Corner Mountain
Water Supply Project
Level II

Executive Summary

Prepared for:

Wyoming Water Development Commission
Herschler Building, Cheyenne Wyoming 82002

Prepared by:

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In Cooperation with:

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INTRODUCTION & SUMMARY RESULTS

Authorization

The Corner Mountain Water Supply Project was authorized by the 1998 Session of the Wyoming Legislature to be conducted under the new projects program administered by the Wyoming Water Development Commission (WWDC).

This section presents a synopsis of the project history, the purpose and scope of this investigation and a summary of the results.

Background

The Corner Mountain Water & Sewer District is located near the Town of Centennial in southeast Wyoming (see Figure 1). The District encompasses 12 subdivisions and adjacent tracts of land in a mountainous area located along Libby Creek and the North Fork of the Little Laramie River. All of which is north of Centennial and State Highway 130. Individual tracts of land within the District are composed of both platted lots and tracts described by metes and bounds. The description used for district formation defined the general boundaries of the service area and excepted owners who were not interested at the time. The gerrymandered nature of the District can be observed in Figure 2.

Many of the property owners in this area have summer cabins, although other residents occupy their homes year-round. Most residents are able to obtain drinking water from shallow wells, springs and nearby creeks. Other property owners must haul water. Of the residents who have a water supply available on-site, many choose to use the water from shallow wells and springs only for washing and flushing toilets.

A survey of area property owners was completed by Coffey & Associates in July 1995 as part of a Level I study of the Corner Mountain area for the WWDC. Approximately 50 percent of 356 area landowners responded to the survey. The survey showed that 28 percent of the respondents occupy their property on a year-round basis. The following survey results were detailed in the Level I report:

Respondents with no water source: 68/175 = 38.9%
Said “Yes” to joining the Water District: 27/175 = 15.4%
Said “No” to joining the Water District: 36/175 = 20.6%
Unknown (did not answer the question about joining the District): 48/175 = 27.4%
Wanted more information or were undecided: 51/175 = 9.1%

In addition to conducting an opinion survey, an inventory of existing sources of water supply and preliminary assessments of water demands were completed during the Level I study. Based on this data water supply alternatives were developed and a preliminary design and cost estimates were completed for feasible alternatives. Demand for water was expected to vary seasonally and daily due to the recreational use of many of the properties in the District. Water demands were projected based on regulations promulgated by the Wyoming Department of Environmental Quality (WDEQ). Due to economic considerations, fire protection was not considered feasible.
FIGURE 1—LOCATION & VICINITY MAPS
FIGURE 2—WATER SUPPLY SYSTEM OVERVIEW
Development of a groundwater source was determined to provide the most feasible source of supply. Four alternatives were evaluated during the Level I study:

<table>
<thead>
<tr>
<th>Option</th>
<th>Service Area Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 1 Total Service Area</td>
<td>This alternative regarded service to all of the interested tract owners within the District. Two wells were recommended to satisfy an estimated maximum day demand of approximately 60,000 gallons. Minimum storage to supply the District was projected to be 22,000 gallons for this alternative based on the average daily demand of the District.</td>
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</tr>
<tr>
<td>Option 2 Middle and Corner Mountain Estates</td>
<td>Property owners in these subdivisions showed the greatest interest in the project. This alternative regarded construction of approximately 12,000 feet of transmission pipeline to serve only these subdivisions. One water supply well was determined to be needed in combination with a minimum of 47,000 gallons of storage.</td>
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<tr>
<td>Option 3 Middle Mountain Estates</td>
<td>This alternative considered a small system designed to serve 49 lots within this subdivision. A single well, capable of producing 12 gallons per minute, in combination with 34,000 gallons of storage was projected to be needed.</td>
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<tr>
<td>Option 4 Middle and Corner Mountain Estates to North Fork #1</td>
<td>In addition to the two subdivisions, this alternative provided service to tracts along Rainbow Valley Road and South Streamside Road. The recommended water system regarded construction of one well capable of producing 21 gpm, with approximately 60,000 gallons of storage and 16,000 feet of transmission pipeline.</td>
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Subsequent to the completion of the Level I Investigation, the Corner Mountain Water and Sewer District was organized in June 1998. Although a majority of the votes cast by area residents were in favor of the District, some residents remain opposed to development of a community water supply by the District. Most of the residents who oppose the District presently benefit from a viable individual water supplies. Some opposition is also based on concerns that construction of a community based system will adversely impact the scenic rural setting in the Corner Mountain area. Thus the District was gerrymandered to allow residents who did not support the District formation to be excluded.

