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*Funding for WRDS and the creation of this electronic document was provided by the Wyoming Water Development Commission (http://wwdc.state.wy.us)*
FORT LARAMIE
WATER SUPPLY REHABILITATION
LEVEL II STUDY

EXECUTIVE SUMMARY

PREPARED FOR:

WYOMING WATER DEVELOPMENT COMMISSION
6920 YELLOWTAIL ROAD
CHEYENNE, WYOMING  82002

PREPARED BY:

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CHEYENNE, WYOMING  82001

IN ASSOCIATION WITH:

DAHLGREN CONSULTING
CHEYENNE, WYOMING

JULY 2008
• ENGINEER’S AND GEOLOGIST’S CERTIFICATE •

WE HEREBY CERTIFY THAT WE HAVE PREPARED OR DIRECTLY SUPERVISED THE PREPARATION OF THESE REPORTS AND THAT WE ARE DULY REGISTERED PROFESSIONALS IN THE STATE OF WYOMING.

JAMES K. MURPHY, P.E.
WYOMING P.E. NO. 5569

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INTRODUCTION

In 2007, the Wyoming Water Development Commission (WWDC) contracted with AVI Professional Corporation (AVI) to conduct a Level II Water System Rehabilitation Study for the Town of Fort Laramie in Goshen County. The purpose was to evaluate the Town’s municipal water system, identify deficiencies, recommend improvements, develop conceptual plans, prepare cost opinions, and generate a GIS product. The following major tasks were completed during the course of the study.

1. SERVICE AREA AND DEMAND PROJECTIONS

The water service area for the Fort Laramie system is confined to the Town’s corporate limits with the exception of three service connections. The Town has an estimated population of 260 served by 175 active water accounts.

It was impossible to make a determination of existing water demand or an accurate prediction of future demand because no reliable well production or point-of-use records were available from the Town.

Since major growth or development in Fort Laramie is unlikely, the existing water supply is adequate for the foreseeable future. However, there are infrastructure and management upgrades that should be made to enhance system operation. These improvements are described in subsequent sections of this report.
2. INVENTORY OF EXISTING SYSTEM

CURRENT CONFIGURATION

The Town’s first public water supply system was constructed in the early 1950’s. The water supply was the Fort Laramie well #1, which was permitted in 1949. Significant system improvements were made in 1962, including over 12,000 LF of 4” and 6” Asbestos Concrete (AC) pipe, a 50,000-gallon storage tank, 16 fire hydrants, valves, and other appurtenances. A second supply well was drilled in 1967.

Neither maps nor records of the current configuration of the water system were provided by the Town. The best information available came from a system map prepared by Baker and Associates in 2002 and from the contract documents for system improvements constructed in 2003.

Extrapolating from these two sources, the system now consists of two production wells in the North Platte River alluvium, approximately 730 LF of 8” PVC, 3,000 LF of 6” PVC, 13,800 LF of 6” AC transmission mains, 6,000 LF of 4” or smaller AC distribution lines, 175 ¾” meters on 1” service lines, 42 fire hydrants, and associated valves and appurtenances.

The Town has a meter billing system purchased from Black Mountain Software. MicroComm provided the SCADA system which operates the wells and storage tank.

Water treatment consists of a sodium hyperchlorate injection system at each wellhead.
SYSTEM DEFICIENCIES

- Storage Capacity. DEQ requirements for construction and operation of public water systems and requirements for fire suppression storage indicate that Fort Laramie’s storage capacity of 50,000 gallons is inadequate.

- Transmission Line between Wells and Storage Tank. A single line conveys water from the wells to the tank and from the tank to the distribution system. This arrangement interferes with disinfection and forces the system to operate in a way that prevents consistent compliance with EPA water treatment regulations.

- Line sizes. With the exception of the 730 LF of 8” PVC installed in 2003, lines in the existing system are below industry standards and DEQ requirements for municipal water systems.

