THAYNE AREA
WATER SUPPLY

November, 1995

SUBMITTED TO

WYOMING WATER DEVELOPMENT COMMISSION

EXECUTIVE SUMMARY

Prepared by

FORSGREN ASSOCIATES / INC.
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EXECUTIVE SUMMARY

1.1 PROJECT OVERVIEW

The Town of Thayne is located in Lower (north) Star Valley, Wyoming near the Wyoming-Idaho border. As with most Star Valley communities, Thayne is situated in an area surrounded by exceptional natural beauty. This location makes the greater Thayne area particularly attractive for development and growth. Thayne is perhaps best known for the Star Valley Cheese factory located at the south end of town.

Thayne's sole water supply source is the Flat Creek Springs located approximately 1 mile east of town. The town has a shared filing on these springs with the Star Valley Cheese factory. Both entities also share a single gravity feed line from the springs. The town's supply is directed to a booster pump station located adjacent to the cheese factory where the water is pumped to a 300,000 gallon steel tank (also located east of town). During most times of the year, the springs have adequate yield to meet the town's present demands. The existing system is not metered (master or individual) and no long-term records are available relative to system demands or spring yields. Specific usage measurements were taken by Forsgren Associates as part of this study.

Existing system pressures typically range from 45 to 65 psi. During the summer months, system pressures drop as much as 20 psi, due to tank draw down, pipe losses, and/or supply shortages. The resulting low pressures represent a serious health risk to the community. Wyoming DEQ regulations require a minimum of 35 psi working pressure at all points in the system during summer demand periods.

Of equal concern to the Town of Thayne is the lack of sufficient water to meet present and future demands. Summer-time rationing is a common event in Thayne. Water resources are a controlling factor in the economic growth of the community. This Level I study is largely in response to this concern.

1.2 STUDY OBJECTIVES

As expressed in the Wyoming Water Development Commission (WWDC) contract Scope of Services, "The purpose of this (Level I) study is to prepare a water supply study for the Town of Thayne". This study also includes an analysis and evaluation of the nearby Bedford water system to insure a regional understanding and approach to the project. This Level I Study was completed in three phases as follows:

Phase I: Inventory of the existing water supply system: This phase involved documentation of spring water quality and yields, usage and needs; and the components and conditions of the existing storage, transmission, pumping, distribution, and fire protection in the Thayne and Bedford water systems. Also included in this investigation was an analysis of water rights, and the feasibility of increasing the available water supply from the Flat Creek drainage. Finally, the service area demographics were studied for current and future water supply requirements.
Phase II:  Groundwater Geohydrologic Analysis and anticipated future water supply: A geohydrologic study of Thayne and the surrounding lower valley area was conducted to determine the most likely location for a primary or supplemental groundwater well.

Phase III:  Conceptual Design and Cost Estimates: Based upon the prioritized future supply options and system requirements from Phase II, conceptual designs were planned and corresponding cost estimates were generated. This phase included computer modeling of each system, cost estimates, rate impact calculations, etc.

1.3 TOWN OF THAYNE WATER SYSTEM

1.3.1 Present Service Area Population

A physical count of homes and businesses within the Thayne corporate boundaries revealed 91 homes, 23 mobile homes, 12 apartment units, 19 motel units, 42 commercial businesses, 3 churches, 1 school, a cemetery, and the Star Valley Cheese Factory. The present population of Thayne is estimated to be 294 persons.

1.3.2 Thayne User Rates

Thayne currently uses a flat rate billing system of $10.00/connection/month for water and $12.00/connection/month for sewer service. The system is currently unmetered with no differentiation between residential and commercial users. Most customers are billed and pay quarterly.

1.3.3 Thayne Water Quality History

In general, the Town of Thayne has a history of full compliance with EPA water quality criteria. We are concerned, however, about the reported need for continuous disinfection to control bacteriological growth. This would not be considered as a normal condition for a properly developed "true" spring source.

MPA particulate testing was conducted as part of this study to ascertain if the town's supply was subject to surface water influence. Water samples were taken at the springs and from the transmission line near the cheese factory. The spring samples showed minor surface water influence. The influence was more pronounced in the sample taken from the transmission pipeline. This could be due to a leak in the transmission line or possibly a syphoning effect at the lower spring collection box.

