LEVEL II STUDY

SOUTH THERMOPOLIS WATER & SEWER DISTRICT
WATER SUPPLY PROJECT

EXECUTIVE SUMMARY

FUNDED BY: Wyoming Water Development Commission

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EA JOB NUMBER: 08082.00
I. PURPOSE

Engineering Associates has been retained by the Wyoming Water Development Commission to conduct the Level II Study to evaluate possible improvements to the water system serving the South Thermopolis Water & Sewer District (STWSD). Specific items to be completed under this study include reviewing the conclusions and recommendations of the Level I Study and providing conceptual designs and cost estimates for construction funding applications by performing the following tasks:

- Update the District’s infrastructure mapping with additional data and corrected shape files;
- Review and update the list of necessary system improvements;
- Evaluate the design alternatives provided in the Level I Study;
- Update the District’s financial status and ability-to-pay information;
- Refine the recommendations of the Level I Study into conceptual designs;
- Create new cost estimates based on conceptual designs and funding availability;
- Complete an Environmental Report in preparation for construction; and
- Provide new conclusions and recommendations for the District’s consideration and use.

The South Thermopolis Water & Sewer District is located in Hot Springs County, immediately south and west of Thermopolis, primarily along U.S. Highway 20. The District was formed in the 1970’s and substantially enlarged in 1981. It currently covers approximately 3,537 acres with an approximate population of 250 residents receiving domestic water service.

In 2007, the median household income in Hot Springs County was $40,709. This figure was only 78% of the state-wide median household income of $52,433. However, our experience has been that the average construction costs in this area are comparable to other regions of Wyoming. This scenario makes identifying viable funding and the ability of District residents to pay for any system modifications or improvements an even more important component of this project.

Water for the water system is supplied by the Town of Thermopolis via a pipeline and master meter located along U.S. Highway 20, extending south from the Town’s corporate limits. South Thermopolis purchases their water from the Town of Thermopolis at a rate of $3.78 per 1,000 gallons. Residents of the District generally only use water from the potable water system for domestic needs. Many residents have groundwater wells located around the District that are used for irrigation purposes, or they obtain irrigation water from the Big Horn River. The use of raw water for irrigation purposes greatly reduces the amount of potable water used within the District.
II. FINDINGS

A. PROJECTED DEMANDS

In order to evaluate future demands for the STWSD water system, it was necessary to project population. Several sources of data were analyzed, including the United States Census Bureau, the Wyoming Department of Administration and Information, and data from current land ownership. Population growth patterns across Wyoming have shifted significantly in recent years. Population estimates were calculated using a growth factor of 2.00% per year for the District:

<table>
<thead>
<tr>
<th>Total Projected Water Demand</th>
<th>2006</th>
<th>2006 PEAK</th>
<th>2039 ADD</th>
<th>2039 PEAK</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPM</td>
<td>27</td>
<td>108</td>
<td>53</td>
<td>213</td>
</tr>
<tr>
<td>GPCPD</td>
<td>151</td>
<td>603</td>
<td>153</td>
<td>612</td>
</tr>
</tbody>
</table>

Population projections for 2039 suggest that the population of the District will be 501 people. This would increase the average daily demand (ADD) in 2039 to 53 gpm, the maximum daily demand (MDD) to 153 gpm, and create an estimated peak demand of 213 gpm. Assuming a population of 501 in 2039 will not dramatically impact the water system, since it is currently capable of providing fire flows in excess of 1,000 gpm. Also, according to their agreement the District’s maximum allowable water usage from the Town of Thermopolis may be increased by 7.5% annually, based on the usage over the previous twelve (12) months. Using this information and the District’s actual water usage in recent years, the growth rate of allowable water usage will be sufficient to meet the projected water demand for this area.

B. WATER DEMAND VARIATIONS

An ADD of 0.039 MGD (27 GPM) was calculated for the entire District using the total monthly water consumption records for the 24 months between August, 2004 and August, 2006. Since the STWSD does not have records for peak hour or peak day demands, peaking factors were estimated from available demand information and factors found in engineering literature. The actual calculations and assumptions are included in the Project Notebook.

