2.0 Executive Summary (2000)

The Mt. Crested Butte Water and Sanitation District (District) owns and operates a conventional filtration water treatment plant (WTP), and a membrane filtration plant, the Meridian Lakes Park Water Treatment Plant, which services a smaller portion of the District. The WTP was originally built in 1985 and consists of two packaged Trident treatment trains. Each Trident treatment train is rated for 350 gpm (0.5 MGD) with a total plant capacity of 700 gpm (1.0 MGD). The WTP receives source water from the East River, Malensik Ditch, and several springs (CBMR Springs) in the area. The source water is combined in the WTP pre-sedimentation pond and flows by gravity to the two packaged filtration units. The East River Pump Station (ERPS) is adjacent the East River and uses a passive intake to collect water in the pump station pre-sedimentation pond. The settled water is subsequently pumped from the East River to the WTP site through approximately 4,500 linear feet of 8-inch diameter ductile iron pipe, built in 1976. The pipe alignment runs through an avalanche zone in steep terrain and its condition is unknown. The Malensik Ditch and spring sources are both conveyed by gravity to the WTP pre-sedimentation pond.

The WTP, ERPS, and pipeline have all had minimal upgrades and needs to be replaced. The current treatment process technology at the WTP cannot reliably achieve its rated capacity making it a challenge to meet system demands above 700 gpm (1.0 MGD). An assessment of the Trident units indicates that the current system capacity is only 500 gpm (0.7 MGD), the media is at the end of its useful life, and the controls need to be updated. The Trident units require significant operation and maintenance as parts wear rapidly, and other treatment equipment is failing. The WTP building also has limited space for the staff. Only two of the three pumps at the ERPS can operate at any given time due to electrical limitations. Both the ERPS and WTP do not have a backup power supply. The ERPS is difficult to access due to the steep access road, especially during the winter months. Backup power is crucial for the system and required by CDPHE. The pipeline has had minimal maintenance since construction in 1976 and there is only one pipeline running from the ERPS to the WTP which is problematic if it is ever out of service. The need for reliable water treatment and replacement of aging equipment and infrastructure at the WTP and ERPS require the District initiate a major capital improvement project to address these concerns.

The District has commissioned several evaluations to determine the most effective options to improve the WTP, ERPS, and pipeline. Based on the findings of these evaluations, replacing the ERPS, the ERPS pipeline, and constructing a new WTP are recommended. The selected alternative is to replace the Trident filters with membrane filtration technology based on several criteria. Membrane filters provide high levels of contaminant removal, have smaller footprints, provide more automation, and require less operator attention. Membrane technology is also a familiar technology for the District operators since it is currently used at the Meridian Lake Park WTP. The project also involves replacing the existing ERPS with a new pump station to replace aging equipment and meet future capacity. The new ERPS will be constructed adjacent to the existing pump station. A new redundant raw water pipeline will also be installed as part of the project. The new line will be larger to meet the increase in capacity of the WTP. In order to meet the future demand estimated in recent master planning efforts, the new system will be designed with a capacity of 1042 gpm (1.5 MGD) expandable to1,388 gpm (2.0 MGD).

3.5 Operator Certification (2000)

The proposed project will not impact the certification level required by the ORC and will not require staffing changes. The existing system requires a Class B certification to operate while the proposed membrane filtration system requires a Class C certification. The District's ORC, Kyle Koelliker is registered under the Operator ID 16696. He has a Class A Water Treatment Operator license with a certification number of CWP-WA-01190-1118 (36495), and a Class 4 Distribution System Operator license with a certification number of CWP-D4-01191-1118 (36496).

3.6 Record Keeping (2000)

The records are all stored in the office of the WTP at 2 Prospect Drive, Mount Crested Butte, CO 81225. The records are retained for the minimum required duration to meet the record keeping requirements of the Districts Monitoring Schedule.

More detail can be found in the "Records Locations" section of attachment 3.

3.7 Annual Budget (2000)

The District's financial planning is done on a yearly basis. The staff begins drafting the annual budget in September and submits it to the Board of Directors by October 15th. The board reviews the draft budget during the October and November board meetings and any modifications are made based on Board feedback. The final budget is approved through voting at the December Board meeting and is submitted to the DOLA by December 15th.

