

7. Treated Water Facilities Master Plan Summary

Background Information

The treated water facilities include the water treatment plants, reservoirs, pump stations, hydroelectric facilities, pressure reducing station and the transmission/distribution lines (water mains).

The city of Boulder's Water Utility operates two water treatment plants - the Betasso Water Treatment Plant and the Boulder Reservoir Water Treatment Plant. Mountain water from the city's watershed and Barker Lake is treated at Betasso, which has a capacity of 46 million gallons per day (MGD). Water available from the Colorado-Big Thompson Project and the Windy Gap Project is treated at Boulder Reservoir, which has a capacity of 13 MGD. Site constraints at the mountainous Betasso plant preclude the realistic expansion of this facility, so all future water treatment expansion will occur at Boulder Reservoir.

The city operates six covered reservoirs, ranging in capacity from 2.0 million gallons (MG) to 9.5 MG, with a total storage capacity of 38.9 MG. There is also a clearwell at each of the treatment plants.

Due to the geographic location of Boulder, the Water Utility serves low areas adjacent to Boulder Creek in the eastern section to high areas against the mountains in the western section. To adequately serve this wide variation in ground elevation, the water distribution system is divided into three pressure zone areas. There are seven pressure-regulating stations in the system that regulate pressure and flow between pressure zones or into storage reservoirs. There are four booster pumping stations in the system, as well as a pumping station at the Boulder Reservoir Water Treatment Plant. These booster pumping stations are able to pump water from a lower elevation pressure zone into a higher elevation pressure zone.

The city operates four hydroelectric facilities on treated water transmission lines with three additional units on raw water transmission lines. The hydroelectric facilities use the power generated from the elevation differential to produce electricity, which is then sold to Xcel Energy.

In 2000 the city revised the master plan for treated water facilities. Integra Engineering assisted city staff

with this effort. As a result, the city continued a moderate water conservation program aimed at reducing the peak water demand and began aggressively replacing water distribution pipes. The utilities division has also developed a computerized hydraulic model of the water delivery system and is evaluating the adequacy of this system on an ongoing basis.

As part of the master planning process, the city adopted the following reliability criteria for delivery of treated water:

1. The city will ensure the delivery of the water required to satisfy essential needs including the maintenance of basic public health, safety and welfare such as indoor domestic, commercial and industrial uses and fire fighting uses, except for droughts and system failures having a frequency of no more than once in 100 years. The average winter consumption plus a fire-flow reserve demand is established as a measure of this demand.
2. The city will ensure delivery of the water required to provide for the continued viability of exterior landscaping, except for droughts and system failures having a frequency of no more than once in 50 years. The following method is used to establish a measure of this demand:

$$ELD = AWC + 0.65 * (PMD - AWC)$$

WHERE: ELD = Exterior Landscaping Demand
 AWC = Average Winter Consumption
 PMD = Peak Month Demand

As an alternative, 75 percent of the peak month demand may be established as a measure of this demand.

3. The city will ensure delivery of the water required to fully satisfy all uses, except for droughts and system failures having a frequency of no more than once in 20 years. The peak hour demand or the peak day demand plus a fire-flow reserve demand is established as a measure of this demand.
4. Providing redundant facilities where practical will minimize complete interruptions to the delivery of water.

5. A reserve capacity of 10 percent will be maintained in the water delivery system. The maintenance of such a reserve capacity will allow a degree of planning flexibility and mitigate water delivery problems that might be caused by operator error.

Future Service Projections and Programs

In 2000, the city updated the Treated Water Master Plan to reassess the city's treated water system and to present a plan for future system development needs. Revisions to water quality regulations and standards, changes to Boulder's land use and zoning and completion of many improvements are major items considered in the update of the Treated Water Master Plan.

The following major improvements are proposed in the 2000 update to the Treated Water Master Plan:

1. The water treatment plants need rehabilitation and improvements to their chemical mixing, flocculation and sedimentation processes in order to optimize treatment and maintain existing capacity. The

plan recommends replacing the complicated and potentially hazardous chlorine gas disinfection system at the Boulder Reservoir Water Treatment Plant. With these improvements, the existing water treatment plants are expected to meet Boulder's future quality and capacity requirements.

2. The newly revised master plan recognizes the industry-wide problem of aging distribution piping. To maintain the current level of reliability, the future will require increased spending on maintenance and replacement of break-prone and aging pipes. The plan recommends replacing one percent of the pipes each year to limit system aging.

Potential development in Areas I and II can be served through a logical extension of the existing distribution system. Proper water main sizing and looping is required. As the water distribution system continues to grow, existing water mains will need to be rehabilitated or replaced. Smaller diameter water mains may need to be replaced to improve fire-flow efficiency.

More information on Boulder's water treatment can be found on the Web at: www.boulderwater.net