A comparison of South Thermopolis’ MDD peaking factor with those of similar Wyoming communities indicates that the assumed peaking factor for the maximum day demand for South Thermopolis is close to the community average.
C. PREFERRED DESIGN REFINEMENTS

The numerous concerns, questions, and ideas that have been put forth throughout the duration of this study have resulted in some great solutions to the District’s infrastructure problems. By reviewing the alternatives from the Level I Study, and revisiting some of the thoughts that had been dismissed early in the process, we were able to create some quality solutions, as well as verify some of our early conclusions. The result was a short list of design refinements that were applied to the alternatives to create new conceptual designs and affordable cost estimates. The preferred refinements are as follows:

- Leave the existing tank in service and install a new tank for the upper pressure zone.
- Move the main PRV from U.S. Highway 20 onto Lane 12.
- Move the new pump station from U.S. Highway 20 onto Lane 12.
- Provide new piping from the upper zone to the Buffalo Creek Road Loop.
- Consider a new tank part of the way up Coyote Run to benefit from additional users, remove the second pump station and PRV, and also keep the infrastructure inside the District boundary.
- Reconfigure the looping lines in the county roads to minimize the number of PRVs needed, while still eliminating as many dead-end lines as possible.
- Consider a new alignment of the Buffalo Creek Road Loop to pick up additional users and possibly reduce costs.

III. CONFIGURATIONS

A. OPTION 1a – UPPER SCHMIDT TANK

Option 1a was created from Option 1 in the Level I Study. This refined version includes many of the adjustments we identified to improve system pressures, reduce costs, and include additional District residents. This option includes utilizing the existing tank in its current location, adding a new tank to the west of Lane 7, and looping the existing dead-end lines in Lanes 3, 5, and 7, along with Bobcat Drive.

This option was considered due to the proximity of the new storage tank location to the greatest area of need, which is the Sable Run development. Although the tank site is several thousand lineal feet from Sable Run, it is closer than the other tank sites provided in the other options.

B. OPTION 3 – BUFFALO CREEK ROAD LOOP

The Buffalo Creek Road Loop was originally included in this study as part of the water system modeling. However, as the cost estimates were being identified for each proposed option, it became apparent that the Buffalo Creek users may be crucial in
making an infrastructure improvement project financially feasible for the District. Subsequently, a cost estimate was completed for this proposed option.

This option considers roughly 17,500 lineal feet of pipelines and a PRV to provide water to users that are currently outside the District Boundary. The constructability of this option is contingent on the District installing an upper pressure zone with adequate water storage. If these users wait to become annexed until after one of the other improvement projects has been completed, it will be considerably more expensive to complete their project and receive water service. On the other hand, if these potential users were to annex into the District in the very near future and then included their proposed pipeline in one of the other improvement projects, the shared costs would be borne by all District water users and the overall project would be less expensive for everyone.

C. OPTION 4a – LANE 7 TANK

Option 4a was created from Option 4 in the Level I Study. This refined version includes many of the adjustments we identified to improve system pressures, reduce costs, and include additional District residents. This option includes utilizing the existing tank in its current location, adding a new tank to the west of Lane 7, and looping the existing dead-end lines in Lanes 3, 5, and 7, along with Bobcat Drive.

This option is favored over the Upper Schmidt Tank as the proposed infrastructure is included in the existing District Boundary.

D. OPTION 5 – COYOTE RUN TANK

This option was derived from the original Option 2 out of the Level I Study. We looked at moving the tank down to an elevation that was similar to the elevations of the Upper Schmidt Tank and the Lane 7 Tank. This eliminated the need for the second pump station and PRV, thus removing the third pressure zone and reducing project costs by a considerable amount. We also looked at looping the existing dead-end lines, and keeping the existing tank in service for the lower pressure zone.

This option has two distinct advantages over Options 1a and 4a. First, the infrastructure for this option is all located inside the existing District Boundary. Also, the locations of the tank and transmission pipeline along Coyote Run allow three additional users to connect to the system. These additional users are crucial to helping the proposed improvements become more economically feasible to the District. Further, the District will be providing water service to District residents that have been assessed mills on their property by the District for a number of years.

A geotechnical investigation was completed near this proposed tank site in June, 2009. The results of the geotechnical investigation showed that the soil composition in this area is generally adequate for constructing an above-ground water storage tank of approximately 250,000-gallon capacity.
IV. COSTS SUMMARY

A. SUMMARY OF PROJECT COSTS (2008 and 2012)

Preliminary costs were developed from bid tabulations collected from recent water projects previously completed by Engineering Associates. These bid tabs provide the bid prices from 2006 for furnishing and installing pipelines and appurtenances. These numbers can be adjusted forward to reflect the costs that can be anticipated for any particular construction year. The preliminary costs are utilized to identify the anticipated total project costs for the preferred alternative. The total project costs can then be used to evaluate potential funding scenarios to determine final EDU (equivalent dwelling unit) costs for the users of the South Thermopolis service area.