1.3.4 Projected Water Supply Needs for the Thayne Area

Present and future water demands for the town of Thayne are summarized in Table 1.1. Water needs are presented separately for the Town of Thayne (present and future), the Star Valley Cheese Factory, and outlying subdivisions.
1.3.4.1 **Town of Thayne Water Needs (Present and Future):** Water demands for the existing town service area are based on the measured average day demand. Future demands assume a 3% annual population growth over the next 30 years.

1.3.4.2 **Star Valley Cheese Water Needs:** Water consumption for the Star Valley Cheese Factory is based on plant meter records for 1990 through 1994 as provided by the plant. It is our understanding that they are not presently planning any major expansion or operational changes. Their water demands, therefore, were assumed to remain constant over the next 30 years.

1.3.4.3 **Outlying Subdivisions:** Three subdivisions were considered as potentially being served by the Town of Thayne in the long-term future. Projected water needs are based on "full buildout" of the platted and planned subdivisions as identified and discussed with the Lincoln County planning office. Per capita consumption was assumed to match that of Thayne.

### TABLE 1.1

<table>
<thead>
<tr>
<th>Town of Thayne (present)</th>
<th>Town of Thayne (2010)</th>
<th>Town of Thayne (2025)</th>
<th>Star Valley Cheese</th>
<th>Riverview, Southbrook and Jepperson Subdivisions (w/full buildout)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. Connections</td>
<td>160</td>
<td>257</td>
<td>400</td>
<td>1</td>
</tr>
<tr>
<td>Est. Population Served</td>
<td>294</td>
<td>472</td>
<td>735</td>
<td>N/A</td>
</tr>
<tr>
<td>Est. Average Day Demand (900 gpcpd)</td>
<td>0.27</td>
<td>0.42</td>
<td>0.66</td>
<td>0.39</td>
</tr>
<tr>
<td>Est. Summer Day Demand (1200 gpcpd)</td>
<td>0.35</td>
<td>0.57</td>
<td>0.88</td>
<td>0.58</td>
</tr>
<tr>
<td>Est. Peak Day Demand (1500 gpcpd)</td>
<td>0.44</td>
<td>0.71</td>
<td>1.1</td>
<td>0.73</td>
</tr>
</tbody>
</table>

**Notes:**

(1) Future demands for the Town of Thayne are based on a 3% annual growth of the existing service area.

(2) Star Valley Cheese demands are based on 1990-1993 meter records provided by the plant. Future demands are assumed to remain constant.

(3) Subdivision demands assume full buildout based on discussions with Lincoln County planning office. Population estimates are based on 2.3 persons per household.

   Jepperson Subdivision: 6-18 lots
   Southbrook Subdivision: 39 lots
   Riverview Subdivision: 40-79 lots

(4) Peak day demand based on current peak system pumping capacity of approximately 300 gpm±.
1.4 RECOMMENDATIONS AND CONCLUSIONS - TOWN OF THAYNE

The Town of Thayne has provided safe drinking water to its residents for almost 50 years. However, Thayne is now facing EPA compliance and water supply problems primarily due to increasingly rigid regulatory requirements and increased demands on the system. Recommendations for addressing these long-term concerns are shown schematically in Figure 1.2 and discussed below:

1.4.1 Recommended System Improvements (Transmission and Supply)

a. Redevelop Flat Creek Springs and Reconstruct Transmission Pipeline

It is recommended that the Flat Creek Springs be redeveloped as required to minimize the potential for surface water influence.

It is recommended that the transmission line from the springs to town be replaced due to its age and fragile condition. A new 10-inch line would be required to carry the town's full water right. The town's booster pumps may also need to be replaced with larger horsepower pumps to match the final spring and pipeline capacity.

b. Construct Supplemental Groundwater Well and Transmission Line

A supplemental groundwater well is recommended to meet Thayne's long-term water supply needs. The recommended well site is approximately 2.5 miles east of town as generally shown in Figure 1.2. Target yield is between 500 and 1000 gpm.

c. "Emergency" Tie to the Bedford System

The proposed groundwater well is located in close proximity to the Bedford system. A tie between the Thayne and Bedford systems at that location would be relatively inexpensive and could provide valuable system redundancy in case of emergency or planned water service interruptions (such as the spring reconstruction).

d. Install Meters

Master meter(s) are recommended to allow the town to better track actual water consumption in the future. This can be a valuable management tool for system planning and operation.

