EXECUTIVE SUMMARY OF THE
LEVEL TWO STUDY FOR THE
NINE MILE WATER AND SEWER DISTRICT

November 1, 1999

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Prepared For:
Wyoming Water Development Commission
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**TABLE OF CONTENTS**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>SERVICE PLANNING AREA</td>
<td>1</td>
</tr>
<tr>
<td>LAND USE PLANNING</td>
<td>1</td>
</tr>
<tr>
<td>POPULATION AND WATER USAGE</td>
<td>2</td>
</tr>
<tr>
<td>SERVICE SYSTEM</td>
<td>3</td>
</tr>
<tr>
<td>SYSTEM DESIGN</td>
<td>4</td>
</tr>
<tr>
<td>PERMITS, GEOTECHNICAL ISSUES, AND SURVEYING</td>
<td>5</td>
</tr>
<tr>
<td>COST ESTIMATE AND FINANCIAL ANALYSIS</td>
<td>5</td>
</tr>
<tr>
<td>SYSTEM OPERATING PLAN</td>
<td>7</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>8</td>
</tr>
</tbody>
</table>

PLATE 1
INTRODUCTION

This report has been prepared following a Level 2 Study, performed by Western Water Consultants, Inc. (WWC) for the Nine Mile Water and Sewer District (the District), and funded by the Wyoming Water Development Commission (WWDC). The District is located in Sections 20, 21, and 29, Township 15 North, Range 74 West, in Albany County, Wyoming. It is approximately nine miles west of the City of Laramie, Wyoming. The purpose of the study was to investigate the feasibility of providing a domestic water supply for the benefit of the District and its members.

The Level 1 study (Coffey, 1998) recommended a water supply system for the District that would satisfy domestic demands. Such a system would include a pump station to raise water pressure to usable levels throughout the District. The source of water for the project would be Laramie’s large diameter pipelines from their water treatment plant, which run directly adjacent to the District along Wyoming State Highway 230.

SERVICE PLANNING AREA

The proposed service area for the District water supply system is shown on Plate 1. At the time this study was undertaken, there had been some discussions aimed at including additional properties within the District (by modifying the District boundaries) prior to the construction of any proposed domestic water distribution system.

The District board has not opposed requests or petitions to enlarge the District boundaries to include other residential properties. Board members did, however, ask several parties that the Board be formally notified of any such request or petition. No such formal notification has been received. Therefore the service planning area adopted for this study is the current District boundary.

LAND USE PLANNING

Land use planning in Albany County is regulated under the county Zoning Resolution. On August 1, 1997, the Board of County Commissioners adopted new land use regulations. As of that date, all existing facilities were zoned based on their tax classification (i.e., agricultural, residential, industrial, or commercial).
Prior to construction of a pump station, a Certificate of Zoning Compliance should be obtained from the county Planning Office. It seems likely that a Certificate of Compliance can be issued for a new pump station, whichever zone it is located in, provided the pump station is so designed and constructed as to avoid posing a nuisance to the surrounding landowners. The Certificate will probably recognize a water pump station as a supplemental conforming use within the existing zone.

**POPULATION AND WATER USAGE**

For long term planning purposes, the following occupancy and population values were adopted.

| Number of Occupied Residences within the District (Number of Services Required) | 137 |
| Percentage of Residences Permanently Occupied | 80% |
| Occupants per Occupied Residence | 3.5 |
| Maximum Number of Individuals Using Water in the District | 480 |

The principal design requirement for the water distribution system and the water pump station is the maximum instantaneous demand. Additional design values are the average daily demand; maximum daily demand; and maximum hourly demand. There are no historical data from the Nine Mile District area on which to base any of these values.

The instantaneous demand was determined using the Fixture Unit method of the Uniform Plumbing Code (IAPMO, 1997). Although the method is designed to provide a basis for sizing water piping in residential and other buildings, it is directly applicable to this situation. The estimated maximum instantaneous water demand for the District is approximately 383 gallons per minute (gpm).

Average daily demand, maximum daily demand, and maximum hourly demand were estimated to be 31,200 gallons per day (gpd), 109,200 gpd, and 546,000 gpd, respectively. These values were calculated using estimated population, a per-capita usage figure, and standard multipliers.

The Level 1 study (Coffey, 1998) concluded that a water supply system that would supply conventional fire flows to the Nine Mile Water and Sewer District is not financially or operationally feasible. Members of the District have expressed interest in obtaining some fire protection. Thus, this Level 2 study did investigate the possibility of providing small,
non-standard, fire hydrants on the proposed District water distribution system. (However the primary fire-fighting water supply will continue to be provided by a very good source hydrant or hydrants, for the refilling of tankers, drawing directly from the City of Laramie’s large diameter mains adjacent to the District.) Adding 200 gpm of fire flow to the maximum daily demand would require a total flow of 276 gpm, which is less than the maximum instantaneous demand previously identified. This subject is discussed further under the heading of System Design.

