EXECUTIVE SUMMARY

For

LYSITE WATER SUPPLY
LEVEL I STUDY

Prepared for:

LYSITE WATER AND SEWER DISTRICT
P.O. Box 163
Lysite, WY 82642

WYOMING WATER DEVELOPMENT COMMISSION
6920 Yellowtail Road
Cheyenne, WY 82002

Prepared by:

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In Association with:

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PURPOSE

The purpose of the Level I Study was to determine water supply options for the Lysite Water and Sewer District (LWSD). The work included preparing preliminary designs and cost estimates for providing a complete water supply system in the project area.

Currently, most of the residents and businesses in the area have their own water supply wells. The wells are of low capacity, and range in water quality from good to poor. Due to the current drought conditions in the area, some of the wells have decreased both in capacity and quality. Because of these problems, the LWSD was formed to begin the work on providing the Lysite area with a reliable potable water supply.

Stetson Engineering, Inc.’s work focused on determining an affordable, reliable water system in regards to supply, storage, and delivery that can meet the needs of the District.

CONCLUSIONS AND RECOMMENDATIONS

Water Supply Sources

As a newly formed District, the LWSD presently does not have a water supply source. The Preferred Alternative to be implemented as a Level 2 Study uses a phased approach to evaluate the potential for water supply from either shallow or deeper sandstone aquifers in proximity to Lysite. The aquifers occur in sandstone channels within the Wind River Formation. Data gathered during the Level 1 Study indicate that within the LWSD there may be potential for cost-effective development of shallow groundwater, whereas to the south of Lysite there are more favorable conditions to develop wells in deeper sandstone aquifers.

The shallow aquifer may be developed with a well less than 350 feet in total depth. The deeper aquifer requires a well depth planned for up to 1,200 feet. The deeper aquifer would be developed only if testing showed that the shallow aquifer was unsuitable.

Based on review of well logs, it was found that the existing School-Community Center well (School Well) may be installed into a viable aquifer for the LWSD. The first phase of the Preferred Alternative will conduct a pumping test in this well, while monitoring the pumping well and three other private wells in the area. The purpose of this test is to determine aquifer yield potential, water quality, and to assess interference effects with neighboring existing wells.

If the School Well pumping test indicates favorable aquifer conditions, a shallow aquifer test well will be constructed on the site. The test well is planned as an 8-inch diameter screened completion with a total depth up to 350-feet and a target capacity of about 20 gpm. If the pumping test finds the School Well site is unsuitable, an exploratory shallow test well of the same construction and total depth will be drilled approximately 300 feet south of the Lysite Store. This well site is in an area where local wells appear to produce more water than at other locations within the LWSD boundaries.

If the Level 2 Study finds that shallow groundwater, where tested, is unsuitable for the LWSD water supply, a deeper test well will be constructed to the south of Lysite. For economic reasons, this deeper test well is limited to a distance of no more than
approximately 1,700 feet south from the LWSD boundary. The well location was selected based on geological work completed as part of the Level 1 Study. In principal, this work found that groundwater development feasibility increases south and east from Lysite. It is nearly certain that a well of sufficient capacity could be installed 2.5 to 4 miles south and east from the LWSD, but unfortunately, such a well is costly due to the length of new water transmission line that must be installed. It is not known as to how far north the more favorable aquifer conditions extend.

The deeper test well is planned for a total depth up to 1,200 feet, based in part on geological data from oil/gas wells, and the total depth of other successful water wells that exist south of Lysite. The well is planned for construction with 7-inch diameter casing and 3-inch diameter screen set in an artificial filter pack. The target yield for the well is 40 gpm. If the aquifer yield appears low (as determined by air-lift pumping at time of drilling and porosity determinations of drill cuttings) a provision has been included to perform a hydraulic fracture stimulation of the producing zone. This treatment creates a fracture while simultaneously filling it with permeable sand, increasing aquifer transmissivity to the well and well yield.

The Preferred Alternative has a total estimated fee of $512,000. Of this total fee, shallow aquifer testing and well construction is estimated at $145,000. Testing and well construction for the deeper aquifer is estimated at $367,000.

**Delivery System**

Because of the estimated construction costs involved it was determined that the preferred alternative for the District at this time is to construct a limited delivery system that would serve only the current members. The system would consist of approximately 5,200 lineal feet of four (4) inch distribution lines, a 25,000 gallon storage tank, a booster pump, and if needed, point of use Reverse Osmosis Treatment Systems (RO). See Figure 1-1. The system is not designed to provide fire protection. At this time the preliminary design is for only providing potable water to the members of the District.