- Condition of pipes. The condition of the AC lines installed in 1962 is unknown. No estimate of leakage could be made because water use records were unreliable.

- System Pressure. System pressures and flows are inadequate to meet fire suppression standards. Hydrant flows and residual pressure were below the recommended levels according to a Public Protection Classification (PPC) survey performed by the Insurance Services Office (ISO) in 2005.

- Records Management. The lack of complete and accurate records was an impediment to this study process. More important, accurate records
are required for the Town to manage the water system and budget for repairs.

- Point of Use Meter Freezing. 42 frozen and cracked meters have been replaced since 2003. Meters are plumbed in near the top of the meter pit and are not insulated.

- Easement Agreement for Tank and Transmission Line. The validity of the easement agreement between the Town and the landowner is currently in dispute. WWDC and other funding agencies require ownership or uncontested control of the real property where system improvements would be located.

3. ANALYSIS OF ALTERNATIVES

STORAGE OPTIONS

- Decommission and remove the existing tank and construct a new and taller tank (standpipe) at the current location.

- Construct a new and taller tank on the knoll across the County road from the tank’s present location.

- Build an elevated storage tank on the Town Park across the street from the wells.

TRANSMISSION LINE OPTIONS

- Replace the single 6” AC line between the wells and tank with dual 8” lines if a new tank is built near the existing tank site.
- Replace 6" AC lines in the distribution system with 8" or larger if system pressure is increased by a new and taller storage tank.

DISTRIBUTION SYSTEM OPTIONS

- Replace 4" and smaller pipes in distribution system with 6" or 8" lines.
- Eliminate remaining dead end lines.

4. COST OPINIONS

The table below summarizes the cost and WWDC eligibility of system improvement alternatives.

<table>
<thead>
<tr>
<th>ALTERNATIVE</th>
<th>CONSTRUCTION COST</th>
<th>WWDC ELIGIBLE</th>
<th>WWDC INELIGIBLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Standpipe at existing site</td>
<td>$654,451.00</td>
<td>$654,451.00</td>
<td>$0.00</td>
</tr>
<tr>
<td>B. Elevated tank at Town park</td>
<td>$1,323,494.30</td>
<td>$1,323,494.30</td>
<td>$0.00</td>
</tr>
<tr>
<td>C. Two new lines, wells to tank</td>
<td>$943,603.60</td>
<td>$943,603.60</td>
<td>$17,325.00</td>
</tr>
<tr>
<td>D. Replace 6&quot; AC with 8&quot; PVC</td>
<td>$1,243,701.88</td>
<td>$1,171,514.38</td>
<td>$72,187.50</td>
</tr>
</tbody>
</table>
5. ECONOMIC ANALYSIS, ABILITY TO PAY, PROJECT FINANCING

Only limited economic calculations addressing the Town’s fiscal situation could be made because the information provided was incomplete. There were also discrepancies between the budget data the Town provided for this study and the fiscal information the Town submitted to the Wyoming Department of Audit.

The budget summary reported annual water system revenues of approximately $50,000. For the purpose of this report, it was assumed that this amount covers all current operating expenses including debt retirement, personnel costs, overhead, administration, and materials. However, the Town budget does not contain any provision to set funds aside for water system repairs or maintenance.

As with most small municipalities, Fort Laramie’s ability to pay for improvements is limited by the size of its consumer base. The Town has 175 active water service accounts. Major capital improvements will require a substantial increase in water rates even if favorable financing packages are available from the WWDC or other sources.

See the Table “Estimates of Rates for Debt Service and Emergency/Major Maintenance Funds at the end of this document for the water rate increases necessary to repay construction loans and create funds for system repairs. A detailed explanation of the contents of this table is contained in Section 5 of the main report.

6. OPERATION, MAINTENANCE, AND MANAGEMENT ISSUES

- Water Production and Use Records. The absence of accurate data on water use and water production posed a major difficulty in evaluating the Town’s water system for future upgrades. This lack of information prevented a thorough analysis of the system. If this data were available, the Town could
use it to more efficiently manage its system and determine the amount of water losses, if any.