**SERVICE SYSTEM**

The proposed distribution pipeline network for the Nine Mile water system is shown on Plate 1. A portion of Plate 1 includes an aerial photo of the project area, which is for information purposes only. The aerial photo was obtained from the Wyoming Department of Transportation, and is obviously not current. The photo is also not orthographically corrected, and thus does not align completely with the actual physical features as they have been surveyed.

Since completion of the Level 1 report, all of the roads within the District have been surveyed and dedicated to public use. These roads will provide routes for most of the District’s water pipelines. The surveyed roads are shown on Plate 1. All water mains within the District would be six- (6-) inch diameter, except for the supply line from the City transmission mains, which would be eight- (8-) inch diameter.

Minor changes may be made to this distribution system if the project is built. Negotiations with specific property owners for easements to construct pipelines may make it more desirable to relocate an easement to a neighboring parcel of land. Such adjustments are not expected to affect the overall effectiveness or cost of the distribution system as shown, however.

The proposed system was modeled using the commercially available WaterCad software. The general modeling scenario included a number of items which are discussed under the section titled System Design, and the model results will be discussed under that section.
SYSTEM DESIGN

Aspects of the proposed water distribution system in addition to the water pipelines are described below. As identified in the Level 1 study, a pumping station will be required to raise water pressures to usable levels throughout the District. The design will include three main pumps and a service pump. An automatic control system will control the pumps. The pump station will also contain the main district water meter, and a reduced-pressure-principal backflow preventer.

Design pump sizes are as follows:

<table>
<thead>
<tr>
<th>Main Pumps (3 total)</th>
<th>Maximum Efficiency Point: 200 gpm @ 115 feet Total Dynamic Head</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum Design Capacity: 250 gpm @ 105 feet Total Dynamic Head</td>
</tr>
<tr>
<td>Service Pump (1 unit)</td>
<td>Maximum Efficiency Point: 35 gpm @ 105 feet Total Dynamic Head</td>
</tr>
</tbody>
</table>

The city has indicated that both of their transmission pipelines should be tapped, in order to assure a water supply if one or the other pipeline is drained for maintenance, or otherwise inaccessible. However, the city has also indicated that only one of the pipelines should be used at any particular time, and that the Nine Mile connection arrangement should not serve as a conduit between the two city pipelines.

The 8-inch pipeline from the city tap to the District pumphouse will have to be placed in a casing installed by boring under the highway. This same casing will also carry a return pipeline, which will provide water at system pressure to the three District properties on the south side of the highway.

A single, full-sized fire hydrant will be located adjacent to the pump station, and will draw its supply from the 8-inch diameter pipeline serving the pump station. In accordance with information from the Laramie Fire Department, this hydrant will obtain its supply ahead of the District water meter and backflow preventer in order to maximize the available flow from the hydrant.

Computer modeling of the maximum demand scenario included

- a continuous domestic demand of 344 gpm, i.e. the majority of the predicted maximum instantaneous demand,
- a fire flow of 200 gpm to a hydrant at the furthest junction of the 6-inch diameter pipeline, in the western portion of the District, and
- a fire flow of 500 gpm to the large hydrant at the pump station, which is presumed to be filling a water tanker for firefighting purposes.
The computer modeling confirmed the technical viability of the proposed distribution and pumping systems. At conditions of maximum demand, the supply pressure in the extreme northwest corner of the District (i.e. the highest and most distant point on the system) is predicted to be approximately 25 pounds per square inch (psi).

PERMITS, GEOTECHNICAL ISSUES, AND SURVEYING

A considerable number of permits, clearances, approvals, easements, and related documentation will be required prior to construction of the proposed system. A description of these items, insofar as known at this time, is provided in the full Report.

A condition of obtaining funding from the United States Department of Agriculture (USDA) Rural Development program, a hoped-for component of this project, is the preparation of an environmental report. The report must be prepared according to the format in Bulletin 1794A-602, published by the Rural Utilities Service (RUS) of the USDA. This Level 2 study report does not comprise, nor meet the requirements of, an Environmental Report for USDA RUS. As part of this study, however, WWC did prepare and mail initial environmental consultation letters to a group of agencies identified by RUS and the WWDC. The list of agencies, the form of the letter, and the responses received are contained in Appendix B of the full Report.

There are not expected to be any significant geotechnical issues that would prevent or significantly affect the construction or operation of a public water supply and distribution system to the Nine Mile Water and Sewer District.

No land surveying was conducted as part of this study. Prior to this study, the District had obtained legal surveys of all public roads in the district, in order that all roadways could be dedicated for public use. Some surveying will have to be done as part of the final design effort.

