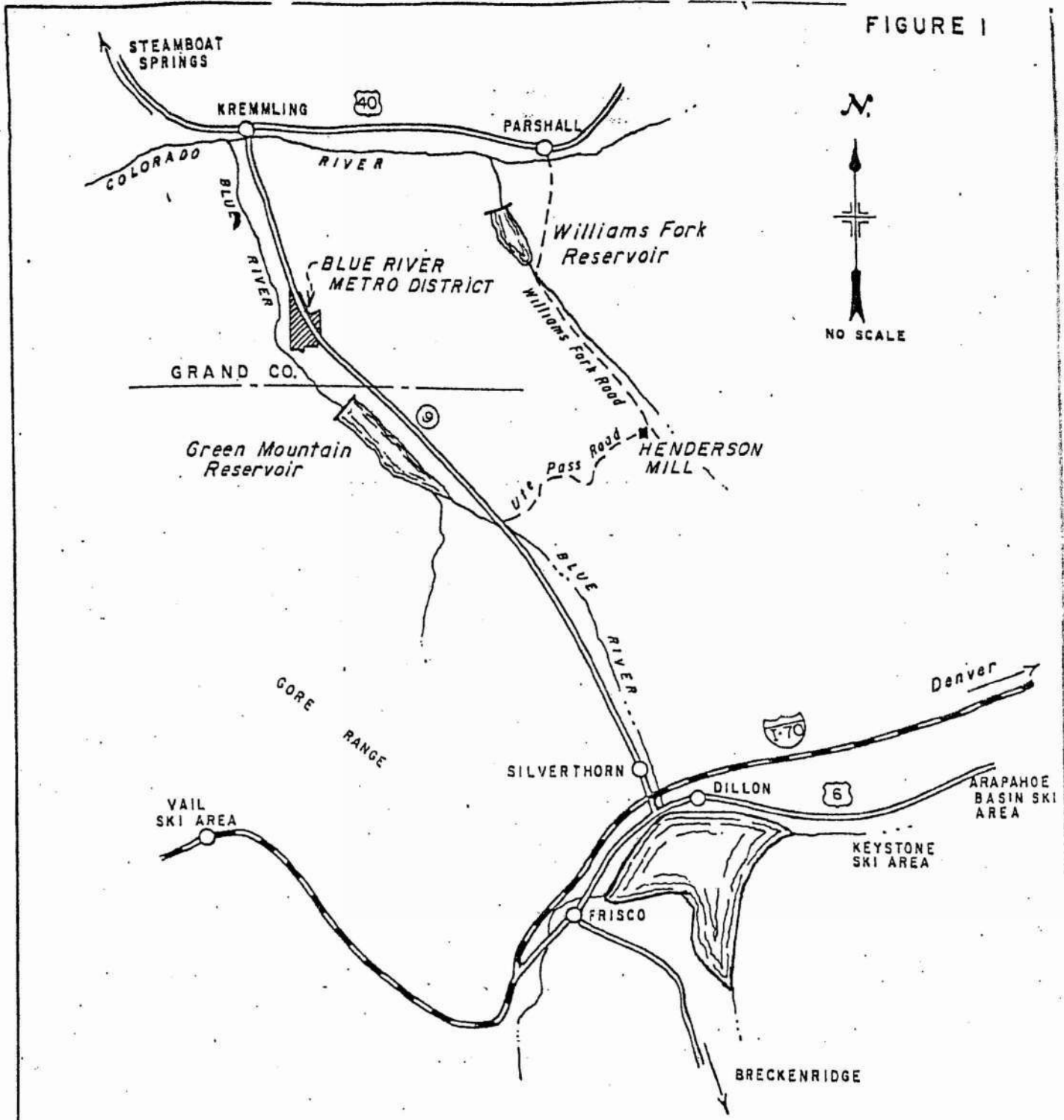
COLLINS COCKREL & COLE

By: 

David S. O'Leary
Counsel to the District

EXHIBIT A
Legal Description and Map of District

FIGURE 1



BLUE RIVER METROPOLITAN DISTRICT	
VICINITY MAP	
Nov 1974	W. W. Wheeler & Associates, Inc. CONSULTING ENGINEERS
	SK-197

EXHIBIT B

LEGAL DESCRIPTION OF METRO DISTRICT

A tract of land located in the west one-half of Section 34 and the west one-half of Section 27, all of Township one south, Range 80 west of the 6th principal meridian, County of Grand, State of Colorado, more particularly described by metes and bounds as follows:

Beginning at the northwest corner of said Section 34, thence N.0°11'12"E, 2649.19 feet to the west one quarter corner of said Section 27; thence N.0°12'39"E., 1315.60 feet along the west line of the northwest one quarter of said section 27 to the south line of lot 30, block 2, Blue Valley Acres; thence S89°55'00"E 379.12 feet, which point is on the easterly right of way line of Colorado Highway No. 9; thence southeasterly along said easterly right of way line the following courses and distances:

- X
1. ^{1,048.80} S8°46'42"E. 1,068.29 feet to the point of curvature; thence
 2. Southeasterly 1175.80 feet along the arc of a curve to the left having a radius of 2765.00 feet, a central angle of 24°22'00", and the chord of which bears S.20°52'30"E., a distance of 1166.98 feet; thence
 3. S.21°53'00"E., 125.20 feet; thence
 4. S.33°03'00"E., 214.92 feet to the southwesterly corner of block No. 5, Blue Valley Acres.

Thence N. 66°52'50"E., along the southerly line of said Block No. 5, 1649.76 feet to the southeasterly corner of said Block No. 5; thence S.0°08'16"W., 2187.02 feet along the east line of the southwest one quarter of said Section 27 to the south one quarter corner thereof; thence S.0°03'59"W., 1325.60 feet along the east line of the northeast one quarter of said Section 34 to the southeast corner of the northeast one quarter of the northwest one quarter of said Section 34; thence N.89°59'02"W, 1320.46 feet to the southwest corner of said northeast one quarter of the northwest one quarter; thence due south 127.02 feet; thence N.43°35'01"W., 309.38 feet; thence S.74°34'48"W., 823.63 feet; thence northwesterly 246.52 feet along the arc of a curve to the right having a radius of 238.12 feet, a central angle of 59°19'02", and the chord of which bears N.75°45'41"W. a distance of 235.66 feet; thence N.46°06'10"W., 118.40 feet to the west line of said Section 34; thence N.00°03'57"W, 1315.94 feet to the northwest corner of said Section 34, the point of beginning.

