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EXECUTIVE SUMMARY

MOORCROFT WATER STUDY

LEVEL I

OCTOBER 30, 1991

PREPARED FOR

THE TOWN OF MOORCROFT

AND

THE WYOMING WATER DEVELOPMENT COMMISSION

PREPARED BY

WESTON ENGINEERING, INC.
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Introduction

The Town of Moorcroft is located in Crook County in the northeastern corner of Wyoming. The Town sits in the transition area between the Powder River Basin and the Black Hills. Large numbers of tourists annually traverse through the region between the Black Hills and Yellowstone Park.

The Moorcroft local economy depends primarily on the limited agriculture in the area and is heavily dependent on the oil industry and the coal mines located in adjacent Campbell County. The Town of Moorcroft has become a "bedroom" community with a large share of residents commuting to jobs in the energy related fields.

Water System Inventory

Water Supply

Lance/Foxhills Wells

The Town of Moorcroft is currently provided water from six Lance/Foxhills wells located within the legal boundaries of Moorcroft. The wells were drilled between 1947 and 1978 and most are nearing the end of their projected useful lives. Currently only two of the wells are being used to supply water for the residents of the Town (Well No.1 and No. 5). The remaining wells are not being used due to quality problems relating to production of large quantities of gas and/or sand. Well No. 3 is not being used due to a low water level which results in the well "pumping off" even at rates as low as 20 gpm. Current production from the two wells in use is approximately 55 gpm or 79,200 gpd. Maximum obtainable rate if all wells could be used would be approximately 180 gpm or 267,800 gpd. (Daily totals would be tempered by lack of storage.) All wells as currently constructed pump directly into the water distribution system, thus not allowing the water to aerate or "settle" any suspended solids removed from the well in the water extraction process.

Water quality analysis performed during the testing of several wells indicated a TDS range of from 1000-1450 ppm. The quality is marginal for public water supply based on EPA primary and secondary recommendations. Review of the water analysis shows the majority of constituents fall well within EPA recommendations with the exception of sulfate. Sulfate will act as a laxative for people who are not accustomed to its presence. The presence of gas or entrained air in the water supply is the most noticeable negative factor due to its tendency to cause severe turbulence in the water mains and when it enters a residents home and is released through the use of a water faucet or water appliances.

Geologic review of the records of the wells drilled in Moorcroft
indicate that all the wells but No. 6 penetrate only the Lance formation. Well No. 6 penetrates the Lance and the top of the Foxhills formation.

**Gillette Madison Water**

The Moorcroft water supply is supplemented by the addition of water from the Gillette Madison Pipeline which runs approximately three miles west of Moorcroft. The water entering the Moorcroft system is controlled by a pressure sustaining valve which allows water to enter the system when the pressure drops below approximately 21 psi at the Moorcroft storage tank. The City of Gillette currently sells the water to Moorcroft at their present industrial rate of $50.15 minimum plus $1.60 per thousand gallons of water.

The main complaint to use of the Gillette water is the reported high chlorine content. Review of the records maintained by the City of Gillette for their chlorine residuals indicates a chlorine content slightly higher than the chlorine content found in water systems that chlorinate as standard practice. Monitoring of the chlorine content was undertaken for a two month period at two points off the Moorcroft/Gillette Madison water tap. Results indicate approximate chlorine residual or free chlorine average of between .65 ppm and .7 ppm. Recommended free chlorine contents are .2 ppm minimum with no recommended upper level. Standard practice maintains a residual of between .1 ppm and .5 ppm.

**Water Storage**

The Town of Moorcroft is currently served by a single 220,000 gallon stand-pipe storage reservoir. The usable water quantity is reduced to approximately 100,000 gallons due to the construction of the overflow piping and the requirement to maintain approximately 35-40 feet of water in the tank to provide minimally acceptable water pressure at the residences located at the higher elevations in Town.

Based on the current population of Moorcroft and their requirements for adequate fire flows and storage the tank should be a minimum of 400,000 gallons at the present time.

**Distribution System**

The Moorcroft water distribution system is comprised of an 8-inch transite pipeline which forms an L-shape around the east and north sides of Town. Branch lines are comprised of 6-inch and 4-inch cast iron pipes. Most lines are looped with the exception of some short branch pipes on the west side of Town.

The Texas Trails Subdivision located on the east side of Town is served by an 8-inch PVC line which taps off a 6-inch cast iron line in the south-east corner of Town. The water line runs through a
variable speed booster station which is designed to pump 795 gpm at 65 psi pressure in an effort to provide suitable water flows and pressure to the residents in the area.

The Gillette Madison water is connected via a 6-inch cast iron line to the distribution system on the west side of Town. Location of the line tends to stabilize pressure in the west side of Town and at the higher elevations of Park Street and near the storage reservoir.

Brief analysis of the hydraulic characteristics of the water distribution system indicate an approximately 20-30% reduction in the estimated water flow capabilities of the system. Reduction is most likely the result of mineral buildups in the water mains and the addition of sediment from the water wells pumping directly into the system. The flow restriction is compounded by the small original size of the lines and their age. Most all the water lines are in excess of 30 years of age.

The combination of small water lines and the elevation of the storage tank provides for minimal water flows and pressures in the area of Park Street and adjacent to the water tower. During periods of high usage residents of these areas have had periods of minimal water and times of no water at all. Monitoring of water pressures during the course of this study showed a high of 28 psi and a minimum of 18 psi in these areas. Standard design procedures for a public water system are based on a minimum of 35 psi.