More information can be found in the 2019 Budget Adopted 12.11.18 and MCBWSD Memo for Annual Budgeting documents in Attachment 7.

3.8 Financial Status (2000)

The District currently plans their annual budget, as described in Section 3.7, using budget information from the previous two years.

Raftelis Financial Consultants was hired by the District to develop a financial plan including a sufficient reserve fund target, plan for future debt service coverage and capital needs, conduct a cost of service analysis, and to design an alternative rate structure. The District has developed a 5-year Capital Improvements Plan (CIP) which is included as part of Raftelis' financial analysis. According to the Water and Wastewater Rate Study by Raftelis, the District has approximately $16.6 million in the water CIP between 2018 to 2022. The wastewater fund has approximately $6.4 million in CIP between2018 to 2022. The District is targeting a cash reserve of 25 percent or 90 days of annual Operation and Maintenance (O&M) expenses and a capital reserve equal to 2 percent of net assets for the water fund and the wastewater fund. The Water Fund does not have any existing debt while the wastewater fund has an outstanding debt of about $375,000 that will be repaid by 2021.

The District currently charges a flat fee of $45.26 for sewer services. The District uses a meter based tiered rate structure for water consumption. The 2019 base rate for water is $44.30 for the first 4,000 gallons. The following are the rates for over 4,000 gallons. The

- Tier 2 - $4.04/1000 for 4,001 to 11,000 gallons.
- Tier 3 - $5.05/1000 for 11,001 to 20,000 gallons
- Tier 4 - $7.07/1000 for 20,001 and above gallons

The District has a total estimated revenue of $9,173,449 for both water and wastewater utilities in 2019 with $4,071,437 estimated for water and $5,102,012 from wastewater. The District estimates $1,705,953 for O&M expenditures and $873,000 for capital expenditures for water and $2,077,850 for O&M expenditures and $2,734,156 for capital expenditures for wastewater. The ending balance is expected to be $1,782,491 overall. More information can be found in the 2019 Budget Adopted 12.11.18, MCBWSD Memo for Annual Budgeting, and 2019 Rate Sheet documents in Attachment 7.

4.1 Health and Compliance (2000)

A sanitary survey at the WTP was conducted by CDPHE on June 6, 2019 with only minor problems. A sanitary survey was conducted at the WTP on April 20, 2016 which recorded one deficiency and one Regulation 11 violation further described in Section 5.2.2Current Compliance Status. The WTP is currently in compliance following changes made after the 2016 survey.

4.2 Existing facility limitations (2000)

The ERPS was built in 1976 with the pumps installed in 1985. Only two out of the three pumps installed in the ERPS can be operated at one time due to electrical service limitations. The ERPS also does not have a backup power supply. The ERPS is needed to pump raw water from the East River to the WTP. If the ERPS is offline due to a power outage, depending on the duration of the outage, there is a potential to limit available raw water to the WTP. The ERPS is also difficult to access, especially in the winter.

The existing transmission line is undersized for a future 1,388 gpm (2.0 MGD) capacity and has no redundancy. Parts of the pipeline is located in an avalanche zone, along steep slopes making maintenance and access difficult.

The existing WTP is unable to reliably meet the peak day demands. Although the filter units were designed for a combined capacity of 700 gpm (1.0 MGD), the actual maximum operating capacity is only 500 gpm (0.7 MGD). The WTP was built in 1985 and has reached the end of its useful life. Corrosion and buildup in pipes and analyzers, as well as unreliable systems like the air blower need to be replaced while addressing a lack of redundancy.

The chemical storage needs to be replaced since one of the two storage tanks is cracked and the WTP no longer has redundancy for chemical storage. The media in the Trident filters is the original media from the construction of the WTP and needs to be replaced. Media is typically replaced every 10 to 15 years.

The backwash systems for the Trident filters are controlled based on a turbidity threshold. The system's backwash system initiates backwashing at an effluent turbidity of 0.2 Nephelometric Turbidity Units (NTU) whereas other systems in similar geographic locations use a 0.1 NTU limit. The backwashing frequency during spring run-off can occur every 4 to 5 hours, which is a significant increase from typical operating conditions where a backwash may occur once a day or every other day. This limits the system's ability to continue treating water to meet the service area demands. There have been times when both Trident units have backwashed at the same time. The backwash pumps are also undersized.