FIGURE 2
**BLUE RIVER METROPOLITAN DISTRICT
 SERVICE AREA**

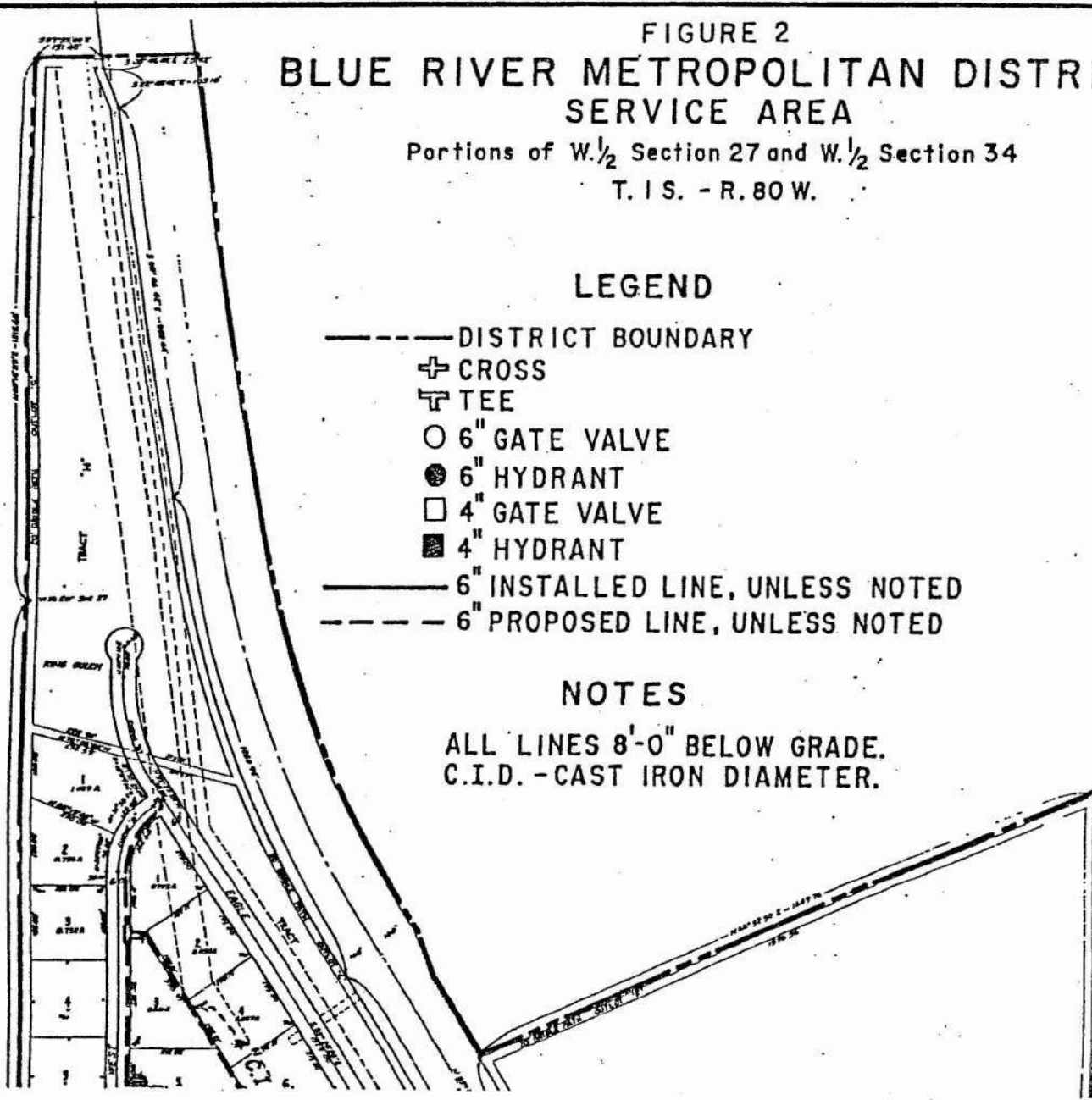
Portions of W. 1/2 Section 27 and W. 1/2 Section 34
 T. 1 S. - R. 80 W.