The system layout in Figure 1-1 is dependent on the supply source being found at the school property. The final configuration of the system would be dependent on the results of the supply source as discussed in the previous section. If the preferred supply source is determined to be south of Town there would be an additional 1,700 lineal feet of four (4) inch transmission lines included in the system. See Figure 1-2.

The preliminary design of the delivery system done in this report was for feasibility purposes. The layout and configuration of the delivery system will be refined in the Level 2 Study after the supply source has been evaluated.

**WATER SUPPLY DEMAND**

### Service Area and Population

The current service area consists of approximately 62.5 acres. According to the Fremont County GIS data obtained from the Fremont County Assessor, the area is currently subdivided into 71 lots. However, there are presently only 35 owners within the district and only 27 lots that plan to be served by the proposed system. The estimated
population of the district is 70 based on 2.61 persons per dwelling unit (year 2000 Fremont County Census Data).

If all 71 lots were developed, the full build out population is estimated at 185. It is however unlikely that the town could experience build out on all the lots in the near foreseen future. There is no central sewer system in the Town. All the homes in the District are served by individual septic systems. Under the current subdivision regulations, many of the lots are too small to be permitted by the Wyoming Department of Environmental Quality (WDEQ) for new septic systems.

The average annual growth rate for Fremont County between 2000 and 2004 was approximately 0.5%. Based on this rate the 2035 estimated population would be about 81. We believe however that there is a potential for further growth in and around the Town because of the existing oil and gas industry in the area. It is estimated that there are about 15 additional lots in the Town limits that could be developed and about sixteen 10-acre lots east of Town that could be developed. Added to the existing 27 lots in the district this would give a potential of 58 lots or approximately 151 persons. This would be an annual growth of about 2.6% over the next 30 years, which we feel could be reasonable for the area if there was a reliable water source.

For final determination of the possible future demand we have included other potential users in the area (Star Trucking, Burlington Resources, and the Community Recreation Center). These three entities were looked at as possibly needing a 1-1/2 inch service. Based on Equivalent Dwelling Units (EDU), these three combined entities would be equivalent to 12 single-family homes or an additional 31 persons.

The following Table summarizes the area population projections in terms of Equivalent Dwelling Units and population (It is assumed that Star Trucking, The Community Recreation Center, and Burlington Resources are connected to the system by the year 2010).

<table>
<thead>
<tr>
<th>LYSITE EQUIVALENT DWELLING UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>2005</td>
</tr>
<tr>
<td>-----------------------------------</td>
</tr>
<tr>
<td>Equivalent Dwelling Units (EDU)</td>
</tr>
<tr>
<td>27</td>
</tr>
<tr>
<td>Equivalent Population (EDU x 2.61)</td>
</tr>
<tr>
<td>70</td>
</tr>
<tr>
<td>Estimated Population (based on 2.6% annual growth)</td>
</tr>
<tr>
<td>70</td>
</tr>
</tbody>
</table>

**Water Demand**

Standard Average and Peak Rates

A water Demand of 125 gpm per person average use rate was used to meet The Wyoming Department of Environmental Quality (WDEQ), Wyoming Water Quality Rules
and Regulations, Chapter 12, section 8 (a), Rules and Regulations. Maximum day demand and maximum hour demands are estimated from the average day demand by applying peaking factors.

- Maximum Day Demand = 2.72 x Average Day Demand
- Maximum Hour Demand = 1.5 x Maximum Day Demand

The following Table summarizes the estimated water use rates for Lysite under present conditions and for selected future years (based on the estimated population growth as previously discussed).

### WATER USE RATES

<table>
<thead>
<tr>
<th>Water Use</th>
<th>2005</th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
<th>2035</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Day Demand (gpm)</td>
<td>6</td>
<td>10</td>
<td>12</td>
<td>14</td>
<td>16</td>
</tr>
<tr>
<td>Average Day Demand (gpd)</td>
<td>8750</td>
<td>13750</td>
<td>16625</td>
<td>20500</td>
<td>22875</td>
</tr>
<tr>
<td>Maximum Day Demand (gpm)</td>
<td>17</td>
<td>26</td>
<td>31</td>
<td>39</td>
<td>43</td>
</tr>
<tr>
<td>Peak Hour Demand (gpm)</td>
<td>25</td>
<td>39</td>
<td>47</td>
<td>58</td>
<td>65</td>
</tr>
</tbody>
</table>

Rates shown are based on present and projected population in the service area, a per capita average day demand of 125 gallons, and peaking factors described above.