1.4.2 Recommended Pipe Network Improvements

With any new construction, efforts should be made to loop all lines (particularly those with hydrants) wherever feasible. It is recommended that new transmission lines in the town of Thayne should be at least 6-inches in diameter to provide fire flows and 8-inches for lines that are not looped.
LEGEND

ROADS
ELEVATION CONTOURS
RIVER/CREEK
WATER TANK
SPRING
EXISTING PIPELINE
CORPORATE LIMITS
PROPOSED PIPELINE

PROPOSED IMPROVEMENTS
THAYNE WATER SYSTEM
FIGURE: 1.2
1.4.3 Service to Nearby Subdivisions

The Thayne water system does not presently have adequate supply or delivery capacity to serve the subdivisions located north and south of town. Nor are we aware of any plans by the town to serve those areas in the foreseeable future. No specific recommendations, therefore, are included herein.

1.5 ECONOMIC DATA

1.5.1 Star Valley Cheese Factory

The Town of Thayne and the Star Valley Cheese factory have been friends and economic partners in the community for many years. The town and the cheese factory are each viewed as independent drinking water systems by the EPA even though they share the Flat Creek Springs and transmission line. The "shared" status of this infrastructure raises questions about the financial responsibility and liability for system improvements.

This project may provide the town and the cheese factory with an excellent opportunity to negotiate a water service agreement in which the town would accept responsibility for operation and maintenance of the springs and the cheese factory would receive water from the town at an agreed user rate. This approach would eliminate redundant water quality testing and simplify water rights issues.

1.5.2 Thayne Project Budget

The budget for the recommended project is $1,071,000 as summarized in Table 1.2.

1.5.3 Thayne Project Financing

Based on discussions with WWDC staff and funding experience with similar projects, it is believed that the project recommendations presented herein are all eligible for WWDC funding. In the past, WWDC has funded this type of project with a 67% grant and a 33% loan at 4% annual interest over a period of 30 years*. It should be noted that WWDC's funding is presently very tight. That fact could influence WWDC's funding formulas and policies relative to this and other future projects.

The Town of Thayne is classified as a "low-to-moderate" income community and qualifies for federal funding through the Rural Economic Community Development (RECD, formerly FmHA) program for this type of project. The "best case" funding scenario using RECD money would require water users to carry a debt load at least equal to 0.5% of Thayne's median household income ($17,969).

Funding scenarios with and without RECD participation are summarized in Tables 1.3 and 1.4 based on current funding practices.
### TABLE 1.2
TOWN OF THAYNE
PRELIMINARY PROJECT BUDGET
SUPPLY, TRANSMISSION, AND STORAGE NEEDS
WWDC ELIGIBLE COSTS