LEGEND

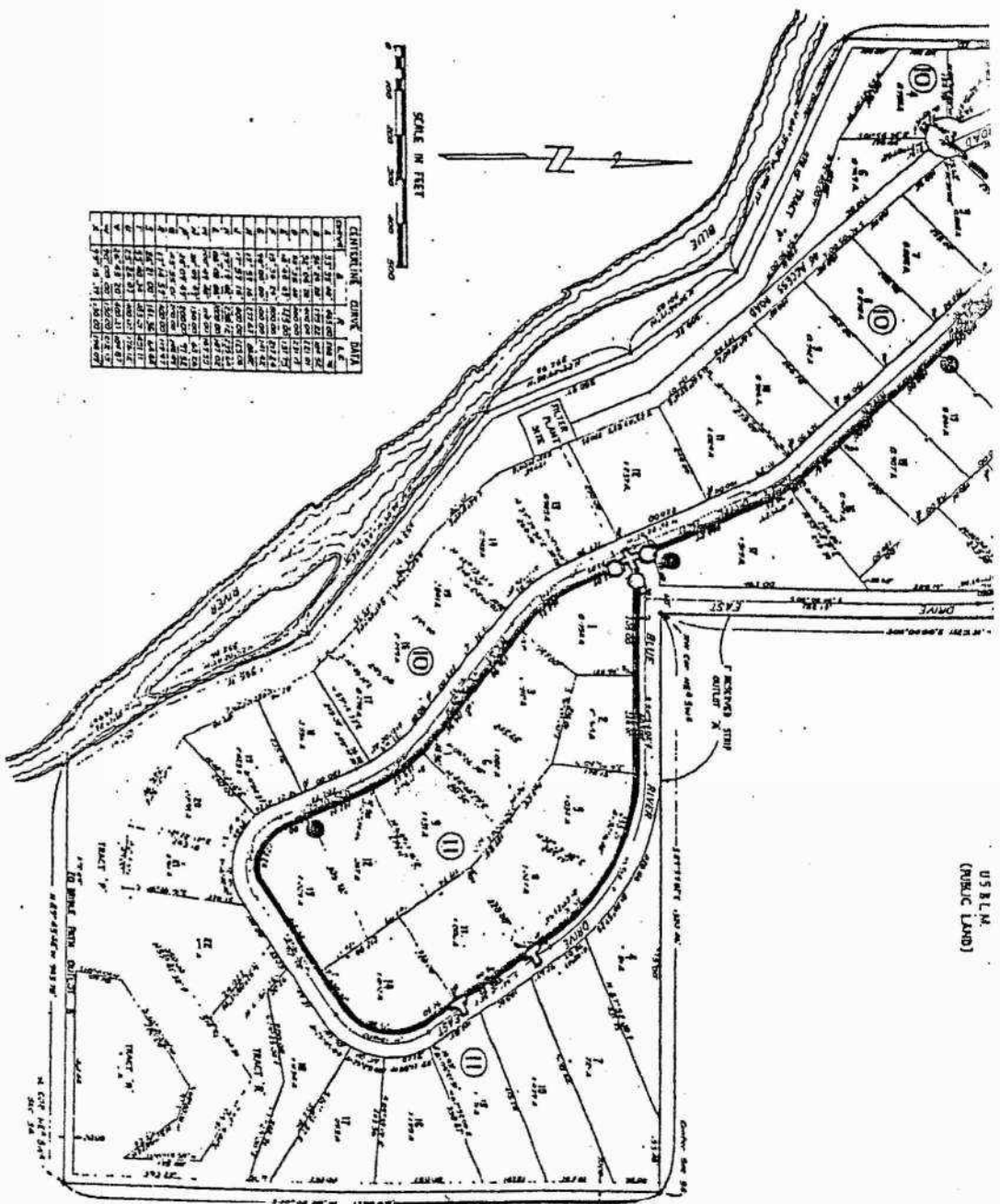
- DISTRICT BOUNDARY
- + CROSS
- T TEE
- 6" GATE VALVE
- 6" HYDRANT
- 4" GATE VALVE
- 4" HYDRANT
- 6" INSTALLED LINE, UNLESS NOTED
- 6" PROPOSED LINE, UNLESS NOTED

NOTES

ALL LINES 8'-0" BELOW GRADE.
 C.I.D. - CAST IRON DIAMETER.







CENTRING CURVE DATA

Station	Chord Length	Chord Bearing	Curve Length	Curve Bearing	Curve Area
1+00	100.00	N 0° 00' 00" E	100.00	N 0° 00' 00" E	0.00
1+10	100.00	N 10° 00' 00" E	100.00	N 10° 00' 00" E	1.57
1+20	100.00	N 20° 00' 00" E	100.00	N 20° 00' 00" E	6.28
1+30	100.00	N 30° 00' 00" E	100.00	N 30° 00' 00" E	14.14
1+40	100.00	N 40° 00' 00" E	100.00	N 40° 00' 00" E	25.13
1+50	100.00	N 50° 00' 00" E	100.00	N 50° 00' 00" E	39.27
1+60	100.00	N 60° 00' 00" E	100.00	N 60° 00' 00" E	56.57
1+70	100.00	N 70° 00' 00" E	100.00	N 70° 00' 00" E	77.02
1+80	100.00	N 80° 00' 00" E	100.00	N 80° 00' 00" E	100.63
1+90	100.00	N 90° 00' 00" E	100.00	N 90° 00' 00" E	137.44
2+00	100.00	S 0° 00' 00" E	100.00	S 0° 00' 00" E	0.00
2+10	100.00	S 10° 00' 00" E	100.00	S 10° 00' 00" E	1.57
2+20	100.00	S 20° 00' 00" E	100.00	S 20° 00' 00" E	6.28
2+30	100.00	S 30° 00' 00" E	100.00	S 30° 00' 00" E	14.14
2+40	100.00	S 40° 00' 00" E	100.00	S 40° 00' 00" E	25.13
2+50	100.00	S 50° 00' 00" E	100.00	S 50° 00' 00" E	39.27
2+60	100.00	S 60° 00' 00" E	100.00	S 60° 00' 00" E	56.57
2+70	100.00	S 70° 00' 00" E	100.00	S 70° 00' 00" E	77.02
2+80	100.00	S 80° 00' 00" E	100.00	S 80° 00' 00" E	100.63
2+90	100.00	S 90° 00' 00" E	100.00	S 90° 00' 00" E	137.44
3+00	100.00	N 0° 00' 00" W	100.00	N 0° 00' 00" W	0.00
3+10	100.00	N 10° 00' 00" W	100.00	N 10° 00' 00" W	1.57
3+20	100.00	N 20° 00' 00" W	100.00	N 20° 00' 00" W	6.28
3+30	100.00	N 30° 00' 00" W	100.00	N 30° 00' 00" W	14.14
3+40	100.00	N 40° 00' 00" W	100.00	N 40° 00' 00" W	25.13
3+50	100.00	N 50° 00' 00" W	100.00	N 50° 00' 00" W	39.27
3+60	100.00	N 60° 00' 00" W	100.00	N 60° 00' 00" W	56.57
3+70	100.00	N 70° 00' 00" W	100.00	N 70° 00' 00" W	77.02
3+80	100.00	N 80° 00' 00" W	100.00	N 80° 00' 00" W	100.63
3+90	100.00	N 90° 00' 00" W	100.00	N 90° 00' 00" W	137.44

W. W. Wheeler & Assoc
CONSULTING ENGINEERS
ENGLEWOOD, CO

US BLM
(PUBLIC LAND)

Exhibit B
Financial Plan
(See Table I-1)