The peak rates as discussed previously are adequate to use in the modeling of a system as long as the system is being designed to provide fire flows. The fire flow sizing more then adequately accounts for the possible peak demands experienced in a water system that are sometimes well beyond the estimated peak hour demands. To determine the possible peak rates experienced in the system, methods described in the American Water Works Association, *Sizing Water Service Lines and Meters – Manual of Water Practices M22*, Second Edition (AWWA-M22) were used.

The following tabulates the AWWA-M22 peak demand data determined for both the year 2005 population and for the estimated year 2035 population. It can be seen by this data that the potential peak in the system is much higher then was determined as the peak hour demand.

<table>
<thead>
<tr>
<th>Equivalent Population</th>
<th>Peak Demand (gpm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 2005 estimate of 70 persons</td>
<td>112</td>
</tr>
<tr>
<td>Potential Full Build out of 183 persons</td>
<td>160</td>
</tr>
</tbody>
</table>
# Preferred Alternative Cost Estimate

The cost estimates for the preferred alternatives are summarized below and are broken down in further detail in tables 7-3, 7-4, 9-1 and 9-2 D in the report.

## Water Supply & Delivery System

### Shallow Well and Limited Distribution System

- Alternative W-1 Shallow Well (Total Costs) $195,700.00
- SCADA Control $20,000.00
- Storage Tank (25,000 gal) $82,000.00
- Point of use RO $27,000.00
- Distribution $211,000.00
- Booster pump and controls $26,000.00

**TOTAL** $561,700.00

### Deep (DOI/Napp) Well and Limited Distribution System

- Alternative W-2 Deep Well (Total Costs) $485,300.00
- SCADA Control $20,000.00
- Storage Tank (25,000 gal) $82,000.00
- Point of use RO $27,000.00
- Distribution $211,000.00
- Transmission $78,500.00
- Booster pump and controls $26,000.00

**TOTAL** $929,800.00
ECONOMIC ANALYSIS AND PROJECT FUNDING

The funding scenarios assume the following:

- **WWDC** 67% Grant for eligible sponsor payback portions of the project.
- **SLIB** 50% Grant for Eligible Components
- **RUS** 20-80% Grant-Loan Split for Eligible Components

**Funding Plan**

**Shallow Well and Limited Distribution System**

- **WWDC Grant** (Including Level II WWDC non-reimbursed well work) $248,700.00
- **SLIB Grant** $106,000.00
- **RUS Grant** $41,000.00
- **RUS Loan** $166,000.00

**TOTAL PROJECT FINANCING** $561,700.00

**Deep (DOI/Napp) Well and Limited Distribution System**

- **WWDC Grant** (Including Level II WWDC non-reimbursed well work) $538,800.00
- **SLIB Grant** $106,000.00
- **RUS Grant** $57,000.00
- **RUS Loan** $228,000.00

**TOTAL PROJECT FINANCING** $929,800.00
**Fee Impact to Users**

The following assumes a Total RUS loan in the amount shown for a rate of 4.5% and a term of 30 years.

**Shallow Well and Limited Distribution System**

<table>
<thead>
<tr>
<th>Item</th>
<th>Loan Amount</th>
<th>Annual Cost to District</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Water System Components</td>
<td>$165,712</td>
<td>$10,173</td>
</tr>
<tr>
<td>O&amp;M</td>
<td>$8,000</td>
<td></td>
</tr>
<tr>
<td><strong>Total Annual Cost to District Members</strong></td>
<td>$18,173</td>
<td></td>
</tr>
<tr>
<td><strong>Total Monthly Cost to District Members (based on 27 taps)</strong></td>
<td>$56.09</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Monthly Cost per Member (based on Number of EDUs)</th>
<th>District Members</th>
<th>Monthly Payment / Member</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>27</td>
<td>$56</td>
</tr>
<tr>
<td></td>
<td>42</td>
<td>$36</td>
</tr>
<tr>
<td></td>
<td>70</td>
<td>$22</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Item</th>
<th>Loan Amount</th>
<th>Annual Cost to District</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Loan Term 4.5% for 30 years)</td>
<td></td>
</tr>
<tr>
<td>New Water System Components</td>
<td>$ 228,184</td>
<td>$ 15,389</td>
</tr>
<tr>
<td>O&amp;M</td>
<td>$ 8,000</td>
<td></td>
</tr>
<tr>
<td>Total Annual Cost to District Members</td>
<td>$ 23,389</td>
<td></td>
</tr>
<tr>
<td>Total Monthly Cost to District Members (based on 27 taps)</td>
<td>$ 72.19</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Monthly Cost per Member (based on Number of EDUs)</th>
<th>27</th>
<th>42</th>
<th>70</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly Payment / Member</td>
<td>$72</td>
<td>$46</td>
<td>$28</td>
</tr>
</tbody>
</table>