**Purpose and Scope**

Consistent with the recommendations from the Level I Investigation, this Level II Study was undertaken to drill and test area aquifers. Based on the results of the groundwater exploration program, conceptual designs and cost estimates are proposed for storage and transmission facilities needed to provide an operable water system for the District. Results from the Level I Investigation are updated and applied in this investigation. This study also presents financial data and funding recommendations for advancement of the project to construction.
Summary Results

Phase I Results

Two test well sites were selected for drilling (see Figure 3). The sites were selected to target groundwater resources in the Cloverly Group (Dakota and Lakota Sandstones) and the Casper Formation. Site access and proximity to potential storage sites and pipeline routes were also considered in locating the test wells.

The Cloverly Group was the target for Test Well No. 1. The test hole was located near the northwest border of the District at the foot of Corner Mountain (see Figure 3). Because of the complex geologic structure and lack of outcrops in the vicinity, the Cloverly Group was not encountered in the borehole. The borehole was advanced through the lower Casper Formation and Fountain Formation (which stratigraphically lies below the Cloverly Group). Drilling was stopped in Precambrian rocks to a total depth of 739 feet. Several potential water-bearing strata were identified from geophysical logging so the borehole was reamed and Well No. 1 was completed. Subsequent aquifer testing indicated the well is capable of producing approximately 25 gpm. Water quality from Well No. 1 was determined to meet EPA primary and secondary standards except for radon. The concentration of radon in a water sample was 494 PicoCuries per liter (pCi/L), which is above EPA’s proposed MCL of 300 pCi/L. Samples collected during the aquifer testing also tested positive for coliform bacteria and iron bacteria.

If Well No. 1 is completed as a production well, the well and appurtenances should be disinfected and the produced water re-tested prior to placing it into service. Routine monitoring and disinfection of the well may be needed to control growth of iron bacteria in the well. If the presence of radon is confirmed to exceed the MCL, water treatment will also be needed.

Well No. 2 targeted the Casper Formation. The test well site was located near the southern boundary of the District along Highway 130. The area of the drill site is covered with a mantle of glacial till. The sub-crop of the Morrison Formation was encountered below the till. Drilling was continued through the Morrison and into the underlying Sundance and Jelm Formations to a total depth of 1,020 feet. Drilling was terminated after it was predicted that the depth to the top of the Casper Formation would be in excess of 3,000 feet at that location.

Although the target aquifer was not encountered during drilling, geophysical logging identified several potential water-bearing strata, so casing and screen were installed to evaluate the productivity of the well. Pump testing showed that well is capable of producing only 4 gpm. Therefore, it is recommended that Well No. 2 not be completed as a water supply well.

Phase II Results

Present-day average daily demand is projected to be 42 gpm (60,000 gpd), with a maximum day demand of 114 gpm (164,000 gpd). Water demand projections were revised and updated from the projections made in the WWDC Level I investigation. The Corner Mountain Water and Sewer District was formed in June 1998. Because the District was gerrymandered, participation in the District varies across the project area. In general, residents who own property located adjacent to creeks have been able to develop shallow groundwater resources. However, most of the properties located away from creeks in the area do not have a viable source of water supply. Some residents with an on-site water supply choose to use the supply...
only for non-potable uses such as bathing and clothes washing. Overall, approximately 50% of area residents have joined the District. If all of the area residents were to request service from the District, projected average-day demands would increase to 74 gpm (107,000 gpd) and maximum-day demands are estimated to increase to 201 gpm (290,000 gpd). Accordingly, two or more wells capable of producing a total of 201 gpm would be required to support full development.