OPERATING REVENUE (Presumes a Running Balance of \$70,000)	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Property Tax at 2.42 Mills (in \$1,000)	6	7	8	9	9	10	12	13	14	15	17	19	20	22	22	22	22	22	22
Service Charges (in \$1,000)	40	44	49	54	59	65	71	77	84	91	98	106	114	123	130	136	143	150	157
Tap Fees (in \$1,000)	32	40	32	40	32	40	32	40	32	40	32	40	40	0	0	0	0	0	0
Connection Fees, Interest Earnings and Fund Balance Use? (in \$1,000)	42	39	31	17	20	15	15	0	0	0	0	0	0						
Total (in \$1,000)	120	120	120	120	120	120	130	130	130	146	147	165	174	145	152	158	165	172	179
Totals	240	250	240	240	240	250	260	260	260	292	294	330	348	290	304	316	330	344	358
Operating Expenses	120	120	120	120	120	120	130	130	130	140	140	150	150	150	150	150	160	160	

APPENDIX G – PROPOSAL FOR YIELD ANALYSIS



BISHOP-BROGDEN ASSOCIATES, INC.

Christopher J. Sanchez
Jeffrey A. Clark
Daniel O. Niemela
Jonathan D. George
Michael A. Saylor
Charles E. Stanzione

April 23, 2019

Lillian B. Tolve
JVA, Incorporated
1512 Larimer Street, Suite 710
Denver, CO 80202

RE: Proposal for a Yield Analysis of the Blue River Metropolitan District Infiltration Gallery

Dear Ms. Tolve:

This letter presents a proposal to assist you with a yield analysis of the Blue River Metropolitan District (District) infiltration gallery. This effort will target the determination of yield from the existing gallery structure to support your master planning efforts for the District.

The District's infiltration gallery was constructed in 1998 under Permit No. 49622-F to a total depth of 20 feet. A shallow depth to a shale bedrock of 15 feet, limited saturated thickness and likely the characteristics of the alluvium at the District location, necessitated the construction of a gallery structure for the District's water supply as opposed to a conventional well structure. At the time of construction, the gallery structure was reported to produce 99 gallons per minute.

To assist you with your master planning efforts and to determine the potential yield of the gallery, we propose the following scope of work:

Scope of Work

- Interview the District's Operator: We will interview the District's operator to better understand the operation and reliability of the gallery structure, the pumping equipment and the opportunities for completing the pump testing including opportunities to collect water levels inside of the gallery structure during pumping.
- Complete a Site Visit of the Gallery Structure: In anticipation of pump testing, we will visit the District to investigate the gallery structure and confirm access and opportunities to complete pump testing on the structure. The field inspection may indicate that a contractor is required to complete the pump testing. If this is the

case, a bid for contractor support will be requested, received and reviewed. That contractor work will be in addition to any budget presented in this letter and will only be performed with your approval. We will observe operation of the well during this visit to the extent possible.

- **Review District Production Information:** You have provided us a link to a Dropbox with information regarding the gallery structure and the District including production information. We will rely on you and the District to provide any available information that may be relevant to our review. We understand that the District has a SCADA system that controls the gallery structure production. If additional information is available, which we will confirm during our interview of the District's operator, we will request that data as well. As part of this work, we will also review the permit files and decree files available from the State regarding the structure.
- **Perform Pumping Test:** We will prepare for and provide onsite observation of a pumping test of the gallery structure including the measurement of static and pumping water levels and observation of pumping rates. We understand that the wells can be controlled by the operator using the SCADA system and that the SCADA system can provide pumping rate information. For the purposes of this proposal, we assume that the gallery well can be accessed at the well head for water level measurements. Accordingly, we do not believe that a pump or well contractor will be required for this portion of the work. As noted above, if contractor support is required, we will seek a bid for that work and will not proceed with any contractor engagement or work without your prior approval. We propose an 8-hour pumping test for this effort, but the duration of the pumping test will be revisited after we learn more about the District's water system operations. We suggest that the gallery be tested before the end of June, if possible, to avoid higher stream flow conditions in the Blue River associated with releases from Green Mountain Reservoir that ramp up in June.
- **Prepare and Provide Technical Summary Memorandum:** We will prepare and provide a technical summary memorandum addressed to you presenting the findings of our investigation. The summary will focus on potential yield and pumping scenarios for the gallery structure to support your master planning efforts.

Agreement

We charge for consulting services based on hourly rates for our personnel assigned to your project. These rates include our employees' hourly salaries, general and administrative overhead, and fee. Our rates are reflected in the attached Standard Schedule of Compensation.

The expenses our personnel incur in direct connection with the project will be billed to you at cost plus 10 percent. We will submit invoices monthly and terms of payment are net thirty days; interest at the rate of 1½ percent per month (annual rate 18 percent) will be

Lillian B. Tolve

April 23, 2019

Page 3

added to that part of the balance not paid within thirty days of the invoice date. Services are subject to be discontinued on the project if payment on an invoice is not made within 45 days of the date of that invoice, unless prior arrangements have been made.

We estimate the consulting work associated with the proposed scope of work can be accomplished for approximately \$10,500. Meetings with you and others, work after our technical memorandum is delivered and work outside the above defined scope will be billed at our normal hourly rates, but will only be completed with your prior approval.

To confirm our understanding of this assignment, and authorize us to proceed, please sign the enclosed copy of this letter and return it to us for our files. The terms of this proposal are offered for a period of thirty days from submittal only.

To the maximum extent permitted by law, the Client agrees to limit the Consultant's liability for the Client's damages to the sum of \$100,000. This limitation shall apply regardless of the cause of action or legal theory pled or asserted.

We hope that this provides you with an indication of the consulting services that will be involved with the yield investigation of the gallery structure. If you have any questions or comments, please do not hesitate to call. We look forward to working with you on this project.

Very truly yours,

BISHOP-BROGDEN ASSOCIATES, INC.



Christopher J. Sanchez
Principal

CJS/jeb
Enclosure
GO-Prp

For: _____
Contracting Agency

By: _____
Authorized Signature Title

Date: _____



BISHOP-BROGDEN ASSOCIATES, INC.