COST ESTIMATE AND FINANCIAL ANALYSIS

The financial analysis considers financial support from, and repayment to, two potential funding agencies: the Wyoming Water Development Commission, and Rural Utility Services (RUS) of the USDA. In keeping with the requirements of the WWDC, the analysis also includes a funding scenario considering financing only by that agency. All
pertinent costs and payment schedules included in the financial and repayment analysis are expressed as both totals, and as cost or payment per Equivalent Dwelling Unit (EDU), in accordance with RUS requirements. For this project, all of the individual residences within the District will qualify as EDUs.

The full Report contains WWC’s best estimate of construction costs and total capital investment costs for the proposed water supply. The estimated capital investment cost is $1,345,000. This is an average of $16,815 per EDU, if 80 residences (EDUs) are initially connected to the system. The full Report also develops monthly cost projections based on the capital cost estimate. Various WWDC-eligible and non-WWDC-eligible costs are tracked separately throughout the financial analysis. The summary table below provides the estimated costs, on a monthly payment basis, for the construction and operation of the proposed system.

<table>
<thead>
<tr>
<th>Assumed Funding Source</th>
<th>Initial Private Debt Repayment Cost, Average Monthly per EDU</th>
<th>Average Monthly Water Bill, (for Operation, Maintenance, and District Debt Retirement), per EDU</th>
</tr>
</thead>
<tbody>
<tr>
<td>WWDC-Only Funding</td>
<td>$111.39</td>
<td>$72.56</td>
</tr>
<tr>
<td>Combined WWDC and RUS Funding</td>
<td>N/A</td>
<td>$73.27</td>
</tr>
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</table>

It should be stressed that the non-WWDC-eligible costs are assumed financed by private borrowing by individual homeowners if RUS funding is not obtained. Therefore the per-EDU values shown for loan repayment for the WWDC-only scenario are only averages, and the loan repayment costs experienced by individual homeowners will vary, depending on the personal financing terms which they can obtain, and on the actual cost of the service line to their particular dwelling.

The following table contains recommended water rate schedules for adoption by the District following the successful passage of a bond issue and construction of the proposed system. Two water rate schedules are presented; the first schedule is very conservative in its assumptions, the second is less so. The table also contains a recommended Connection Fee for District customers who tap into the distribution system in the future.
Recommended Water Rate Schedule Utilizing Combined WWDC-RUS Funding

<table>
<thead>
<tr>
<th>Assumed Number of EDUs Connected</th>
<th>80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Average District Monthly Expense, per EDU</td>
<td>$ 73.27</td>
</tr>
<tr>
<td>Fixed Cost Portion of Average Monthly Expense, per EDU</td>
<td>$ 63.34</td>
</tr>
<tr>
<td>Variable Portion of Average Monthly Expense, per EDU</td>
<td>$ 9.93</td>
</tr>
<tr>
<td>Average Monthly Water Usage, per EDU, gallons</td>
<td>7,165</td>
</tr>
</tbody>
</table>

For Guaranteed Ability to Meet Fixed Monthly Expenses

| Billing Rate, per Thousand Gallons | $ 1.39 |
| Fixed Monthly Tap Fee | $ 63.34 |

Assume that Operations will be 50% Funded by Water Charges

| Billing Rate, per Thousand Gallons | $ 5.11 |
| Fixed Monthly Tap Fee | $ 36.64 |

Plant Investment Fee for New Taps

| Cost of New Saddle, Tap, Service Line, Meter Pit, & Meter | $ 1,295.75 |
| Customer is responsible for service line from meter to residence |

In general, water utilities do not set their fixed monthly charges sufficiently high to cover all their fixed costs. The larger a utility is, the lower it can set its fixed charges. The District cannot safely plan to recover its fixed expenses unless it sets fixed monthly charges at a relatively high level. Schedule 2 in the above table sets the fixed monthly charge high enough to cover half (50%) of the District’s estimated fixed monthly expense. An intermediate schedule, somewhere between those shown in the table, can be adopted if the District’s directors desire to use the fixed monthly charge to recover somewhere between 50% and 100% of the District’s fixed monthly expenses. A different schedule should also be adopted if significantly more or fewer than 80 EDUs are connected to the system.

**SYSTEM OPERATING PLAN**

There will be three principal entities engaged in operating and maintaining the Nine Mile Water and Sewer District water supply and distribution system. These will be District Board of Directors, the District’s business manager, and the District’s system operator. Further details of the operating plan for each of these entities are contained in the full Report.
REFERENCES


NOTE:
This photograph may not be geographically
accurately scaled or property positions.
Some streets and properties may not
be accurately represented in the photograph.

EXPLANATION
- NEW PIPELINE
- EXISTING CITY OF LARAMIE
- TRANSMISSION PIPELINES
- ESTIMATED NUMBER OF RESIDENTS FOR CALCULATING DEMANDS AT MODEL JUNCTIONS
- DISTRICT BOUNDARY

PLATE 1
ROADS AND PROPOSED WATER PIPELINE LOCATIONS
IN THE NINE MILE WATER AND SEWER DISTRICT