- **Maintenance Records.** The Town has no procedure in place for recording either regular system maintenance or replacement of system components. For example, no information was available concerning when the well pumps were installed. Pump manufacturer, horsepower rating, or other specifications could not be determined. Since both pumps were replaced in the spring of 2008, this information is now available to the Town and should be maintained for future reference. No data was available on leak repairs or other routine system upkeep. Inadequate records of point-of-use meter replacement contributed to discrepancies in water use records.

- **Fiscal Records and Budget.** The fiscal records and budget data provided by Fort Laramie for this study did not contain enough information to determine whether or not the current rate structure is sufficient to cover expenses and make the system self-supporting. When asked for fiscal information, the Town did not provide records of actual income and expenditures, but did submit a budget summary for three fiscal years. Water system expenses excluding debt retirement are shown as $16,000, but there is no allocation for personnel, power, or overhead costs. While the Town budget contains line items for “Rainy Day Account,” ($30,000) and “Emergency Funds” ($10,000), these accounts are not earmarked for the water system.

- **Certification of Water System Operators.** The Town is required to have a primary and back-up operator certified as Level I Water System Operators. The Town should ensure that operators receive appropriate training to meet certification requirements.

- **Water Rates.** The Town’s current water rates are $19.00 for the first 1000 gallons, then no charge beyond the base rate for the next 10,999 gallons.
Usage above 12,000 gallons is charged at a flat rate of $1.00 per 1000 gallons. Using fiscal data submitted by the Town, it cannot be determined if this rate covers water system operating expenses. As noted above, there is no verification that the Town maintains a dedicated account for emergencies or for major maintenance and repairs.

7. RECOMMENDATIONS

- Storage. Storage capacity should be increased to 150,000 gallons.

- Transmission Lines. The single transmission line between the wells and the tank should be replaced with dual lines.

- Distribution System. The estimated 6,000 LF of 4” and smaller lines should be prioritized for replacement. The remaining 11,000 LF of 6” AC transmission pipe in the Town’s system should be scheduled for replacement over the next few years. An increase in system pressure from a taller tank may damage these pipes.

- Record Keeping. The Town should take the steps necessary to ensure that accurate records of well production and metered usage, water system income and expenses, and system maintenance are maintained.

- Water Rates. The Town should adopt a progressive rate structure similar to the following example:

<table>
<thead>
<tr>
<th>Usage</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>11,999 gallons</td>
<td>$19.00</td>
</tr>
<tr>
<td>12,000 to 14,999 gallons</td>
<td>$1.00 per 1000</td>
</tr>
<tr>
<td>15,000 to 17,999 gallons</td>
<td>$1.25 per 1000</td>
</tr>
<tr>
<td>18,000 to 20,999 gallons</td>
<td>$1.50 per 1000</td>
</tr>
<tr>
<td>Above 21,000 gallons</td>
<td>$2.00 per 1000</td>
</tr>
</tbody>
</table>
This rate structure assumes no changes in the Town’s current debt. If the Town elects to pursue any of the major system improvements discussed in this report, the recommended increase in the base rates displayed in the Table at the end of this document should be implemented.

- Water Treatment. Disinfection of the Town’s water supply is compromised by the single line between the wells and the storage tank. Unfortunately, there is no technical or mechanical solution that can be implemented while decisions are pending on the future configuration of the storage tank and transmission lines. In the absence of an interim solution, the water system operator must be relied on to diligently monitor chlorine concentrations delivered to users. Unfortunately, construction alternatives that would resolve this problem will not be in place before 2010 or 2011.

- System Security. The Town should take steps to protect the integrity of its water system from malicious damage and accidental contamination. Because the Town’s two wells are only 50 feet apart, a spill or other surface contamination could affect both wells. The well buildings should be enclosed with security fencing and a secure locking gate. The Town’s storage tank is also vulnerable to damage and to the introduction of foreign material into the tank itself. The tank should be protected with security fencing.