Christopher J. Sanchez
 Jeffrey A. Clark
 Daniel O. Niemela
 Jonathan D. George
 Michael A. Saylor
 Charles E. Stanzione

SCHEDULE OF COMPENSATION

Effective January 2019

Applicable to Services Furnished on a Per Hour Basis

<u>Classification</u>	<u>Billing Rate</u>
PROFESSIONAL STAFF	
Principal.....	\$170.00-\$230.00
Associate/Senior Project Manager	\$160.00-\$170.00
Project Manager	\$135.00-\$165.00
Senior Engineer/Hydrogeologist/Hydrologist.....	\$115.00-\$160.00
Project Engineer/Hydrogeologist/Hydrologist.....	\$105.00-\$120.00
Engineer/Hydrogeologist/Hydrologist II.....	\$90.00-\$110.00
Engineer/Hydrogeologist/Hydrologist I.....	\$80.00-\$100.00
GIS Specialist.....	\$85.00-\$110.00
TECHNICAL SUPPORT STAFF	
Intern/Technician.....	\$60.00-\$80.00
Word Processing/Administration	\$60.00-\$80.00

The above Standard Schedule of Compensation is subject to periodic revision. The schedule includes salary costs, ordinary overhead and profit. Applicable expenses for travel and subsistence, incidental out-of-pocket costs, communications, reports preparation, printing, outside services, etc., are reimbursable at invoice cost plus 10 percent. Mileage is reimbursed at the IRS Standard Mileage Rates for business miles driven.

APPENDIX H – GUIDANCE DOCUMENT FOR LEAK DETECTION

WATER LEAK DETECTION AND REPAIR PROGRAM

EPD Guidance Document
August 2007

TABLE OF CONTENTS

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Unaccounted-for Water _____	4
Types of Leaks _____	4
Leak Detection and Repair Strategies _____	5
Checking for Leaks _____	6
<i>PART 2: MAIN ELEMENTS OF A COMPREHENSIVE LEAK DETECTION AND REPAIR PROGRAM</i> _____	7
<i>PART 3: LEAK DETECTION AND REPAIR REPORT FORM</i> _____	11

Georgia Environmental Protection Division
Watershed Protection Branch

Guidance Document

Leak Detection and Repair Programs

Developed by the Georgia Environmental Protection Division (EPD)
To support the “Coastal Georgia Water and Wastewater Permitting Plan for Managing Saltwater Intrusion”

This guidance document is principally intended for entities in the 24-county area of Georgia’s coast addressed in the “Coastal Georgia Water and Wastewater Permitting Plan for Managing Saltwater Intrusion”, located in Sub-Regions 1, 2 and 3, that are:

- Private Industrial Transient and Non-Transient Non-Community Water Systems (TNCWS and NTNCWS) with an Operating Permit and a Water Withdrawal Permit; or
- Private Industrial Transient and Non-Transient Non-Community Water Systems (TNCWS and NTNCWS) with ONLY an Operating Permit.

It is designed to guide the development and implementation of a leak detection and repair program for industrial or small commercial water system permittees, who are required to address leak detection and repair as a condition of their permit. However, Community Water Systems of all types could also greatly benefit from this document.

When to use this guidance document: For permittees described above using water derived from the Upper Floridan aquifer in the coastal counties of Georgia, a special condition of all new or modified withdrawal permits will be development and implementation of a water leak detection and repair program. The permittee must submit a detailed description of that program to the Georgia Environmental Protection Division’s District Office for concurrence no later than 18 months from the permit issue date. The program must be updated at intervals determined by EPD.

How to use this guidance document: This guidance document is organized into three parts: Part 1: Essentials of Leak Detection and Repair – Provides a discussion of the importance of leak detection and repair, the major causes of leaks, and how to identify leaks. Part 2: Main Elements of a Leak Detection and Repair Program – Provides a detailed description of the type of program permittees should implement, and related compliance requirements. Part 3: Leak Detection and Repair Form – Provides a form for small commercial users or industrial permittees to use to assure compliance with the various requirements of the program described in Part 2. This form must be submitted to EPD with the detailed description of the leak detection and repair program.

EPD Contact: If you have any questions, or require additional information, please contact the EPD Drinking Water Program, at 404-656-4807. As the July 2006 Coastal Permitting Plan is implemented, EPD will welcome feedback from permittees regarding this guidance document.

PART 1: ESSENTIALS OF LEAK DETECTION AND REPAIR

SUMMARY

Detecting and repairing leaks is one of the main components of water conservation. This guidance document will address the strategies to reduce water loss due to leaks, and acknowledges the concepts developed by organizations such as the International Water Association (<http://www.iwahq.org>) October 2000 Reference Paper “[Losses from Water Supply Systems](#)”, and the American Water Works Association (www.awwa.org) Manuals of Water Supply Practices.

Old or poorly constructed pipelines, inadequate corrosion protection, poorly maintained valves and mechanical damage are some of the factors contributing to leakage. Leak detection has historically assumed that all, if not most, leaks rise to the surface and are visible. In fact, many leaks continue below the surface for long periods of time and remain undetected. With an aggressive leak detection program, water systems can search for and reduce previously undetected leaks. Water lost after treatment and pressurization, but before delivered for the intended use, is water, money and energy wasted. Accurate location and repair of leaking water pipes in a supply system greatly reduces these losses. Once a leak is detected, the water utility must take corrective action to minimize water losses in the water distribution system.

Unaccounted-for-water for industrial/commercial systems should not be more than 10 percent of the total water produced. It is preferred that more than 95% of the water delivered be accounted for. Any loss of more than 10 percent in a system requires priority attention and corrective action. Advances in technology and expertise should make it possible to reduce losses and unaccounted-for-water to less than 10 percent.

Every industrial and commercial water system facility should implement cost effective water loss control measures that will minimize distribution system water losses. Water systems with pressurized distribution systems should promote water auditing, leak detection, and leak repair as a means to reduce operating costs and conserve water. The water audit can be used on systems with customer meters, while leak detection and repair can be used on any pressurized water system. The difference between produced water and the total of metered use and authorized non-metered use estimates is an indicator of the severity of unauthorized use problems or system water leaks.

