

Abstract: Town Water Supply Engineering Design

Submission category: Community enhancement projects

A rural community in Eastern Tennessee is seeking assistance to prepare preliminary engineering designs for a water storage solution. The town has 350 customers. Their current system uses water pumped up to a steel storage tank residing on a hillside on the southeastern border of the town.

The storage tank on the hillside is approaching a point of critical failure; the hillside is increasingly losing stability. Emergency repairs were conducted a few years ago during a period where the tank was in an active failure, and these repairs were intended to be temporary while an alternative storage solution was designed.

During the site visit the condition of the existing tank became clearer. The hillside showed evidence of multiple landslides over time, including trees that were bent 30 degrees between growth before and after landslides. The hillside near the tank has deep fissures in the soil. The tank has no foundation and is simply sitting on soil.

The site visit was very useful for clarifying the issues and refining the list of available alternatives. Based on preliminary analysis and meetings with the town's stakeholders, three alternatives were developed and analyzed:

Alternative 1 – Rehabilitation. Keeping the current site and rehabilitating the current tank would require improving the site to a condition that does not require constant emergency maintenance. To stabilize the land, sheet piling could be installed to help prevent the hillside from deteriorating further. This is not a do-nothing alternative because there would be ongoing maintenance costs. Furthermore, the existing pipes connecting the town to the water tank are vulnerable to local landslides.

Alternative 2 – Standpipe. The second alternative is a standpipe water tank system which would be installed next to the town's baseball field. If the standpipe option is selected, a pump will be required. A pump will require increased maintenance and may be less reliable.

Alternative 3 – Elevated Storage Tank. The final alternative would be the construction of a new elevated water storage tank with a capacity of 100,000 gallons. An elevated tank would also require site preparation and foundation work. Both the standpipe and elevated tank would be located south of the baseball field. Due to location, this alternative would also have much easier site access than the current tank.

Recommendation

After taking into consideration the multiple design alternatives, the client's opinion, and the sustainability analysis, the recommended solution was the elevated storage tank. The elevated storage tank will provide the required pressure at the final connection. No pump will be needed to fill the tank, as the incoming supply pressure is adequate. This solution will provide better water quality and is not at risk from the unstable slope that the existing tank uses.