- Leak Detection Program. The Town should conduct a leak detection program to determine where water loss is occurring. A leak detection program is relatively inexpensive and the expense is recouped through savings in pumping and disinfection costs if significant system losses are identified and corrected.

- Service and Maintenance Contracts. The Town should consider entering into service contracts with Micro-Comm and Black Mountain Software to cover
replacement of system components in case of lightning strike, power surge, or other major mishap.

- **Protection of Meter Pits.** The Town should insulate meters and meter pits to prevent freezing. Many municipalities install the same fiberglass batting used for residential construction.

- **Rehabilitation of Irrigation System.** Sections of the Town's surface irrigation system are in disrepair. The Town should consider restoring the system to provide raw water for lawn maintenance and to protect the Town's water right.

8. **GIS PRODUCT**

A limited GIS map containing the system components inventoried during this study was prepared and provided to the WWDC. The GIS component includes maps and aerial photos in the public domain and surveyed hydrant locations. The water system GIS layer was taken the map developed by Baker Engineering during the 2002 study. Bid documents for water system improvements from September, 2002 were also used to make estimates about the present configuration of the system. Verification of information obtained from the Town or the Baker study was beyond the scope of this study.
### ESTIMATES OF RATES FOR DEBT SERVICE AND EMERGENCY/MAJOR MAINTENANCE FUNDS

<table>
<thead>
<tr>
<th>SYSTEM COMPONENT ALTERNATIVES</th>
<th>CONSTRUCTION COST</th>
<th>RATE INCREASE, WWDC LOAN</th>
<th>RATE INCREASE, EMERGENCY FUND (1)</th>
<th>RATE INCREASE, MAJOR MAINTENANCE AND REPAIR</th>
<th>INCREASE IN BASE RATE FOR THIS ALTERNATIVE</th>
<th>CURRENT BASE WATER RATE FOR 12,000 GALLONS</th>
<th>TOTAL ESTIMATED BASE WATER RATE 12,000 GALLONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A New 150,000 tank, existing location</td>
<td>$654,451.00</td>
<td>$5.95</td>
<td>$0.60</td>
<td>$18.88</td>
<td>$25.43</td>
<td>$19.00</td>
<td>$45.03</td>
</tr>
<tr>
<td>B Elevated 150,000 tank</td>
<td>$1,323,494.30</td>
<td>$12.03</td>
<td>$0.60</td>
<td>$18.88</td>
<td>$31.51</td>
<td>$19.00</td>
<td>$50.51</td>
</tr>
<tr>
<td>C Two PVC lines between tank and wells</td>
<td>$943,603.60</td>
<td>$8.58</td>
<td>$0.60</td>
<td>$18.88</td>
<td>$28.06</td>
<td>$19.00</td>
<td>$47.06</td>
</tr>
<tr>
<td>D Replace all 6” AC transmission lines with 8” PVC</td>
<td>$1,243,701.88</td>
<td>$10.65</td>
<td>$0.60</td>
<td>$12.63</td>
<td>$23.88</td>
<td>$19.00</td>
<td>$42.88</td>
</tr>
</tbody>
</table>

### ESTIMATES OF RATES FOR COMBINATIONS OF COMPONENTS

| A, C and D New tank at existing location, 2 lines to tank and all 6” AC replaced | $2,841,756.48 | $25.17 | $0.60 | $12.63 | $38.40 | $19.00 | $57.40 |
| A and C New tank at existing location and 2 new lines to tank | $1,598,054.60 | $14.52 | $0.60 | $18.88 | $34.00 | $19.00 | $53.00 |
| B and C Elevated tank, replace all 6” ACP transmission lines | $2,567,196.18 | $22.68 | $0.60 | $12.63 | $35.91 | $19.00 | $54.91 |

(1) Add to base rate only once.