B. RATE SCHEDULES

The District’s current rate schedule does fund the operation and maintenance of the water system. Table 7.13 shows the existing rate schedule. Table 7.21 shows the recommended rate schedule for the existing system, using a positively-tiered rate structure to promote water conservation.

Rate schedules can be set based on tap sizes, which correlate to EDUs. The EDUs were established to consider all residential uses (5/8” meter, 5/8” x 3/4” meter, or 3/4” meter) equal to 1 EDU. Given that information, EDUs are calculated based on a ratio of the area of each meter size to a residential meter. It should be noted that actual residential tap sizes in the District are largely unknown, although most of them are either ¾” or 1” in size. The District has been working to replace every residential water meter in the District with a ¾” meter. Because of this, meter size was used to calculate EDUs. (Tables 7.16 through 7.40 in the Final Report show the different funding scenarios and recommended rate schedules for the various improvement alternatives considered.)

<table>
<thead>
<tr>
<th>Tap Size</th>
<th>EDU</th>
<th>Total Taps</th>
<th>Base Rate Per Month**</th>
<th>Cost per Usage Over 3,000 Gallons (per 1000 Gallons)</th>
<th>Average Water Usage Over 3,000 Gallons</th>
<th>Average Monthly Bill (includes existing costs)</th>
<th>Total of Monthly Bills</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4”</td>
<td>1</td>
<td>118</td>
<td>$34.72</td>
<td>$5.80</td>
<td>2,000</td>
<td>$46.32</td>
<td>$5,465.96</td>
</tr>
<tr>
<td>1 1/2”</td>
<td>4</td>
<td>0</td>
<td>$138.89</td>
<td>$5.80</td>
<td>92,000</td>
<td>$672.49</td>
<td>$0.00</td>
</tr>
<tr>
<td>2”</td>
<td>7.11</td>
<td>4</td>
<td>$243.05</td>
<td>$5.80</td>
<td>330,000</td>
<td>$2,157.05</td>
<td>$8,628.21</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td><strong>$14,094.17</strong></td>
</tr>
</tbody>
</table>

* There are no known 1 ½” taps in the District at this time.
** Based on EDUs and includes 3,000 gallons for Residential and 7,000 for Commercial.
TABLE 7.21
RECOMMENDED WATER RATE SCHEDULE FOR EXISTING SYSTEM

<table>
<thead>
<tr>
<th>Tap Size</th>
<th>E</th>
<th>D</th>
<th>U</th>
<th>Total Taps</th>
<th>Base Rate Per Month**</th>
<th>TIER 1 Cost per 1,000 Gal (1 to 2,000 gal over base rate)</th>
<th>TIER 2 Cost per 1,000 Gal (2,001 to 7,000 gal over base rate)</th>
<th>TIER 3 Cost per 1,000 Gal (7,001+ gal over base rate)</th>
<th>Average Water Usage Over Base Rate</th>
<th>Average Monthly Bill (includes existing costs)</th>
<th>Total of Monthly Bills</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4&quot;</td>
<td>1</td>
<td>118</td>
<td>$34.72</td>
<td>$5.80</td>
<td>$6.80</td>
<td>$8.00</td>
<td>2,000</td>
<td>$46.32</td>
<td>$5,465.96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 1/2&quot;</td>
<td>4</td>
<td>0</td>
<td>$138.89</td>
<td>$5.80</td>
<td>$6.80</td>
<td>$8.00</td>
<td>88,000</td>
<td>$832.49</td>
<td>$0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2&quot;</td>
<td>7</td>
<td>4</td>
<td>$243.05</td>
<td>$5.80</td>
<td>$6.80</td>
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<td>$2,840.65</td>
<td>$11,362.61</td>
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<tr>
<td>Total</td>
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<td>$16,828.57</td>
<td></td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

* There are no known 1 ½" taps in the District at this time.

** Based on EDUs and includes 3,000 gallons for Residential and 7,000 for Commercial.

V. CONCLUSIONS

A. SUMMARY

The South Thermopolis Water & Sewer District Water System appears to have the same infrastructure problems that were identified in the Level I Study. However, the District has made several improvements in the operation and maintenance of their system in the past two years. The District Board and Staff have also been very proactive in seeking assistance from multiple agencies and exploring funding sources.