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Est. Cost</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Flat Creek Springs Rehabilitation</td>
<td>$185,800</td>
</tr>
<tr>
<td>2</td>
<td>Spring Transmission Line</td>
<td>$118,800</td>
</tr>
<tr>
<td>3</td>
<td>Groundwater Well</td>
<td>$185,800</td>
</tr>
<tr>
<td>4</td>
<td>Well Transmission Line</td>
<td>$216,200</td>
</tr>
<tr>
<td>5</td>
<td>Misc.</td>
<td>$ 39,000</td>
</tr>
<tr>
<td></td>
<td><strong>Subtotal</strong></td>
<td><strong>$745,600</strong></td>
</tr>
<tr>
<td></td>
<td>Preparation of Plans and Specs</td>
<td>$ 74,600</td>
</tr>
<tr>
<td></td>
<td>Permitting &amp; Mitigation</td>
<td>$  6,500</td>
</tr>
<tr>
<td></td>
<td>Legal Fees</td>
<td>$  6,000</td>
</tr>
<tr>
<td></td>
<td>R.O.W. Acquisition</td>
<td>$  12,000</td>
</tr>
<tr>
<td></td>
<td>Construction Cost (from above)</td>
<td>$745,600</td>
</tr>
<tr>
<td></td>
<td>Construction Engineering (10%)-(exclusive of well drilling)</td>
<td>$ 64,500</td>
</tr>
<tr>
<td></td>
<td>Well Inspection/Geohydrologist</td>
<td>$  35,000</td>
</tr>
<tr>
<td></td>
<td><strong>Subtotal</strong></td>
<td><strong>$845,100</strong></td>
</tr>
<tr>
<td></td>
<td>Contingency (15%)</td>
<td>$ 126,800</td>
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<tr>
<td></td>
<td><strong>Construction Total</strong></td>
<td><strong>$971,900</strong></td>
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### TABLE 1.3
TOWN OF THAYNE
TYPICAL PROJECT FUNDING
(WWDC PARTICIPATION ONLY)

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>WWDC Grant (67%)</td>
<td>$ 717,570</td>
</tr>
<tr>
<td>WWDC Loan (33%)</td>
<td>$ 353,430</td>
</tr>
<tr>
<td>Annual Loan Payment (4% - 30 year)</td>
<td>$20,439/year</td>
</tr>
<tr>
<td>&quot;Immediate monthly rate impact (160 connections)&quot;</td>
<td>$10.65/conn./mo.</td>
</tr>
</tbody>
</table>

PROJECT TOTAL $1,071,000

1-6
TABLE 1.4
TOWN OF THAYNE
PROJECT FUNDING
(WWDC AND RECD PARTICIPATION)

<table>
<thead>
<tr>
<th></th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>WWDC Grant (67%)</td>
<td>$717,570</td>
</tr>
<tr>
<td>RECD Grant</td>
<td>$144,130</td>
</tr>
<tr>
<td>RECD Loan</td>
<td>$209,300</td>
</tr>
<tr>
<td></td>
<td>$1,071,000</td>
</tr>
</tbody>
</table>

Annual Loan Payment (5½% - 30 year) $14,400/year
"Immediate monthly rate impact (160 connections) $7.50/conn./mo.

Note:
Rural Economic Community Development (RECD) funding participation based on "best case" indebtedness equal to ½% of Thayne's median per household income ($17,969.00) per connection. Assumed RECD interest rate = 5.5%

1.5.4 User Rate Impacts
Average "immediate" user rate impacts are estimated to be between $7.50/conn/month (best case) and $10.65/conn/month depending on RECD funding participation.

1.6 BEDFORD WATER SYSTEM

1.6.1 Bedford Water System History
In the late 1980's, the Bedford water system was experiencing severe pressure and supply problems primarily due to growth in the Bedford service area. A long-standing moratorium had been imposed on any new connections. An application was made to the WWDC for assistance in addressing those system limitations. Forsgren Associates was subsequently selected to conduct Level I and Level II investigations of the Bedford system. Based on the recommendations of those studies, Bedford's water system was reconstructed in its entirety to address water quality concerns, water supply needs, etc. The Bedford Water and Sewer District was formed by local residents at that time in order to provide a legal political entity to obtain funding and to construct and operate the new system. System construction was completed in 1990.

The Bedford Water and Sewer District and the Town of Thayne are located in close proximity to each other and can reasonably be viewed as part of the same regional service area. For that reason, it was felt that an evaluation of the Bedford system would be an appropriate part of this study.

1.6.2 Present Bedford Service Area Population
The Bedford Water and Sewer District provides domestic water to most of the rural residents living in the area bounded by Thayne on the west and Bridger Forest on the east. It should be noted that the Bedford district service area does not include the nearby Star
Valley Ranch development which has a privately owned and operated water system. The Bedford system presently has 156 active and 91 "underground" (inactive) service connections. Nearly all of the connections are residential with the exception of the LDS church and a few small commercial businesses. The present population served by the Bedford water system is estimated to be approximately 555 persons based on 150 residential homes with an average of 3.7 persons per household.

