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**WYOMING WATER DEVELOPMENT
COMMISSION**

**DUBOIS AREA WATER
MASTER PLAN-LEVEL I**



EXECUTIVE SUMMARY

MAY 1999

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DUBOIS AREA MASTER PLAN

EXECUTIVE SUMMARY

For The

The Wyoming Water Development Commission
05SC0291253

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May 1999

DUBOIS AREA WATER MASTER PLAN LEVEL I

EXECUTIVE SUMMARY

CONCLUSIONS AND RECOMMENDATIONS

The Dubois Area Water Supply Master Plan has four main objectives. First, to evaluate the Dubois municipal water system and determine its fitness for service. Second, identify system deficiencies. Third, prioritize present and future system needs. Fourth, to develop a Prioritized Master Plan of the improvements to meet future demands for the Dubois Area based on the needs and the town's ability to pay. In the course of this planning effort, the following conclusions and recommendations have been reached.

CONCLUSIONS

General

- ◆ The Town of Dubois is expected to experience steady growth through the year 2028 with population growth rates of approximately 1 percent per year. Some people feel, however, the Upper Wind River valley could experience a growth rate as high as 4 percent per year.
- ◆ The population served by Dubois central water system could experience growth from its present level of 980 people to 1340. Water demand could increase from a maximum of 380,000 gallons per day to 520,000 gallons per day by the year 2028. Should Dubois grow at 4 percent per year, the service population for Dubois could be as high as 4000 by 2028.
- ◆ No new land development will be required to accommodate the expected Dubois service population of 1,340 people. If however Dubois does grow at 4 percent per year, approximately 440 additional acres will need to be developed.
- ◆ The population growth rate, whether it is 1 percent or substantially higher, makes no material difference in the system needs identified in this Master Plan.

Water Supply

- ◆ Dubois current water supply of 800 gpm is adequate to meet present needs. Dubois has an ample ground water supply to meet all forecasted growth for the service area through the year 2028.
- ◆ The pump in Well No. 6 is either faulty or is severely restricted in some way and is delivering no water to the system. Well No. 7 had failed as of late fall 1998 and was producing no water. It has exceeded its useful life.
- ◆ Well No. 8, produces about 300 gpm, but because of its design produces far less than the formation will yield. Well No. 10 is producing water at near original levels and is in excellent condition.
- ◆ The best location for a future well for Dubois is in the immediate area of Well No. 8. The aquifer in this vicinity could produce 1,000 gpm or perhaps more. To gain the full use of this aquifer, a new well will have to be drilled. Until then, Well No. 8 can continue producing at its present level.
- ◆ The quality of the town's water supply is at risk because of several abandoned wells throughout town.

Storage System

- ◆ The Dubois storage reservoirs are in good condition.
- ◆ The water delivery rate for fire suppression (fire flow) for the High School and the downtown area is 3,000 to 3,500 gpm for three hours.
- ◆ To meet current and future fire suppression needs, the town needs an additional 400,000 to 600,000 gallons of storage.

Transmission System

- ◆ The Town of Dubois transmission lines are all in good or excellent condition.

Distribution System

- ◆ The distribution system consists of 14.7 miles of line. Some 3.7 miles (26 percent) of the distribution system is comprised of undersized lines, 4-inch in diameter.
- ◆ The distribution system functions well on a non-emergency basis, although the system lacks adequate operational control because of failed and missing valves, and the 4-inch lines on Meckem St. and Ramshorn St. that feed the fire hydrants are inadequate.
- ◆ The Town of Dubois can address all of its system deficiencies in the coming 10 years with only modest monthly rate increases of \$3.00 in 2000 and an additional \$4.50 by 2006.

Operations

- ◆ The lack of appropriate operation records and adequate system maps for use by the operation staff has contributed to inadequate record keeping and system inefficiencies.
- ◆ The chlorination system is operational in only one well, Well No. 10. Equipment at Well No. 8 and Well No. 6 need to be replaced.
- ◆ The tank level and pump control system is antiquated and only marginally reliable. The present system coupled with the lack of an alarm system leaves the town with an unacceptable risk of having the tanks running dangerously low.

Rural Areas

- ◆ Central water systems are currently feasible only in the Union Pass area and the Stoney Point subdivisions. If implemented, they will be quite costly.
- ◆ Painted Hills can most efficiently be served by an extension of the Town of Dubois' system.
- ◆ In all other rural subdivision, central systems are not presently feasible.

RECOMMENDATIONS

General

- ◆ The Town of Dubois should seek a Water Development Commission Level II/III study to develop preliminary designs, refined cost estimates, funding planning and construction for:
 - Design and construct a well for the airport.
 - Design and construct a new water storage tank.
 - Design and construct a new well within 200 feet of Well #8.
- ◆ Water rates currently average \$16.21 per household. To accomplish the goals outlined in this report water rates should increase by \$3.00 for FY '00/01 and step increased by \$7.50 to an average of \$23.70 by FY '06/07.
- ◆ Tap fees are currently \$975. These also should be increased to \$1,500 so they fully cover the town's cost of water supply capacity, storage, and transmission capacity for each new service connection.