After further investigation into the District’s infrastructure concerns and financial status, it appears we have identified some improvement options that are affordable and will meet the District’s needs. The most critical improvement that must be made to the system appears to be additional storage at a higher elevation. The two biggest issues with the District’s water system are the private booster pumps that are connected directly to the system and the existing booster pump station for Sable Run. Water storage is needed above all of the existing water users to eliminate these problems and minimize threats to public health and safety. This will improve fire flows, eliminate the existing booster pump station, and increase the water pressure in those areas where current pressures are not sufficient.

B. CONCLUSIONS

The small population of the District, combined with the low average household income, limits the local funding available to make sufficient improvements to the water system to improve fire flow, system pressures, and eliminate some existing maintenance problems. There are a few distinct improvements that the District can implement that will improve water quality in areas of the District with the worst potential for quality
issues. Water quality within the District is being negatively impacted by the dead-end pipelines located throughout the system. While changing the source of supply from surface water to groundwater may reduce or eliminate some existing water quality issues, it will likely have minimal positive impact on overall water quality as the alternative sources identified in the Level I Study present additional quality problems.

While the District water system is not configured in a manner that facilitates providing fire flows established by the International Fire Code to all serviced areas, the rural nature of the community does provide the District some flexibility in timing on installing additional water transmission lines and relocating the storage tank to a higher elevation. However, the newly-constructed business park and the proposed assisted-living facility could require additional fire flows in the near future. More importantly, the low-pressure areas we identified in the system and the failing booster pump station are serious concerns that need to be addressed. The District should begin planning for system upgrades that will remedy these problems.

The District has done a great job of implementing several of the ideas and recommendations of the Level I Study. However, additional work is always needed to save costs and improve system operations. The District should begin planning for future system replacement costs, regardless of whether or not a capital construction project is forthcoming. The transmission line rupture in June 2008 and the cost and time associated with changing out every water meter in the District should be clear indications of how important it is to start saving early.

C. RECOMMENDATIONS

The most important recommendations for the District are as follows:

1. Reduce System Water Losses

The District can reduce water losses in the system by replacing outdated water meters, identifying and correcting unmetered water usage, and locating and eliminating other system leaks. These actions will reduce system costs and increase water revenues.

2. Disconnect Existing Private Booster Pumps

Several private booster pumps have been identified that are currently connected directly to the District’s water system. These connections are not allowed by Wyoming DEQ regulations, as they create a potential for system damage and are a threat to public health and safety. If a private booster pump creates negative pressure in the public water system, this can lead to the introduction of unsafe contaminants and/or pipe collapse. Groundwater and other contaminants could be pulled into the system through leaks, cross-connections, or unsafe system connections. To avoid these potential threats, a private cistern should be required
between the District system and any private booster pumps to reduce the possibility for negative pressures in the public water system.

3. Eliminate Sable Run Booster Pump Station

The operating conditions of the Sable Run Booster Pump Station have been reviewed during the course of the Level I and Level II Studies. This facility is not capable of providing adequate water pressure and quantity to the Sable Run development, as it was originally designed as a temporary facility for a few residences. Further, this pump station is very problematic and will continue to deteriorate at an ever-increasing pace.

The District should plan to eliminate this facility from its water system in the next five (5) years. This can be done by replacing the facility with a new pump station or by providing additional water storage at a higher elevation that can feed the Sable Run area by gravity flow. Based on the cost estimates provided in Chapter 7 of the Final Report, providing water storage at a higher elevation that can benefit more areas of the District will be much more cost-effective than replacing the existing Sable Run facility with a similar pump station. Further, with no elevated storage on Sable Run, this system will not operate efficiently and will continue to be a problem for the District in the future.

The District should implement a program for updating its system mapping on an annual basis. As new services are installed and old ones are found or abandoned, they should be recorded by the District’s field personnel and compiled into a working document that can be used to update the electronic files on a regular basis. The District should also consider tracking the installation and location of any new or replacement valves, hydrants, piping, repair clamps, etc. that are installed in the system. Keeping track of this information will be very helpful to the District as it continues to improve its operation and maintenance procedures.

D. PREFERRED CONCEPTUAL DESIGNS

Engineering Associates recommends the South Thermopolis Water & Sewer District strongly consider applying for construction funding for Options 3 & 5 as one complete project. This combination provides the most economical solution to the District’s existing problems. By including as many new water users as possible, the costs and benefits of the necessary improvements are shared by the most District users of any improvement alternatives we have explored so far. The funding looks favorable for this project, and the users’ ability-to-pay is in line with the anticipated District costs. If the District is successful in securing the optimal agency funding for this project, the combination of Options 3 & 5 will provide the most benefit to the District, and its users, for the least cost per EDU.