The Trident units should have a backwash rate of 12 gpm/sf while the actual backwash rate is only at 10 gpm/sf.

Like the ERPS, the WTP also does not have a backup power supply. This is problematic because if either system loses power the District cannot provide water to customers. The water is pumped to distribution by the High Service Pump Station at the WTP. The District would have to rely on the water remaining in the storage tanks until power is restored. The District is located in a remote mountain town and not having a backup power supply increases the risk of not being able to meet domestic and fire demands. Backup power is also required by CDPHE.

4.3 Operations and Maintenance Issues (2000)

The existing WTP is ageing and requires excessive upkeep by the operators to sustain the equipment. O&M costs will continue to increase if the existing facilities are not updated or replaced. The operators must spend substantial time cleaning out the turbidimeters and replacing worn parts due to a combination of inadequate floc and old media that leads to ineffective filtration. The backwash system sometimes uses more water than the filters can produce. Currently, operators are manually adjusting chemical dose for coagulant, chlorine, and caustic soda and the actual dose of all the chemicals is unknown. The coagulant for pretreatment needs to be reevaluated to improve flocculation.

The operators are unable to monitor the discharge pressure at the ERPS from SCADA, and there is only one low level float currently monitoring the wetwell. The ERPS is difficult to access, but multiple pump failures force operators to make frequent visits for maintenance. The fuses inside the motor starters for the pumps are also blown often and operators need to perform maintenance before the pumps can operate. Remote monitoring and controls, as well as backup power at the ERPS will decrease visits to the ERPS for O&M.

5.1.1 Raw Water Supply

There are three main sources that supply the WTP. The three sources are:

Source 1: East River (surface water)

The East River is the primary source of raw water treated by the system. Raw water is pumped by the ERPS to the WTP pre-sedimentation pond where it blends with the other water sources.

Source 2: Malensik Ditch (surface water)

Water from the Malensik Ditch is fed to the plant when available to maximize water rights except during Spring runoff as this water is high in turbidity during runoff. Spring runoff usually starts in April and ends in June. Water from the Malensik Ditch originates from a spring gallery and flows by gravity to the WTP pre-sedimentation pond.

Source 3: Springs on Mt Crested Butte

The four springs are Upper Keystone 1, Upper Keystone 1A, Keystone Flats, and Painter Springs. Water from the springs is used throughout the year and account for approximately 30 percent of the raw water. Spring water is transported by gravity to the WTP pre-sedimentation pond.

There are no source modifications as part of the project.

5.1.2 Water Rights (2000)

The District's water rights for the East River allows for utilization of 7.6 cfs (3,400 gpm). In dry years, the WTP's call on the East River is limited to 1.78 cfs (797 gpm) in the summer and 1.1 cfs (493 gpm) in the winter. Flow from the springs fluctuate throughout the year and peaks at approximately 0.9 cfs (400 gpm) during spring runoff, which occurs between April and July. The Malensik Ditch provides up to 0.25 cfs (112 gpm) from July through November. The District has an existing water right for the Malensik Ditch pipeline for 1.5 cfs (670 gpm). The District has sufficient water rights to meet their current and projected demands.

The District owns additional water rights for the Meridian Lakes Park WTP which were conveyed to the District during the inclusion process. The Meridian Lakes Park WTP had 24.64 acre-feet of absolute water rights added in 2018, bringing the District's total water rights to 217.1 acre-feet. There is an additional 36.5 acre-feet of storage in the Meridian Lake Park Reservoir.

5.2.1 Overall treatment description (2000)

Raw water from the 500,000 gallon pre-sedimentation pond flows by gravity through a 12-inch ductile iron pipe to the WTP. The treatment process begins with two Trident conventional filtration packaged units. Disinfection is accomplished through a combination of UV inactivation and chlorine disinfection. Filtrate is conveyed to a clearwell with a volume of 80,000 gallons. The treated water is then pumped to the finished water storage tanks, with a combined capacity of 1.2 million gallons before going to the distribution system by gravity.

