

DATE: February 14, 2018

FROM: Philip Stuckert, P.E., Infrastructure Director

SUBJECT: Water Treatment Plant Design Options

Summary:

Spring Hill 6 MGD Water Treatment Plant

In approximately 1997, Spring Hill began exploring the possibility of constructing its own treatment facilities. This consideration was based on the continued increases in water purchase rates as well as the cost to provide needed upgrades to the transmission facilities (transmission line and booster stations) required to purchase and convey additional water from Columbia to Spring Hill. Spring Hill began the long process of applying for a withdrawal permit in 1998 to determine if the Tennessee Department of Environment and Conservation (TDEC) would approve withdrawal of water from the Duck River. After submitting all required environmental studies and engineering materials, TDEC approved the withdrawal of 6.0 Million Gallons per Day (MGD) from the Duck River at river mile 166, located upstream of Carpenter's Bridge Road. The withdrawal permit #98-463 was issued in March 1999. Soon after the approval of the withdrawal permit, Spring Hill began efforts to have engineering performed for the Raw Water Intake (RWI), Raw Water Transmission Line (RWTL) and the Water Treatment Plant (WTP). As part of these engineering efforts, TDEC additionally required applying for an Aquatic Resource Alteration Permit (ARAP) to construct the RWI on the river. The requirements of this ARAP consisted of an aquatic life survey of the river bed upstream and downstream of the proposed intake site. This survey consisted of a biologist/scuba diver performing a cross-sectional inventory of aquatic life at 100-foot intervals, 1/4 mile upstream and 1/4 downstream of the proposed RWI site. A botanical study, archeological study and historical study were also required to be performed and submitted to TDEC, US Army Corp of Engineers, TN Fish and Wildlife, US Fish and Wildlife as well as coordination with TVA. Once all studies were completed and approved, engineered construction plans were submitted to TDEC for review and approval.

Spring Hill's RWI, RWTL and WTP were constructed during 2001-2003 and brought online in August 2003. The facilities were designed to meet a 20-year service life. However, these facilities have been strained during drought conditions. Additionally, the capacity of 20-years has been somewhat shortened due to past and current increased development trends in the housing market within Spring Hill. This was the reason Spring Hill entered into a purchase agreement with Columbia as to allow an additional water purchase during peak demand use and drought conditions.

Water Use Projections:

Based on work performed within the Water Capacity Study, the current water use is 2.8 MGD (average) and 4.2 MGD (peak). The peak water use projections for Spring Hill are 5.46 MGD by year 2021, 6.0 MGD by year 2023 and 10 MGD by year 2037.

Current Need:

The current WTP has the capacity to produce an average of 4.0 MGD with intermittent peak usage exceeding design capacity. Spring Hill's peak water demands are currently projected to reach 5.46 MGD by year 2021 and 6.0 MGD by year 2023. Due to the current growth within the City, there exists an immediate need for additional water. There are two options to meet this immediate need, first, is to purchase water from Columbia and, second, is to expand the current water facilities. The first option, has been dampened by the fact that Columbia has recently realized (post signing of purchase agreement with Spring Hill) that their current water

treatment capacity is not as much as they originally believed. This downsizing of their capacity was due to an evaluation of their facilities in which they discovered they do not have a 20 MGD capability but only 16.4 MGD. This in-turn will probably lead Columbia not to renew a long term contract with Spring Hill until they have upgraded their facilities. Therefore, it appears the only viable option currently available for Spring Hill is to begin planning to expand its own WTP.

Current Facilities Restraints

The existing pumps, electrical controls and other components located at the RWI will require upsizing in order to pump 6.0 MGD to the WTP. The existing 18-inch RWTL will more than likely accommodate conveyance of 6.0 MGD, with no additional future capacity beyond 6.0 MGD. An additional RWTL 6.5 miles in length, including boring under I-65, will be required to convey water from the RWI to the WTP for a capacity greater than 6.0 MGD.

The WTP should be able to be expanded by means of filter media replacement, to a higher rated filter such as a membrane filters rather than the existing mixed media sand and anthracite filters. The WTP improvements to 6.0 MGD will also require upsizing of tankage, pumps, valves, piping and electrical however, an expansion of the building itself should not be required. Additional large scale improvements such as building expansion, backwash solids handling, chemical feed expansion, and treatment components expansion will be required to expand beyond 6.0 MGD.

In order to expand capacity beyond the 6.0 MGD, the RWI influent pipe/screen will either need to be upsized or a dual parallel pipe installed out into the river. The RWI structure will have to be expanded in which the 60-foot deep wet well will need to be expanded accordingly to accommodate higher influent flows along with larger internal piping, expanded and upgraded electrical and controls. The upstairs building area may also need expanded at the time of increasing to 10 MGD.

Future Need:

The question has been raised, which is a great question, why not begin the design process to a 10 MGD rather than to 6.0 MGD? Planning for an expansion to 10 MGD will require performing all the previously listed steps and studies necessary to obtain approval from TDEC and all the other agencies which have to approve the expansion to pull additional water out of the Duck River. In addition, an ARAP will also be required to make improvements to the RWI if an additional pipe is installed in the river or an expansion to the wet well is required. These steps, studies and processes will require 18-months to 24-months, if not longer to obtain an expanded withdrawal permit. In addition, past droughts in the Middle TN area have resulted in numerous water basin shortage studies, such as the Duck River Basin Studies which have been performed to make recommendations for better management of the water resources within this particular watershed. Operations of Normandy Dam, a required 100 cubic feet per second (cfs) minimum river flow, drought management plans, environmental impact concerns as well as evaluating a regional solution to water supply needs have all been factors which have evolved since the most recent droughts. These factors will also have to be encompassed in any request to expand the RWI above its current permitted withdrawal of 6.0 MGD. To simplify, TDEC will consider all of the above studies before issuing the City of Spring Hill a new withdraw permit exceeding 6 MGD. Perhaps after reviewing all of the data, TDEC may issue Spring Hill a new withdrawal permit in a lesser amount as to meet the twenty-year use demand projections.

