0.0 Executive Summary

Water planning is an important tool used to predict future water system needs and justify many different types of capital improvement projects. The Town of Breckenridge undertook this study to evaluate the need for a second water treatment plant and to identify and evaluate plant site alternatives. Included in the study are budget level cost estimates for the new plant and improvements to the water distribution system that are necessary to incorporate the new water plant into the existing infrastructure. The budgetary information can be utilized for future financial planning purposes.

Construction of a new 3 MGD conventional water treatment plant with a raw water intake located near Lake Dillon along the Blue River is recommended and supported by the study results. Major reasons for this recommendation include:

Potable Water Production Capacity

Current water treatment plant design capacity at the existing Gary Roberts Water Treatment Plant (WTP) is 5 MGD. However, the plant has an effective operational capacity of approximately 4 MGD during periods when the raw water experiences high turbidity during late spring and summer runoff. A difference in operational versus rated capacity is not unusual for water treatment plants of all sizes. Raw water variability and the type of treatment process units in the plant can impact the plant production capability. The Town plans to initiate evaluation and rehabilitation of the plant in 2014.

The Town has experienced a peak day water demand of 3.41 MGD in July 2008. Historically, July has been a peak water demand month in Breckenridge. Given the existing summertime plant operational capacity of approximately 4 MGD, the peak day demand accounts for more than 80% of the plant's production capacity. Population forecasts indicate that there will be a 10% chance for the 2015 peak day demand to exceed 5 MGD.

Good planning practice dictates that water systems should begin planning and designing capacity expansions when the system reaches 80% of the rated capacity, because it typically takes several years of planning and construction to bring a new treatment plant online.

Operational Flexibility

A 3 MGD water treatment plant will provide operational flexibility for the Town's water system. In the near term, repairs and improvements will be required at the existing water treatment plant to maintain it's viability over the long-term. Construction of a 3 MGD plant provides the Town with water treatment capacity that will allow portions of the existing plant to be taken off line to complete improvements. Having 3 MGD capacity at the second plant also allows for operational flexibility and the opportunity to have a second source of supply in the case of a wild fire in the Upper Blue River watershed. Planning for future development of a groundwater well as a second source of supply for the proposed plant also increases operational flexibility.

The plant could be constructed in two 1.5 MGD increments and the water demand managed by controlling the number of additional customers added to the system. Regardless of plant size, finished water from the new treatment plant should be delivered to the Town

distribution system without restricting the area that the new plant can serve. This will allow the Town to maximize benefits from having a second plant for demand management and water rights flexibility.

Maximizing Water Rights

Construction of a 3 MGD plant can allow for maximizing the Town's water rights, particularly if the new water plant intake is located below the Blue River Gauge near Dillon. Based on discussions with Tom Williamsen, the combination of a 3 MGD second plant and the location of the intake on this stretch of the River have significant advantages for flexibility of water storage in the Tarn. Water taken from below the Blue River gauge near Dillon must be augmented at 5 percent. If water production from the second plant is maximized during periods when storage is desired, the overall water requirement is reduced.

HDR recommends that the Town utilize a conventional water treatment process train due to overall treatment reliability along with operational flexibility. Treatment processes included in the proposed conventional water treatment plant are rapid mixing, flocculation, settling using plate settlers, dual media filtration, and disinfection utilizing chlorine. Drying beds are recommended for drying sludge. Due to the concern over space requirements, evaluation of and cost estimates for a packaged treatment system and mechanical dewatering equipment are provided as part of the study. The packaged plant option does not have a significant impact on the footprint required or equipment cost, but the mechanical dewatering equipment option does. Overall, the mechanical dewatering option saves an acre of space for triple the cost of drying beds. Depending on the outcome of the property acquisition this may be a beneficial option.

All treatment recommendations in the study require further evaluation at the time of preliminary design based on measurements of seasonal water quality near the intake. Pilot testing of the mechanical dewatering system is necessary to ensure that the Town's needs are met.

Five of seven sites considered in this study are deemed possible for construction of the water treatment plant. The five sites were evaluated in detail with respect to cost and to non-economic factors. The evaluated sites are identified by a numerical designation (1 through 5) in this report since some of them involve private property and must remain confidential. The least cost sites are Sites 3 and 4. The sites ranking highest with respect to non-economic factors are Sites 2 and 4. From a distribution standpoint, Sites 3 and 4 are favorable due to their proximity to the North Storage Tank and the ability to deliver water to the Tarn zone with a single finished water pump station.