The WTP operates under the surface water treatment rule (SWTR) regulations and meets the Long Term 1 and Long Term 2 Enhanced SWTR requirements. The District receives over two credits of removal for *Cryptosporidium* and 2.5 credits for *Giardia*. The disinfection clearwell has been designed to target 0.5 credits for *Giardia* and 4.0 credits of removal for viruses. Baffles were installed to transform the clearwell into a serpentine configuration to increase contact time (CT) with an assumed baffle factor of 0.3.

5.2.2 Current Compliance Status (2000)

The District is currently in compliance with Regulation 11 after the improvements following the 2016 sanitary survey. The 2016 survey found that backflow prevention assemblies on controlled cross connections were not tested and maintained annually, which was identified as a significant deficiency. The District conducted a survey of all non single family residential connections and tested at least half prior to 2017. The backflow prevention and cross connection control plan was submitted to CDPHE September 9, 2016. All backflow preventers have been tested and are now functioning properly. In addition to backflow prevention, the 2016 sanitary survey found that the District was not properly monitoring and or recording turbidity values, which is a violation of Regulation 11, Section 11.8(1)(2). In July of 2016, the District installed a new turbidimeter and pump to sample from the entry point to the baffled clearwell. The turbidimeter and pump were integrated into the WTP's SCADA system on September 9, 2016. The District submitted a sanitary survey response form to CDPHE on June 1, 2016.

5.2.4 Appropriateness of Treatment Technologies (2000)

The existing Trident package system is appropriate treatment technology for the WTP based on historic finished water quality data, but the chemical pretreatment system is not adequate for TOC removal and runoff turbidity. During Spring, the Trident filtration systems need to be backwashed more frequently which results in difficulties meeting demand and decrease the operational capacity of the facility. This will be address by the proposed membrane filtration system, which will be designed for a firm capacity of 700 gpm (1.0 MGD).

5.2.5 Capacity of Treatment Technologies (2000)

Based on a the 20-year population growth projection from Section 6.2, the WTP needs to have a capacity of 1,388 gpd (2.0 MGD). Due to inefficiencies in the existing system, the operators are already experiencing difficulties meeting peak water demands. The Trident units have not been able to operate at the full capacity of each unit. Without upgrades or replacements, the District will not be able to meet water demands current or future.

5.2.6 Operational Controls (2000)

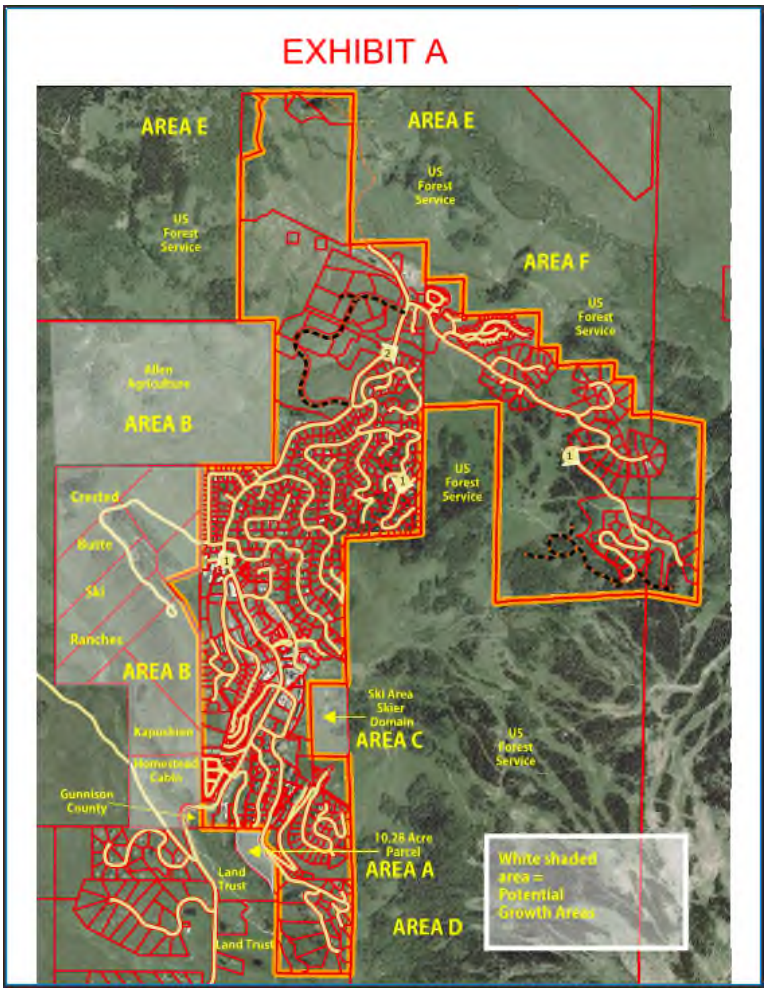
SCADA is used to control the WTP. The original control console for the Trident package system is in the electrical room and can be used when SCADA control is down. The ERPS is also controlled through SCADA but operators are unable to operate more than two pumps at a time due to electrical limitations. The chemical feed systems at the WTP are adjusted manually making it difficult to know the exact dose of coagulant, chlorine, and other chemicals being added to the water.