1.6.3 Present User Rates

Bedford presently reads water meters on a 6 month summer/winter basis. Water users are charged a flat rate of $20.00/month. Water use over 75,000 gallons during the 6 month winter period is charged at an addition $1.00/1000 gallons up to 100,000 gallons. Winter water use over 100,000 gallons is charged at $3.00/1000 gallons.

1.6.4 Existing System Description

A schematic overview of Bedford's existing water system is shown in Figure 1.3. Bedford's primary water supply originates from two springs located approximately 3 miles east of the Bedford townsite in Strawberry Creek Canyon. The district is also supplied by a supplemental well located about 1/2 miles west of the townsite.

The canyon spring transmission pipeline consists of a 10-inch ductile iron pipe that runs from the springs to a PRV valve at the mouth of the canyon. The line was constructed in 1989 and should be in excellent condition. Well water is delivered to the Bedford system through an 8-inch ductile iron pipe. This line was constructed in 1988 and should also be in excellent condition.

The Bedford system has two gas chlorination facilities. One chlorination facility is located at the well, the other is near the mouth of Strawberry Canyon for disinfection of the well water and spring water respectively.

The Bedford system presently has no storage facilities. System storage was not felt to be necessary or economically justified at the time the system was constructed because of the supply redundancies built into the system.

Presently available spring delivery capacity is approximately 950 gpm. Existing well pumping capacity is 300 gpm. Bedford's total existing system water supply, therefore, totals 1250 gpm (1.8 MGD).

1.6.5 Water Quality History

Since it's construction in 1989, the Bedford water system has had an excellent history of EPA compliance. We are aware of no water quality problems or concerns that have arisen over the past 5-6 years.
RECOMMENDATIONS AND CONCLUSIONS - BEDFORD WATER AND SEWER DISTRICT

The Bedford water system has, in our opinion, been well managed and operated without serious problems since construction in 1989 and 1990. The district requested this study to insure that their present and future water users are protected from future growth impacts through proper planning. Recommendations for addressing Bedford's growth concerns are shown schematically in Figure 1.3 and are as follows:

1.7.1 Recommended System Improvements (Short-term)

a. System Storage

The highest recommended priority for improving the Bedford water system is the construction of a 3/4 million gallon water storage tank. The tank should be located near the mouth of Strawberry Creek Canyon (north or south side) to maximize spring delivery capacity to the tank. A partially buried concrete structure is suggested based on aesthetic concerns of the U.S. Forest Service and long-term maintenance concerns. A storage tank for peaking will allow for more efficient utilization of existing water resources.

b. Bedford No. 1 Well Adjudication

The State Engineer's Office recommended that the Bedford Well No. 1 water right be revised to reflect the actual district service area rather than the service area associated with the original Big Spring filing. Adjudication of the well was delayed pending that change. It is recommended that this work be completed in the near future to insure the district's water right.

1.7.2 Recommended System Improvements (Long-term)

As long-term growth occurs in the Bedford area, Bedford's existing water supplies will become more strained. Recommendations for meeting Bedford's future needs include:

a. Well Capacity Enlargement

The Bedford well has a potential yield of up to 1000 gpm. The existing well pump capacity, however, is only 300 gpm. A larger well pump can be constructed in the future as the need arises.

b. Booster Pump for the East Bridger Forest Ranches Area

Construction of a low-head booster pump and control system (or small storage tank) to feed the east Bridger Forest Ranches area would eliminate the need to maintain a minimum working pressure in the spring transmission pipeline. This would effectively restore the transmission line capacity from about 950 gpm to at least it's original design capacity of 1270 gpm.
c. **Rate Structure Revisions (Conservation)**

Bedford presently uses a flat-fee rate structure during the summer months. A reasonable response to long-term growth, in our opinion, would be the implementation of a summer-use rate structure that encourages conservation. This approach could reduce system demands by 25% or more.

d. **Muddy String Road**

It is our understanding that many residents along Muddy String Road jointly petitioned the Bedford District for water service. Service to this area, offers some benefits to existing users by "looping" the dead-end line on the Thayne-Bedford road with the dead-end line at the end of Lost Creek Road. This line would enhance circulation and result in more stable system pressures.