Expansion of the existing WTP to 6.0 MGD will allow the city to meet its immediate growth needs while also preparing to submit all necessary studies for application to increase withdrawal to 10 MGD. The design of the

existing WTP should allow for an expansion within the footprint of the current building with minimum disturbance to existing infrastructure. Therefore, the immediate need to expand to 6.0 MGD would provide assurance the WTP could meet the needs through 2024 while preparing documents and studies required to apply for an increase of withdrawal from the Duck River to 10 MGD.

Facility Plan

TDEC requires a FP in order to implement the proposed WTP expansion improvements. A facilities plan evaluation will determine in detail the extent of all improvements needed to expand to 6.0 MGD and ultimately to 10 MGD, if TDEC issues the City a 10 MGD withdraw permit. The current timeline proposes a FP be completed by June 2019. The next step would be to award a design contract in 2020 and then bid out the project in mid 2021, with an anticipated construction time of 18-24 months. This schedule would allow an expanded 6.0 MGD plant to be online by mid 2023.

Options and Risk

CPWS has plans to build a second WTP at their Alexander Bend Property. It has not been determined at this time what is best financially advantageous for Spring Hill: to purchase the peak demand water from CPWS or front the initial capital outlay for their own expansion to 10 MGD. Spring Hill may not require the use of the additional water until 2037 and only then during peak demand days. The proposed FP will include an evaluation of further expansion of the plant and coordination with TDEC. When selecting components for expansion, an analysis for a potential 10 MGD plant will be considered.

Requesting to increase the withdrawal and submitting all required studies to TDEC, in addition to their review and "Public Comments Period", can be a lengthy process and involves many environmental conditions to be met. Planning for a future expansion to 10 MGD is recommended, however proceeding with design of a 10 MGD WTP at this time, prior to receiving approval to withdraw an additional 4.0 MGD from the Duck River, would be a risk. Other options for water sources should be investigated such as groundwater or other surface waters, should TDEC not approve an increase in the withdrawal permit.

There are other risks with expanding the WTP to 10 MGD prior to acquiring a permit to withdraw 10 MGD from the Duck River. The points below further outline those risk associated with designing a 10 MGD permit without acquiring permission to withdraw 10 MGD from the Duck River.

Scenario No. 1. A possible failure to meet the City's immediate need to supply its customers with a potable water supply for the maximum day usage of 2023.

Risk: The City prepares a FP under state rules, regulations and guidelines so as to acquire a permit from TDEC for construction of an expanded water treatment plant. The development of the FP documents is an iterative process allowing comments from all parties. The development of a FP also allows the city to utilize this plan when applying for a low interest loan with the State Revolving Loan Fund for construction of the WTP expansion. FP expedites the review and approval process with TDEC. The FP will address the goal and outcome to expand the city's WTP from 4 MGD to 6 MGD.

Scenario No. 2. Designing a 10 MGD Water Plant without acquiring a 10 MGD Withdraw permit from the Duck River will raise issues with TDEC.

Risk: As mentioned above, city staff recommends preparing a FP for the plant expansion to receive a permit to construct and access to low interest construction loans. This insures the city will have a WTP online to meet water demand by calendar year 2023. Failure to address the short term needs of the city by complicating the process with the parallel design of a 10 MGD WTP may raise a number of questions by TDEC. The development of the documents will require extensive meetings with TDEC. Since TDEC is aware that we have a permit to withdraw 6 MGD from the Duck River, additional environmental and hydraulic studies on the Duck River are minimized. The existing permit to withdraw 6 MGD from the Duck River will expedite the approval from TDEC to design and build the new 6 MGD plant.

Scenario No. 3. The design of a 10 MGD Water Treatment Plant will not be reviewed by TDEC since we do not have a 10 MGD withdraw permit.

Risk: If the FP addresses two plant designs, one for a 6 MGD plant and the other for a 10 MGD plant, TDEC intuitively will not take the time and effort to review the second design based on 10 MGD since the City has not addressed hydrological and environmental issues to withdraw 10 MGD from the Duck River.

Scenario No. 4. Designing the 10 MGD Plant outside TDEC's purview will risk the potential of receiving a future permit to construct and receiving SRF loan funds for construction.

Risk: If the city designs the 10 MGD WTP outside of TDEC's regulatory approval process and prior to completing a FP and associated required documents/studies established by TDEC, a permit to construct the 10 MGD WTP will not be issued. FP and associated studies for interactive discussion among each agency to address concerns and issues during design is a required process. Separating TDEC from the process presents significant risk from them not approving the construction drawings and leading to additional environmental studies on the Duck River. Therefore, the city may be delayed for months or years for failure to address these issues upfront in a proactive consultation with TDEC during the design process.

City staff believes that it is in the best course of the city to prepare a FP and associated documents to expand the plant from 4 MGD to 6 MGD. Once the FP is approved by TDEC and a permit to construct is issued by TDEC, then the City should immediately seek permission to withdraw up to 10 MGD from the Duck River. Once that permission is granted by TDEC, the City should start the process to prepare the necessary documentation to request withdraw of 10 MGD from the Duck River and to build a 10 MGD water plant. The next challenge for the city is to acquire a longer term reliable potable water supply. This may involve working with CPWS for a short period of time as we seek to acquire a permit from TDEC to withdraw a permit for the withdraw of water from the Duck River and to construct a 10 MGD water plant.