5.2.7 Residuals Management (2000)

The residuals collected from the filter backwash are sent to the backwash pond to settle. The settled water is then recycled via a pump station to the WTP pre-sedimentation pond to blend with the raw water sources. Solids in the backwash pond accumulate and are dredged, dewatered, and disposed of approximately every ten years.

6.1.2 Urban Growth Boundary (2000)

The Town of Mt. Crested Butte has developed a Three Mile Plan that was updated on September 4, 2018. The project components are within the Town's Three Mile Plan which aims to provide guidance on development and growth boundaries.



6.1.3 Local and Regional Issues (2000)

- Were local and regional planning efforts considered
    - The WTP is located close to the edge of the District boundary and far from heavily developed areas. There are housing developments next to the WTP and efforts have been made to minimize the disturbances caused by construction.
    - The District's planning department coordinated with local and regional planning agencies to coordinate demand projections for the 20-year planning horizon. Population and tourism projections used for these projections are consistent with the District's planning values and County projection estimates
- Were local and regional water quality and/or quantity efforts considered?
    - Neither source water quality nor quantity is an issue for the WTP.
- Was consolidation with another water system/treatment facility considered?
    - Due to the WTP's location, existing infrastructure, and water rights, consolidation with another water system is not feasible.

6.2 Population and Water Demand Projections (2000)

The District evaluates population and demand based on single-family dwelling (SFDs). To evaluate the future water demand for the WTP, 320 gpd/SFD was used to be consistent with former District planning documents. A 2.0 percent growth rate was chosen based on a conservative annual growth pattern from the past 20 years. A method similar to Method 2 was used by replacing ERTs with SFDs to calculate demand. Based on the growth projections a plant with a firm capacity of 868 gpm (1.25 MGD) and a rated capacity of 1,042 gpm (1.5 MGD) will meet the demands for a 20-year planning period.

See Attachment 17 for 20-year population and water demand projections.

6.3.1 Overall Water Resource Management Description (2000)

The District has sufficient water rights to meet the projected 20 year demand for the service area. The District also has water rights for source water that is treated by the Meridian Lakes Park WTP. The Meridian Lake Reservoir also has 192 acre-feet of storage.

The Town's water sources are of good water quality. The 10 million gallon raw water reservoir provides sufficient storage to provide a raw water supply buffer in the event of contamination in either Wildcat Creek or Coal Creek. The head-gate valve from Coal Creek, or the valve at the reservoir can be closed to isolate the reservoir from contamination under these conditions.

6.3.2 Water Rights (2000)

The District has sufficient water rights for the 20-year planning period. The District's water rights for the East River allows for utilization of 7.6 cfs (3,400 gpm), which already meets the 1,388 projected demand. In dry years, the WTP's call on the East River is limited to 1.78 cfs (797 gpm) in the summer and 1.1 cfs (493 gpm) in the winter. The District has additional water rights for the Malensik Ditch pipeline for 1.5 cfs (670 gpm), about 0.9 cfs (400 gpm) from the springs, and up to 0.25 cfs (112 gpm) from the Malensik Ditch which can account for the additional water needed to meet 1,388 gpm in dry years. The District has sufficient water rights to meet their current and projected demands.