Benefits of Leak Detection and Repair

Minimizing leakage in water systems has many benefits for water customers (and their suppliers). These benefits include:

- Improved operational efficiency.
- Lowered water system operational costs.
- Reduced potential for contamination.
- Extended life of facilities.
- Reduced potential property damage and water system liability.
- Reduced water outage events.
- Improved public relations.

Some added benefits of leak detection and repair that are difficult to quantify include:

- increased knowledge about the distribution system, which can be used to respond more quickly to emergencies and set priorities for replacement or rehabilitation programs;
- more efficient use of existing supplies and delayed capacity expansion;
- increased firefighting capability.

Leak detection and repair programs can lead other important water system activities, such as:

- inspecting hydrants and valves in a distribution system;
- updating distribution system maps;
- using remote sensor and telemetry technologies for ongoing monitoring and analysis of source, transmission, and distribution facilities. Remote sensors and monitoring software can alert operators to leaks, fluctuations in pressure, problems with equipment integrity, and other concerns; and
- inspecting pipes, cleaning, lining, and other maintenance efforts to improve the distribution system and prevent leaks and ruptures from occurring. Systems might also consider methods for minimizing water used in routine water system maintenance.

Unaccounted-for Water

Unaccounted-for-water includes unmeasured water put to beneficial use as well as water losses from the system. It is the difference between water produced (metered at the treatment facility) and metered use (i.e., water sales plus non-revenue producing metered water). Unaccounted-for water can be expressed in millions of gallons per day (mgd) but is usually discussed as a percentage of water production:

$$\text{Unaccounted-for water (\%)} = [(\text{Production} - \text{metered use}) / (\text{Production})] \times 100\%.$$

Authorized un-metered uses include firefighting, main flushing, process water for water treatment plants, landscaping of public areas, etc. Water losses include all water that is not identified as authorized metered water use or authorized un-metered use.

Types of Leaks

There are different types of leaks, including service line leaks, and valve leaks, but in most cases, the largest portion of unaccounted-for water is lost through leaks in supply lines. There are many possible causes of leaks, and often a combination of factors leads to their occurrence. The material, composition, age, and joining methods of the distribution system components can influence leak occurrence. Another related factor is the quality of the initial installation of distribution system components. Water conditions are also a factor, including temperature, velocity, and pressure. External conditions, such as stray electric current; contact with other structures; and stress from traffic vibrations, frost loads, and freezing soil around a pipe can also contribute to leaks.

Underground Leaks

The underground piping on either side of a water meter should be maintained. Leaks in underground plumbing can be caused by many different factors, including rusting through from age or from stray electric currents from other underground utilities that can prematurely rust metallic piping, driving over piping with heavy trucks or equipment, poor initial installation, freezing and thawing of a pipeline,

leaking joints or valves, or transient high pressure events such as opening and closing valves or starting and stopping pumps quickly.

Signs of underground leaks include:

- Unusually wet spots in landscaped areas and/or water pooling on the ground surface.
- An area that is green, moldy, soft, or mossy surrounded by drier conditions.
- A notable drop in water pressure/flow volume.
- A sudden problem with rusty water or dirt or air in the water supply (there are other causes for this besides a leak).
- A portion of an irrigated area is suddenly brown/dead/dying when it used to be thriving (water pressure is too low to enable distant heads to pop up properly).
- Heaving or cracking of paved areas.
- Sink holes or potholes.
- Uneven floor grade or leaning of a structure.
- Unexplained sudden increase in water use, consistently high water use, or water use that has been climbing at a fairly steady rate for several billing cycles.

If any of these conditions exist at a property, there may be a leak. If a leak is suspected, a professional leak detection company may be required to pinpoint its exact location and a contractor hired to perform repairs. There are leak detection service companies listed in the yellow pages. Any utility contractor should be able to repair a leak once the location is known.

Leak Detection and Repair Strategies

There are various methods for detecting water distribution system leaks. These methods usually involve using sonic leak-detection equipment, which identifies the sound of water escaping a pipe. These devices can include pinpoint listening devices that make contact with valves and hydrants, and geophones that listen directly on the ground. In addition, correlator devices can listen at two points simultaneously to pinpoint the exact location of a leak.

Large leaks do not necessarily constitute the greatest volume of lost water, particularly if water reaches the surface where they are usually found quickly, isolated, and repaired. However, undetected leaks, even small ones, can lead to large quantities of lost water since these leaks might exist for a long time. Ironically, many small leaks are easier to detect because they are noisier and easier to hear using hydrophones. The most difficult leaks to detect and repair are usually those under stream crossings. Leak detection efforts should focus on that portion of the distribution system.

Active leak detection is crucial in identifying unreported water leakage and losses in the distribution system. Finding and repairing water losses through an active leak detection program will reduce water loss and, in many cases, save substantial money. Without a leak detection program, leaks may only be found when they become visible at the surface, or when major infrastructure collapses. Active leak control will reduce expensive emergency overtime repairs and the associated liability costs. The impact on customers is also greater in emergency repair situations as is the possible impact on other infrastructure (roads, sewers, utilities) and on the environment due to possible discharges of chlorinated water. Detecting leaks is only the first step in eliminating leakage. Leak repair is the more costly step in the process. On average, the savings in water no longer lost to leakage outweigh the cost of leak detection and repair.

In most systems, assuming detection is followed by repair, it is usually cost effective to completely survey the system every one to three years. Selecting a strategy depends upon the frequency of leaks in a

given pipe and the relative costs to replace and repair them. For example, instead of repairing older, leaking mains, some argue it is preferable to replace leak-prone older pipes. Deciding whether to emphasize detection and repair over replacement depends upon site-specific leakage rates and costs.

In general, leak detection and repair result in an immediate reduction in lost water, whereas replacement will have a longer-lasting impact to the extent that it eliminates the root cause of leaks. The most important factor in a leak detection and repair program is the need for accurate, detailed records that are consistent over time and easy to analyze. Records concerning water production and sales, and leak and break costs and benefits, will become increasingly important as water costs and leak and break damage costs increase and as leak detection and rehabilitation programs become more important. Generally, the water system should keep three sets of records: (1) monthly reports on unaccounted-for water; (2) leak-repair report forms; and (3) updated maps of the distribution system showing the location, type, and class of each leak.