The study details a distribution system evaluation that recommends improvements to expand the existing system and create new pressure zones to serve additional customers. A majority of the recommended improvements are tied to system expansion to meet future customer needs, so the improvements are the same for each potential second WTP site.

Financing sources for projects of the magnitude of the treatment plant are reviewed and the costs of debt financing are estimated. The impacts of a wildfire in the Upper Blue River watershed on the water utility are reviewed and suggestions are presented for preparation.

The estimated order of magnitude net construction cost of the treatment plant in 2013 dollars, including property acquisition, equipment, buildings, new raw water delivery and distribution system improvements, and site work ranges between $21.5 and $29 million for each of the five

sites. The order of magnitude net construction cost estimate in 2013 dollars for the distribution improvements required to increase the capacity of the distribution system to meet the demand from new customers is $43.5 million. These are approximate estimates made without extensive detailed engineering data. According to the American Association for Cost Estimating, this type of estimate is accurate within a range of -30% to +50%.

A summary of the costs for each site that was evaluated in detail is presented in Table 0-1. Each of the sites listed is considered adequate for constructing a new water treatment plant. Low and high range costs are presented for each site due to the broad spectrum of assumptions that are built into the cost estimates.

Table 0-2 presents a summary of the costs for distribution system improvements in each pressure zone. Improvements are grouped by zone because the projects in a single zone are typically hydraulically connected and dependent upon one another, so they should be constructed at the same time.

Table 0-1: Summary of Estimated Costs for a 3 MGD Water Treatment Plant at Various Sites in Breckenridge

Item No.	Description	Total Cost at Each Potential Site									
		Site 1		Site 2		Site 3		Site 4		Site 5	
		Low	High	Low	High	Low	High	Low	High	Low	High
1	Treatment Building	$ 9,649,000	$ 10,613,900	$ 9,649,000	$ 10,613,900	$ 9,330,000	$ 10,263,000	$ 9,649,000	$ 10,613,900	$ 9,649,000	$ 10,613,900
2	Utilities	$ 192,000	$ 211,200	$ 192,000	$ 211,200	$ 192,000	$ 211,200	$ 596,000	$ 655,600	$ 192,000	$ 211,200
3	Site Improvements	$ 1,207,000	$ 1,327,700	$ 1,246,000	$ 1,370,600	$ 1,317,000	$ 1,448,700	$ 1,670,000	$ 1,837,000	$ 1,748,000	$ 1,922,800
4	Property Acquisition	$ 611,000	$ 672,100	$ -	$ -	$ 446,000	$ 490,600	$ -	$ -	$ -	$ -
5	Raw and Finished Pipeline and Pump Stations	$ 5,030,000	$ 5,533,000	$ 5,382,000	$ 5,920,200	$ 3,886,000	$ 4,274,600	$ 5,031,000	$ 5,534,100	$ 7,376,000	$ 8,113,600
Subtotal Direct Construction Cost		**$ 16,689,000**	**$ 18,357,900**	**$ 16,469,000**	**$ 18,115,900**	**$ 15,490,000**	**$ 16,688,100**	**$ 16,542,000**	**$ 18,640,600**	**$ 18,965,000**	**$ 20,861,500**
Mountain Factor (10%)		$ 1,668,900	$ 1,835,790	$ 1,646,900	$ 1,811,590	$ 1,549,000	$ 1,668,810	$ 1,654,200	$ 1,864,060	$ 1,896,500	$ 2,086,150
Total Direct Construction Costs		**$ 18,357,900**	**$ 20,193,690**	**$ 18,115,900**	**$ 19,927,490**	**$ 17,039,000**	**$ 18,356,910**	**$ 18,196,200**	**$ 20,504,660**	**$ 20,861,500**	**$ 22,947,650**
Standard General Conditions (10%)		$ 1,835,790	$ 2,019,369	$ 1,811,590	$ 1,992,749	$ 1,703,900	$ 1,835,691	$ 1,819,620	$ 2,050,466	$ 2,086,150	$ 2,294,765
Subtotal NET Construction Cost		**$ 20,193,690**	**$ 22,213,059**	**$ 19,927,490**	**$ 21,920,239**	**$ 18,742,900**	**$ 20,192,601**	**$ 20,015,820**	**$ 22,555,126**	**$ 22,947,650**	**$ 25,242,415**
Overhead and Profit (15%)		$ 3,029,054	$ 3,331,959	$ 2,989,124	$ 3,288,036	$ 2,811,435	$ 3,028,890	$ 3,002,373	$ 3,383,269	$ 3,442,148	$ 3,786,362
Estimated NET Construction Cost (2013)		**$ 23,222,744**	**$ 25,545,018**	**$ 22,916,614**	**$ 25,208,275**	**$ 21,554,335**	**$ 23,221,491**	**$ 23,018,193**	**$ 25,938,395**	**$ 26,389,798**	**$ 29,028,777**
Inflation Escalation (19 Months to midpoint of construction at 3.0%)		$ 1,103,000	$ 1,213,388	$ 1,089,000	$ 1,197,393	$ 1,024,000	$ 1,103,021	$ 978,000	$ 1,232,074	$ 1,254,000	$ 1,378,867
Estimated NET Construction Cost (2015)		**$ 24,326,000**	**$ 26,758,406**	**$ 24,006,000**	**$ 26,405,668**	**$ 22,578,000**	**$ 24,324,512**	**$ 23,996,000**	**$ 27,170,469**	**$ 27,644,000**	**$ 30,407,644**
Engineering Plans, Studies, and Permit Preparation		$ 500,000	$ 550,000	$ 500,000	$ 550,000	$ 500,000	$ 550,000	$ 500,000	$ 550,000	$ 500,000	$ 550,000
Engineering Design, Construction Services, and Legal (20% on 2013)		$ 4,645,000	$ 5,351,681	$ 4,583,000	$ 5,281,134	$ 4,311,000	$ 4,864,902	$ 4,604,000	$ 5,434,094	$ 5,278,000	$ 6,081,529
Total Estimated Construction Cost (2015)		**$ 29,471,000**	**$ 32,660,087**	**$ 29,089,000**	**$ 32,236,801**	**$ 27,389,000**	**$ 29,739,414**	**$ 29,100,000**	**$ 33,154,562**	**$ 33,422,000**	**$ 37,039,173**