6.3.3 Source Water Supply Capacity (2000)

The East River Pump station has three pumps, but only two are able to run at a time due to electrical limitations. There is also no backup power supply, so it may be difficult to meet demands if all pumps are not operable or if there is a power outage.

The existing raw water transmission line is only 8-inches in diameter and won't be able to handle a 1,388 gpm (2.0 MGD) capacity. There is also no redundant line. A new 12-inch pipeline will be installed to meet the projected 20-year demand while also providing redundancy.

7 Assessment of Alternative (will be included as an attachment for all)

See the Alternatives Assessment in Attachment 19.

8 Selected Alternative (will be included in the same attachment as 7)

8.4 Appropriateness of Treatment Technologies (2000)

The proposed treatment technologies will be able to treat the water to meet water quality standards set by CDPHE and EPA. The chosen pretreatment process is familiar to the operators in the District since the other treatment plant (Meridian Lakes WTP) within the District also uses membrane filtration. The new pump station will also allow the District to fully use their water rights. The proposed design will allow for expansion of the ERPS and WTP to 1,042 gpm (1.5 MGD) with a 1,388 (2.0 MGD) buildout and the pipeline will be designed for and initial capacity of 1,388 gpm (2.0 MGD). A redundant pipeline will be beneficial to the District to increase reliability in the event of a failure, minimize the effects of corrosion, and reduce the risk associated with other unforeseen events.

8.5 Environmental Impacts (2000)

The ERPS and pump station pre-sedimentation pond are surrounded by wetlands. As long as less than half an acre of wetlands is affected, the work will be permitted under a Nationwide 404 permit. The ERPS is located at an elevation of 9,063 feet, which is the same elevation as the 100-year floodplain elevation. Raising the new pump station's elevation by 2 feet above the bank elevations minimizes the risk of flooding.

A stormwater discharge permit will be required if the disturbed area is over 1 acre.

Resource Engineering has assisted the District in applying for multiple permits. The work for the ERPS and pipeline has been approved by the US Forest Service (USFS) and the Army Corp of Engineers. The USFS Heritage Assessment for the pump station has stated that the project has no potential effect on cultural resources.

8.6 Land Requirements (2000)

The majority of the pipeline is located on USFS land and permitting efforts with the District and Resource Engineering have been underway to permit the site for construction for the last several years. The final application for a special use permit to use approximately 3.5 acres of National Forest Lands has been submitted under the Federal Land Policy and Management Act and is awaiting approval. The pipeline alignment not within USFS land will be restricted to existing easements on CBMR property. Construction occurring for the WTP is restricted to the existing land owned by the District and no additional easements are anticipated.

8.7 Construction Requirements (2000)

The ERPS and pipeline are difficult to access due to their location. Existing access roads will be utilized for the ERPS construction and the pipeline construction will adhere to the requirements set forth in the USFS permit. A new WTP building will be constructed which will house the new treatment systems. The existing treatment process will not be decommissioned until the new system has been fully commisioned. This allows for minial downtime. Peak system demand for the District occurs during the summer and winter when tourism is at its highest. Due to the size of the project, the short construction

season, and weather impacts, construction will have to take place during peak demand seasons; however, efforts will be made to target priority construction activities, validation, and testing.

8.8 Operational Aspects (2000)

The proposed improvements do not impact the level of operator certification required to operate the facility, Class C. The system's ORC is a certified class A operator.

8.9 Costs (2000)

- Summarize the capital cost associated with the selected alternative. The 20 year cash flow projection included in Attachment 7 must reflect the capital and operation and maintenance costs associated with the selected alternative.
    - The total cost of the proposed project will be included after 30 percent design.
- Include an estimate of the projected increase in and total average monthly user charges. Does the user charge system allow for billing, collection, enforcement?
    - The project should decrease the overall O&M costs because the membrane system is automated and will require less maintenance and controls by operators.
    - The yearly O&M costs will continue to grow at the expected rate based on typical projected water demand growth over the 20-year planning period.