Water demand projections were developed based on design criteria published by the WDEQ. Since many of the residents of the area do not continuously occupy their homes and few properties have developed lawns or gardens with significant irrigation requirements, the average-day demand projections were applied primarily for conceptual design. A new well is proposed to be drilled and completed in the Cloverly Group. Ultimately, a second well would probably also be needed in order to supply growth in demand. The two wells would be developed approximately 500 feet apart near the south of the District near Highway 130.

Development of a water system for the Corner Mountain Water and Sewer District is constrained by significant topographical relief in the project area. Four pressure zones are needed to provide service across the District (see Figure 17). The proposed new Cloverly wells are located in pressure zone 1. A buried concrete storage tank with a capacity of 200,000 gallons is also proposed to be developed in pressure zone 1 at a location adjacent to the proposed well sites. A pump station will be needed in order to supply pressure zone 1 from storage. Chlorination equipment needed for the well supply to the storage tank is planned to also be housed within the pump station building. Pressure zones 2 and 3 would be supplied by gravity and will require pressure reducing valves in transmission lines in order to maintain service pressures in these zones within allowable limits. A fourth pressure zone would be established by installation of small booster pumps on service connections to selected properties located at higher elevations along the west edge of the District.

Approximately 44,590 feet of new water transmission pipeline is needed to provide service across the District. Phased construction of transmission pipeline was evaluated to assess the economic feasibility of the project (see Figure 19). A total of five phases of construction were considered. The first phase incorporated construction of pipelines needed to serve areas within the District with the highest density of residents in need of a viable water supply. Subsequent phases would serve areas with lower densities of property owners expressing interest in obtaining water from the District. The probable cost for construction of all five phases of the project needed to serve the entire District is estimated to be $4,103,642.

Since the District was just formed it has not yet accumulated cash reserves and is looking towards grants, loans and user fees to finance construction and operation of the proposed water system. Two funding scenarios were evaluated in this study. The first scenario regards a 60/40 grant/loan package from the WWDC supplemented with a 50/50 grant/loan package from the Farm Loan Board for project improvements that are not eligible for funding through the WWDC. Both funding packages considered a 7.25 percent interest rate and a 30-year loan term. The projected monthly cost per user for this funding scenario ranged from $77 to $87 depending on which phase of development is selected by the District. Only a small incremental increase in monthly user costs is realized for construction of all phases because approximately 40 percent of user fees is needed to fund operation and maintenance of the system.
FIGURE 17—PRESSURE ZONES
The second funding scenario differs from the first in that a loan from the Rural Utilities Service would be sought to match grants from the WWDC and Farm Loan Board. Thus, the second scenario considers financing with an interest rate of 5.125 percent over a 30 year term. The lower interest rate would decrease user fees to a range of between $69 and $75 per month.

Conclusions and Recommendations

Although a viable groundwater supply, capable of meeting the demands of the system, was not established in Phase 1 of this investigation, the test well drilling program provided valuable information that can be applied to future exploration efforts. A new test well targeting the Cloverly Aquifer is recommended at a site east of Corner Mountain Test Well No. 2.

Conceptual design for a water supply system was developed under Phase II based on supply from a new test well located east of Test Well No. 2. Although one well completed in the Cloverly Aquifer could potentially yield enough water to supply the District, it is prudent to include estimated costs for construction of a second well when the project is advanced to Level III.

It is recommended this Level II Investigation be extended to include drilling and testing of a Cloverly well at a location east of the Test Well No. 2. If a viable source of water supply can be identified during the Level II study, the estimated cost to construct and finance a water supply system will be within the range of fees charged at other rural locations in Wyoming.

Acknowledgments

Coffey & Associates and Weston Engineering wish to acknowledge the individuals who contributed to this study. John Wade, WWDC Project Manager, provided critical input towards the resolution of issues that arose during the course of this study.

Officers of the Corner Mountain Water & Sewer District including Donald R. Lamb, Gerald B. Lewis, K.R. Dickinson, Richard D. Greenlee and Judy McClure, provided assistance in the collection and analysis of data, as well as invaluable insight into alternative improvement plans which could best serve the needs of the District.

We would also like to acknowledge Jim and Marlene Bradley, and Jerry and Diane Gudenkauf for providing access to their lands for drilling of the test wells for this project.