Abstract:

In order to responsibly plan for projected water demands, the Town of Winnsboro (Town) worked with BP Barber to develop a needs and sources analysis for its water supply system. This planning effort included demand projections, an evaluation of the existing raw water supply, and an evaluation of the capacity and reliability of the raw water transmission system. Based upon the finding from the study, recommendations for needed improvements were provided.

The outline of the presentation includes a discussion of the purpose of the project, an explanation of the existing raw water supply system, the projected water demands, a comparison of needs and sources, and recommendations.

The raw water supply for the Town’s drinking water system consists of several raw water sources as well as a transmission system that delivers the raw water to the water treatment plant. The raw water sources include the Mill Creek Reservoir, Rion Quarries, Sand Creek, and “Upper Reservoir”. The Mill Creek Reservoir serves as the primary source for the Town’s water system. This reservoir contains several zones or “pools”, including flood control, water supply, and sediment storage.

The Mill Creek Reservoir includes an intake structure with three levels. Intake Level 1 is located at the bottom of the water supply zone. Intake Level 2 is located in the sediment storage zone and Intake Level 3 is located at the bottom of the intake structure. Due to poor water quality suspected below the water supply zone, Intake Levels 2 and 3 are currently not used. The estimated storage capacity above Intake Level 1 is 473 million gallons (MG). The estimated storage capacity above Intake Level 2 is 310 MG.

The Upper Reservoir serves as a recharge source for the Mill Creek Reservoir. Its estimated storage capacity is 100 MG. The Upper Reservoir is physically higher than the Mill Creek Reservoir by about 15 feet. Based upon this elevation difference, it can be used as a recharge source for Mill Creek Reservoir using a gravity siphon. The Rion Quarries also serve as a recharge source for the Mill Creek Reservoir. Water can be pumped directly to the Mill Creek Reservoir from the quarries, which have a total estimated volume of 1,475 MG. Finally, Sand Creek consists of a 420 gpm pump station
and has piping to the water treatment plant and the Upper Reservoir. The total recharge capacity is estimated to be 4.2 – 6.8 million gallons per day (MGD).

The raw water transmission system consists of a 4.0 MGD pump station and pipes ranging from 8- to 16-inches in diameter. The reliable capacity of the raw water system is 3.1 MGD, due to the 150 psi pressure maximum.

The Town is expecting a considerable increase in the number of its water customers, particularly in the Town of Blythewood. Determining the timing and magnitude of water system improvements requires a meaningful understanding of growth the system will experience over the next twenty years in terms of water demand. Several sources were used to determine the projected growth, including the Central Midlands Council of Governments, Richland County, and Fairfield County. A population growth of approximately 40% is expected during the planning period.

The projected demands along with evaporation, precipitation, and reservoir inflow and outflow data were used to perform a safe yield analysis of the Town’s raw water sources. The hydrologic analysis was conducted using the original version of the USDA’s Reservoir Operations (RESOPS) Model. In addition, EPA’s SWMM software was used to verify the results from the original model.

The hydrologic analysis determined the Town will have sufficient storage and recharge capacity (using additional storage options) to meet projected demands if access is provided to the sediment storage zone in the Mill Creek Reservoir. To access the storage volume in the sediment pool, the Town will need to use Intake Level 2 on the raw water intake structure. Because the water quality below Intake Level 1 has reportedly been of lower quality, the Town should conduct testing to confirm the water quality at this depth. If the water is of a poorer quality, a destratification system should be installed to develop a uniform water quality at both intake levels. Because the reservoir was constructed using federal funds (under PL 566), modification of the reservoir’s original operating plan requires review and approval from the Natural Resources Conservation Service (NRCS).

The Rion Quarries are not owned by the Town, but the Town has permission to withdraw water until the quarries are placed back into service. Since it is unknown how long the Town will be able to use the quarries, other sources need to be evaluated. Potential sources identified for alternate water supply include a connection to the Broad River or an interconnection with the City of Columbia.

A computerized hydraulic model was used to evaluate the raw water transmission system and to determine the timing and magnitude of system improvements. The transmission system limits the treatment capacity to 3.1 MGD even though the water treatment plant is capable of producing 4 MGD. Therefore, the first step in preparing for future growth is to upgrade the 8- and 10-inch raw water lines to 16 inches.

The demand projections were also used to estimate when the water treatment plant will need to be upgraded. The State Primary Drinking Water Regulations state that a preliminary engineering report must be submitted when the peak month demand exceeds 80% of the rated capacity, and plans and specifications must be submitted when the peak month demand exceeds 90% of the rated capacity. Based on the demand projections, it is possible that the actual treatment capacity of 4.0 MGD could be exceeded between 2011 and 2016. The DHEC-rated treatment capacity of 3.1 MGD could be exceeded as early as this year.

The recommendations were grouped into short term, intermediate, and long term categories based upon potential impact on the system or perceived need for implementation. Short-term recommendations include the following:
- Upgrade raw water transmission lines
- Use of sediment storage zone in Mill Creek Reservoir
- Destratification System in Mill Creek Reservoir
- Implement a drought management plan

Intermediate Recommendations (2011-1016) include the following:
- Evaluate sedimentation in the Mill Creek Reservoir to determine when dredging of the reservoir will be necessary
- Increase water treatment plant capacity

The presentation will discuss the specific growth projections as well as the hydrologic and hydraulic water modeling techniques that were used. The major findings of these evaluations will also be discussed in greater detail. Of particular emphasis will be the recommendations that were made and a schedule of system improvements required to meet future water demands.