WATER REQUIREMENTS

According to the 1990 Census the Town of Moorcroft had declined to 768 residents from the 1158 figure of the 1980 Census. These figures calculate to a population decline of approximately 34%. The decline can be primarily attributed to the reduction of activity in the local energy related fields. The reduction is large compared to other communities in the area which showed declines of 15-20%. Comparison of the Moorcroft School Enrollment numbers to the population of Moorcroft does not form a normal comparison. Student enrollment numbers have remained almost constant throughout the ten year period.

Projected growth in the Moorcroft-Crook County area is to be approximately 2-1/2% per year for the next ten years. Based on this estimate the population of Moorcroft would grow to 983 residents by the year 2000.

The Moorcroft water system currently serves 286 residential water taps, 12 businesses, an elementary school, high school and a Christian school. The twelve business consist of grocery stores, cares, restaurants, liquor establishments and motels. The motels,
swimming pool, and watering of the activity fields at the High School represent the main water usages in addition to the residential consumption.

Water consumption based on the Moorcroft metered water sales indicates an average consumption of 116 gpcd. This number would not reflect any losses in the system or for any unmetered water usages. The number is low compared with the usage of surrounding communities. In an effort to allow for some unaccountable losses and an average closer to neighboring communities we have selected 160 gpcd as the average with an estimated maximum daily average of 400 gpcd. Based on these averages the current average demand would be 122,880 gpd and the maximum daily average would be 307,200 gpd. The estimated average consumption in the year 2000 would be 157,280 gpd and the maximum daily average would be 393,200 gpd.

Water Supply Alternatives

Groundwater in the Moorcroft area occurs in rocks which comprise two major, regionally extensive aquifer systems. The aquifer systems are comprised of the Lance-Fox Hills Aquifer and the Madison Aquifer.

Lance-Fox Hills

The sandstones within the Lance Formation and the Fox Hills Sandstone comprise the Lance-Fox Hills Aquifer. Groundwater from the aquifer yields up to 200 gpm in some wells in the eastern Powder River Basin. Water quality in the Moorcroft area is regionally containing TDS values of between 800-1500 ppm.

Additional or replacement wells could be drilled in to the Lance-Fox Hills aquifer and supply the required quantity of water required by the Town of Moorcroft. Water quality would be approximately equal to that which they are receiving at the present time.

Madison Well

The Madison Aquifer includes approximately 700 feet of dolomitic limestone and dolomite which comprise the most areally extensive aquifer in the region. Regional wells in the Madison aquifer produce from several hundred to several thousand gallons per minute.

To construct a Madison well with acceptable water quality would entail drilling the well approximately eight miles east or northeast of Moorcroft. A pipeline would have to be constructed to transfer the water from the well to the Town of Moorcroft.
Water quality for a well drilled in the Madison formation would be superior to the water currently produced from the Lance-Foxhills wells.

**Gillette Madison Pipeline**

The alternative exists to become totally dependent upon the Gillette Madison Pipeline for the water source for the Town. The water quality would meet the current EPA guidelines for primary and secondary standards.

The Wyoming Legislature in authorizing funds for the construction of the Gillette project provided that taps would be allowed for Moorcroft, Rozet and other industrial entities located along the pipeline route. There is currently no formal contract between Gillette and Moorcroft for providing water to the Town. The system was designed to provide for an estimated demand of 600 gpm to be provided for the Town of Moorcroft.

The main drawback to total reliance on the pipeline is the lack of protection in the event the system was shutdown for repairs or maintenance. This event did happen approximately one year ago and the resulting flow coming back from Gillette was highly turbid water.

**SUMMARY**

The Town of Moorcroft has experienced problems relating to their water system for many years. The system has not been upgraded or improved for many years.

The present storage system is inadequate to provide for proper pressure or flows during periods of peak use or to provide acceptable fire flows in the case of an emergency. The system needs to be upgraded with a properly located and sized storage system.

The present water distribution system needs to be upgraded installing larger water mains and distribution branch lines. There are currently several areas of Town including the downtown business district that are being served by 4-inch lines constructed over 40 years ago. The lines are showing signs of plugging based on a hydraulic analysis of the system. A program needs to be implemented for replacement of the majority of water lines in the Town.

The present water supply wells are old. We do not feel that it is feasible to spend a lot of money to try and rehabilitate the wells. Small expenditures of "clean-out" and pump replacement would improve the quantity of water produced. A collection system
bringing all the raw water to one point for future chlorination and aeration in the storage reservoir should be implemented to upgrade the system and for improvement of the water quality.

Additional water supply wells could be drilled in the Lance-Fox Hills Aquifer to provide for the water requirements of the Town. The water quality would be approximately equal to the water now being used. A Madison Well could be constructed to the east or northeast of Moorcroft to meet the water requirements of the Town. The overall water quality of the Madison Well would be superior to the water produced from the Lance-Fox Hills Formation.

A shift to total dependence on the Gillette Pipeline could be made as the current wells met the end of their useful lives. Political and economic questions would have to be met for this shift. Total dependence on the line would leave the Town open for problems in the event of a water emergency while the line was shut down for repairs.

RECOMMENDATIONS

The Moorcroft system has not been upgraded for many years. There are several alternatives available to increase the water supply and/or improve the available water quality. The selection of preferred alternatives is complicated by the financial and political realities that relate to the Town of Moorcroft, the City of Gillette and the State of Wyoming. It is our recommendation that the Moorcroft Water Supply Project be extended to a Level II Study that would present an in depth economic analysis of the following alternatives: 1) siting and construction of a 500,000 gallon water storage reservoir and appurtenances, 2) siting and construction of a Lance-Fox Hills water supply well, 3) siting and construction of a Madison water supply well, 4) shifting to reliance on the Gillette Madison Pipeline and associated piping and collection system of the existing water wells. The study should present analysis of initial investment and long term operation and maintenance costs. The study should delineate all advantages and disadvantages associated with each system.