Table 0-2: Summary of Estimated Costs for Distribution System Improvements in Breckenridge

Item No.	Description	Total Cost of System Distribution Improvements	
		Low	**High**
1	Summit Estates Zone	$ 4,852,000	$ 5,337,200
2	Highlands Park Zone	$ 3,197,000	$ 3,516,700
3	Airport Zone	$ 755,000	$ 830,500
4	High School Zone	$ 3,341,000	$ 3,675,100
5	Forest Hill Zone	$ 2,119,000	$ 2,330,900
6	High Point Zone	$ 4,029,000	$4,431,900
7	Mt Baldy Zone	$858,000	$943,800
8	Woodmoor 1 Zone	$250,000	$275,000
9	Woodmoor 2 Zone	$2,764,000	$3,040,400
10	Bunker Hill Zone	$4,748,000	$5,222,800
11	Upper Slope Zone	$30,000	$33,000
12	White Cloud Zone	$30,000	$33,000
13	Tarn Zone	$3,948,000	$4,342,800
14	Tarn Pump Station at Gary Roberts WTP	$350,000	$385,000
Subtotal Direct Construction Cost		**$ 31,271,000**	**$ 34,398,000**
Mountain Factor (10%)		$ 3,127,100	$ 3,439,800
Total Direct Construction Costs		**$ 34,398,100**	**$ 37,837,800**
Standard General Conditions (10%)		$ 3,439,810	$ 3,783,780
Subtotal NET Construction Cost		**$ 37,837,910**	**$ 41,621,580**
Overhead and Profit (15%)		$ 5,675,687	$ 6,243,237
Estimated NET Construction Cost (2013)		**$ 43,513,597**	**$ 47,864,817**
Inflation Escalation (19 Months to midpoint of construction at 3.0%)		$ 2,067,000	$ 2,274,000
Estimated NET Construction Cost (2015)		**$ 45,580,597**	**$ 50,138,817**
Engineering Design, Construction Services, and Legal (20% on 2013)		$ 9,116,119	$ 10,027,763
Total Estimated Construction Cost (2015)		**$ 54,697,000**	**$ 60,167,000**