1.8 **BEDFORD PROJECT ECONOMIC DATA**

1.8.1 **Bedford Project Budgets**

The preliminary estimated project budget for construction of a new 3/4 MG tank and transmission line is $565,900. The estimated combined cost of expanding the system to serve the Muddy String Road area totals $317,600. These costs are summarized in table 1.5.

1.8.2 **Bedford Project Financing**

Based on discussions with WWDC staff and previous experience on similar projects, the proposed water storage tank should be fully eligible for WWDC funding. The proposed Muddy String Road pipeline is also believed to be eligible for WWDC funding. Service connections to that line, however, are clearly not WWDC eligible. It is likely that these service connections could be funded through the Wyoming Farm Loan Board. In the past, WWDC has funded eligible components of this type of project with 67% grant and 33% loan money (at 4% annual interest).

The Bedford service area may qualify as "low-to-moderate", and would possibly qualify for federal funding assistance through the Rural Economic Community Development (RECD, formerly FmHA) program.

1.8.3 **User Rate Impacts**

Projected "immediate" user rate impacts associated with these recommended improvements are summarized in Table 1.5.
### TABLE 1.5
**BEDFORD WATER AND SEWER DISTRICT**
**PROJECT FUNDING**
(WWDC AND WYOMING FARM LOAN BOARD PARTICIPATION)

<table>
<thead>
<tr>
<th></th>
<th>Tank &amp; Transmission Line</th>
<th>Muddy String Road Ext.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>WWDC Grant (67%)</td>
<td>$379,150</td>
<td>$168,840</td>
<td>$549,990</td>
</tr>
<tr>
<td>WWDC Loan (33%)</td>
<td>$186,750</td>
<td>$83,160</td>
<td>$269,910</td>
</tr>
<tr>
<td>Farm Loan Board Grant (50%)</td>
<td>0</td>
<td>$32,800</td>
<td>$32,800</td>
</tr>
<tr>
<td>Farm Loan Board Loan (50%)</td>
<td>0</td>
<td>$32,800</td>
<td>$32,800</td>
</tr>
<tr>
<td>TOTALS</td>
<td>$565,900</td>
<td>$317,600</td>
<td>$883,500</td>
</tr>
<tr>
<td>Annual Loan Payment(1)</td>
<td>$10,800</td>
<td>$7,520</td>
<td>$18,320</td>
</tr>
</tbody>
</table>

### Existing User Rate Payer Impacts

| Present "Active" connections only (156) | $5.77/conn./mo. | N/A |
| Present "Active connections & Muddy String Residents (196) | $4.59/conn./mo. | (2) |
| Present "Total connections & Muddy String (287) | $3.14/conn./mo. | (2) |

**Notes:**
1) WWDC loan payment based on 4% annual interest over 30 years. Farm Loan Board payment based on 7.25% annual interest over 30 years.
2) Cost of construction would be generally offset by increased revenue (assuming 32 or more connections).

### 1.9 WHAT NEXT FOR THAYNE?

It is recommended that the Thayne Water Supply Project be advanced to a Level II status within the WWDC program. Specific goals of the Level II study should include:

a. Construct a test well as proposed herein.

b. Refine the conceptual design of the proposed project.

c. Evaluate the regional relationship of the Thayne water system relative to surrounding communities and systems.

d. The Town of Thayne should use the interim period of the Level II study to approach the Star Valley Cheese factory to obtain an agreement relative to the rehabilitation of the Flat Creek Springs, construction of the spring transmission line, and the costs associated with that work.

### 1.10 WHAT NEXT FOR BEDFORD?

It is recommended that this project be advanced to a Level II status in the WWDC program. Specific goals of the Level II study should include:
a. Refine the conceptual design and cost estimates for the proposed project to reflect the needs and preferences of the community.

b. Evaluate the regional relationship of the Bedford water system relative to surrounding communities and systems.

c. The Bedford District should gage the true interest in obtaining municipal water service for Muddy String Road residents. If it is decided to serve that area, the district and Muddy String Road residents should proceed with the annexation process.