Checking for Leaks

Identifying leaks can be difficult; however, at minimum the following should be performed:

- Inspect irrigation systems for obvious above ground leaks. Extremely wet areas above an underground pipe can be an indication of a broken pipe or joint.
- Examine equipment routinely and look at exposed pipes to see if you can visually see any leaking water.
- Compare your records with the same month of previous years. While the amount of water used will vary due to weather and processes, look for sharp increases in your consumption that could indicate a leak.

If you suspect a leak at your facility, take steps to get the leak fixed.

Business and Commercial Leak Detection

Costs related to leakage can add up quickly. Not only do businesses pay water and sewer charges for a leak, but there can be considerable additional costs for repairing water damage or from production down time caused by larger leaks. Some leaks may continue for years without being noticed, finally culminating in a sudden major failure from the gradual undermining of a footing or foundation segment. In some cases, failures from a long-term leak can endanger lives.

Because leaks are continuous and can cause damage over time, checking for leaks on a regular basis can prevent considerable expense on utilities and property repairs. Common sources of leaks are toilets, faucets or showerheads, broken mechanical equipment or valves and underground piping including water service lines and irrigation systems.

Equipment Malfunction: One of the largest sources of leakage at business/commercial properties is equipment malfunction. Often these kinds of “leaks” go on for extended periods because they are not causing any damage or disruption to daily operations. Common areas where malfunctions can occur include:

- Overflow valves or float valves on cooling towers, water features, swimming pool equipment, storage tanks, etc. can malfunction in the open position allowing equipment to continuously overflow water to the sewer.

- By-pass valves can be left open following equipment maintenance, allowing a piece of equipment that is normally on a closed cooling loop to operate in a single pass mode, wasting thousands of gallons of water every day.
- Temperature control valves fail, causing substantially more water to be passed through a piece of equipment than is necessary to cool it sufficiently.
- Off/on switches or sensors can stick in the on position, running water through machinery that normally would be shut off when not in use.
- Rusting through or separation of internal parts that allow water to escape and drain from a machine that normally contains and/or re-circulates the water.
- Nozzles that are supposed to shut off drip continuously or stick on.

A weekly or monthly visual inspection of water using equipment will usually uncover these types of problems.

Even businesses that do not use water as part of their operations can be harmed by water leaks. For example, it is estimated that, in an average residence, 20 or more gallons of water are lost to leakage each day, and the most common culprits are leaking toilets or dripping faucets. It is not uncommon to find toilets causing much more leakage than the average 20 gallons. Silent toilets leaks can account for up to 300 gallons of day of lost water without anybody noticing the leakage. This size of leak is very costly and should be repaired immediately. Leaks in flush valve style toilet are less obvious and need to be fixed by a person familiar with this procedure.

PART 2: MAIN ELEMENTS OF A COMPREHENSIVE LEAK DETECTION AND REPAIR PROGRAM

Private Industrial Transient and Non-Transient Non-Community Water Systems permittees must implement a comprehensive leak detection and repair program to attain a 10 percent or less unaccounted-for water loss in their systems. The program must include auditing procedures, and in-field leak detection and repair efforts, and be submitted to EPD as a condition of the withdrawal or operating permit.

Implementation of the comprehensive program submitted to EPD must consist of at least the following actions:

- 1) In accordance with permit requirements, the water system must adopt an industrial/commercial leak detection and repair program and submit an implementation schedule to EPD no later than 18 months from the permit issue date. The program prepared by the system must outline an implementation schedule to achieve unaccounted-for-water of not more than 10 percent within 5 years, or sooner, as outlined in this section.
- 2) The industrial/commercial leak detection and repair program to be submitted to the EPD should, at minimum, include the following information:
 - (a) Actual annual water production volume by the supplier.
 - (b) Annual distribution system leakage (unaccounted-for water) expressed in percentage and volume.

Distribution system leakage totals calculated in accordance with the formula below shall be recorded in annual percent and volume;

$$\text{DSL}(\%) = [(\text{TP} - \text{AC}) / (\text{TP})] \times 100$$

Where:

- DSL = Percent of Distribution System Leakage (%)
- TP = Total Water Produced and Purchased
- AC = Authorized Consumption

These numbers should be entered on the “Leak Detection and Repair Form” in Part 3 of this Guidance Document. Note that:

- (i) Total water produced and purchased, and authorized consumption must be calculated. Elements of authorized consumption that cannot be metered, such as fire flow, must be estimated;
 - (ii) All or portions of transmission lines may be excluded when determining distribution system leakage; and,
 - (iii) Any water that cannot be accounted for shall be considered distribution system leakage.
- (c) You must maintain reportable evidence documenting that:
- (i) A leak detection survey using best available technologies has been completed on the system within the past three years;
 - (ii) All leaks found have been repaired;
 - (iii) The system is unable to locate additional leaks; and,
 - (iv) Ongoing efforts to minimize leakage are included as part of the system's water-use efficiency program.
- (d) If the calculated annual distribution system leakage is greater than 10 percent, you must provide an explanation of any technical or economic concerns, or other system characteristics, contributing to exceedance of the 10% standard.
- (e) If an alternative method is being used to calculate distribution system leakage totals, then it must include annual figures and the chosen methodology's numerical standard(s). The alternative methodology used must be included in one of the recognized national publications on water loss and/or leakage. Furthermore, any alternative method must provide a better evaluation of distribution system leakage than calculating the percent of total water produced and purchased; it must be appropriate for the system requesting to use it; and it must use numerical standards so that compliance and action levels can be assessed.

- (f) For systems not fully metered, you must maintain documentation to report the status of meter installation and any actions taken to minimize leakage.
 - (g) You must maintain reportable evidence documenting that whether the system has developed and implemented a general water loss control action plan for the water system and whether the implementation schedule is being met.
 - (h) Maintain reportable evidence showing that the distribution system leakage has been calculated annually for the past three years, and whether the calculated annual distribution system leakage is 10 percent or less.
 - (i) If the average distribution system leakage for the last three years has not met the standard 10 percent or less, EPD will work collaboratively with the water system to ensure the control methods and level of activity are commensurate with the level of leakage. This may require the water system to develop and implement a water loss control action plan, and submit it to EPD's District Office for review and concurrence. The water loss control action plan shall, at minimum, address: (i) the control methods necessary to achieve compliance with the distribution system leakage standard of 10 percent or less; (ii) an implementation schedule; (iii) a budget (or Business Plan) that demonstrates how the control methods will be funded; (iv) any technical or economic concerns which may affect the system's ability to implement a program or comply with the standard including past efforts and investments to minimize leakage; (v) if the average distribution system leakage calculated is greater than 10 percent of total water produced and purchased, the water loss control action plan must assess data accuracy and data collection, implementation of field activities such as actively repairing leaks or maintaining meters within twelve months of determining standard exceedance.
- 3) The water system shall implement corrective actions measures that yield apparent and real water savings. Leak detection and repair must be a continuous effort. The water system shall reduce system leakage to an economic minimum and repair leaks when reported and cost-effective to repair. In addition to repairing all reported leaks, the water system should consider the following intervention measures to reduce components of un-reported leakage and background leakage:
- i. Sonic Leak detection surveys;
 - ii. Installation of acoustic data loggers;
 - iii. Accelerated repair of reported leaks;
 - iv. Regular measurement of District Metered Area flows, when applicable;
 - v. Replacement of leaky water mains and laterals; and
 - vi. Pressure management.
- 4) Based on the percent value, the leakage levels within the industrial/commercial water systems shall be classified into four different categories: Category A (less than 10%); Category B (11% - 12%); Category C (13% -14%); and, Category D (15% or greater).
- 5) The water system may use up to five years to implement measures to recover all economically recoverable losses and achieve compliance with the unaccounted-for- water of less than 10 percent, as follows:
- a) No later than Year 3: Must achieve Category C status or better with unaccounted-for-water of between 13% and 14%.

- b) No later than Year 4: Must achieve Category B status or better with unaccounted-for-water of between 11% and 12%.
 - c) No later than Year 5: Must achieve Category A status with unaccounted-for-water of less than 10 percent.
- 6) You must annually record and maintain leak detection and repair program activities by completing the *Leak Detection and Repair Report Form* in Part 3 of this Guidance Document. This form must be completed no later than January 31st of every year and summarize the program activities and results for the previous 12-month period. The completed forms must be available for review during EPD inspections and sanitary surveys, and copies submitted when requested by EPD.

Additional resources for developing a leak detection and repair program can be found in the International Water Association (<http://www.iwahq.org>) October 2000 Reference Paper “[Losses from Water Supply Systems](#)”, and the American Water Works Association (www.awwa.org) Manuals of Water Supply Practices, especially “Water Audits and Leak Detection (M36)”.

PART 3: LEAK DETECTION AND REPAIR REPORT FORM

Unaccounted-for Water Use:

Unaccounted-for water is the difference between water pumped or purchased and water that is metered or confidently estimated. Unaccounted-for water should include master meter inaccuracies, domestic and non-domestic meter under registration, errors in estimating for stopped meters, over registration revenue meters, unauthorized hydrant openings, unavoidable leakage, recoverable leakage, illegal connections, water storage tank overflows, data processing errors.

Calculation of unaccounted-for water use should be based upon the volumes reported on your monthly or semiannual reports filed with the Environmental Protection Division.

I. GENERAL SYSTEM INFORMATION

Reporting Period (Year)	
Water System Permit #	
Water System Name	
Water System Address	
Contact Person Name	
Contact Person Phone #	
Description of Water Use	

II. SOURCES OF WATER SUPPLY

Please give amounts in gallons per minute (**gpm**), per day (**gpd**) or million gallons per day (**mgd**).

Source Type: **SW** = Surface supply, **GW** = Ground supply, **P** = Purchased supply

Source Status: **R** = Regular use, **S** = Standby use, **E** = Emergency use

Name of Source	Source Type	Pumping Capacity

III. WATER USAGE AND METERING

Are all sources of supply (including major interconnections) equipped with master meters? Yes_ No_			
What percentage of your system is metered? __%		How often are they read?	
How many meters are recalibrated and/or replaced each year?			
Water Production for calendar year _____		Water Consumption for calendar year _____	
Total Water Production: (metered pumped or purchased)		Total Water Consumption: (metered use)	

IV. WATER SUPPLY AUDIT FOR CALENDAR YEAR _____

Total metered water production (from previous section)		Total		% of Total
Total metered water consumed (from previous section)		Subtract		
Authorized unmetered usage		Subtract		
e.g. firefighting, flushing, cleaning, etc..		Subtract		
		Subtract		
		Subtract		
Water lost to breaks that have since been repaired		Subtract		
TOTAL UNACCOUNTED-FOR WATER (Distribution System Leakage (DSL))		Sub-Total		

Formula: Unaccounted-for water (%) = (Production - metered & authorized use) / (Production) x 100% (DSL)

V. LEAK DETECTION AND REPAIR

Do you regularly survey your system for leaks with listening equipment? _____ yes _____ no						
Total miles of distribution pipe	Percent of system surveyed each year	Length of pipe surveyed each year	Listening equipment used	Year of Last survey	Number of leaks found	Number of leaks repaired

Do you have a regular water system rehabilitation program? _____yes _____no
If yes, give details:

On a separate page, please describe your future plans for water system leak detection and repair.

Recommendations:
 * Check at least one third of your water distribution system for leaks each year.
 * Fix every detectable leak as soon as possible.
 * Have an on-going system rehabilitation program.

VI. CERTIFICATION OF WATER LEAK DETECTION AND REPAIR PROGRAM:

To be signed by the owner or official of the water system operating this water system.

I hereby certify that the information provided on this form is true and accurate to the best of my knowledge and belief.

Date: _____ Signature: _____ Title: _____