Supply System

- ◆ Identify and solve the pump or piping problem(s), which are preventing well No. 6 from producing water.
- ◆ Well No. 7 should be plugged and abandoned.
- ◆ Develop and implement a wellhead protection plan to safeguard the quality of the town's future water supply.
- ◆ It is recommended that the town obtain a portable generator to operate Well No. 10 in the event of a prolonged power outage.

Transmission System

- ◆ Extend the municipal system to serve the Painted Hills subdivision when those residents want to install a central system and are willing and able to fund an equitable portion of its cost.

Distribution System

- ◆ Replace defective system valves and install those new valves recommended.
- ◆ Replace the systems undersized mains and loop dead end lines as recommended in Chapter 6 of the report.
- ◆ Install the recommended additional fire hydrants near the High School and a 6" line to downtown hydrants.

Operations

- ◆ Replace the present tank level and pump control system. Explore using the Dubois Telephone Exchange's LMDS for tank level control if the FCC approves their license application.
- ◆ Install and operate a chlorinator on each well.

- ◆ Establish, implement, and maintain a formalized maintenance program for the wells, pumps, controls, chlorinators, and other associated well equipment.
- ◆ Establish and rigorously maintain operations records including a current set of equipment records, daily water production and runtime records, and monthly water levels in each well and power consumption records on each well.
- ◆ Obtain adequate copies of mapping for operations staff use.

BACKGROUND OF WWDC INVOLVEMENT

Prior to this planning effort, neither the Town of Dubois nor the surrounding area had a long-term plan for addressing potable water supply needs. There was concern that water rationing would be needed if any of the town's wells failed. Water quality concerns are also an issue. There are several unprotected, abandoned wells in town. These have the potential for contaminating the town's water supply. Other issues that concerned the Town of Dubois is dealing with the regulatory impacts if it is determined that the town wells are surface water influenced and whether the EPA would then require that a treatment plant be built.

In response to these growing concerns, the Town of Dubois requested that the Wyoming Water Development Commission (WWDC) conduct this study. In October 1997, that request was favorably reviewed and was funded by the 1998 Legislature as part of the Omnibus Water Bill.

This Master Plan addresses only domestic water needs. This involves developing planning for four key issues:

- Planning for an adequate long-term supply.
- Meeting distribution needs of future service areas.
- Inventorying Dubois' system deficiencies and prioritizing their corrections.
- Determining needs in areas of concentrated rural development.

SERVICE PLANNING AREA AND ITS WATER DEMANDS

Planning Area Boundary

The geographic limits of the planning area for this study were developed in cooperation with the Wyoming Water Development Commission, Fremont County, and the Town of Dubois to include all of Fremont County west of the Wind River Indian Reservation. Ideas and concerns were solicited from all interested parties for determining the areas that may potentially be included in the Master Plan. A conceptual boundary was discussed at the scoping meeting held on July 6, 1998.

The adopted Dubois Area Water Master Plan boundary is bounded by:

1. The forest boundary on the north, west, and south.
2. The Wind River Indian Reservation on the east

Local Economy

Fremont County's economy is comprised mainly of agriculture, oil and gas production, tourism, retail trade, services, and government. The Dubois economy, while similar, has little petroleum production and is significantly more dependent on tourism. Until 10 years ago, lumber was a major industry in Dubois. That industry has now closed. Many of the new residents to the Upper Wind River Valley have come to Dubois for its natural beauty and peacefulness. Many are retirees. They tend to build new homes in the

rural areas near Dubois. The growth of rural subdivisions has been responsible for an increase in the home construction trades.

There is no information indicating that any high growth industries will become a major part of the area's economy during the 30-year planning horizon. Consequently, population is expected to grow only at a slow to moderate rate through the planning period.

Population Forecast and Water Demand

From the onset of this study, we were aware of the variations in the forecasted population growth rates in the Upper Wind River Valley. Information recently compiled by the Dubois Planning Commission varies significantly from that of the U. S. Census Bureau and Wyoming Department of Administration and Information's Economic Analysis Division (DAI). From the Dubois Planning Commission report dated March 15, 1999, it was reported that the Dubois area growth rate from 1990 to 1998 was approximately 4 percent. None of the other data sources could verify that finding. The DAI historical data shows that Fremont County had an average growth rate of 0.92 percent and the Town of Dubois had an average growth rate of 1.29 percent per year over the seven-year period from 1990 to 1997. The State's growth forecast for Fremont County and Dubois is about 0.54 percent per year for the period of 1997 through 2008, the last year for which forecasts are available.

After analysis, it is James Gores and Associates opinion that the information generated by the State would more accurately depict the population growth for the 30-year planning period. The Town of Dubois Planning Officials, however, feel that basing the Water Master Plan on a low growth rate may leave the water supply capacity of the town vulnerable if actual population growth rates prove to be close to those they have forecast. To resolve this dilemma, James Gores and Associates decided to provide a broader range of population and water demand forecasts. Forecasts are provided for annual growth rates of both 1.0 and 4.0 percent per year.

To arrive at forecasts for potable water demands, James Gores and Associates made an analysis of Dubois' water usage coupled with the population forecasts discussed earlier. An analysis was made of both Dubois water production and consumption records. That analysis showed that the Town of Dubois per capita consumption falls within normal ranges for a town of its size located in its climatic zone. These values were used to forecast future demand.

The current and forecasted water demands for the Town of Dubois system are tabulated below. These demands represent the expected 1 percent and 4 percent annual growth rate plus the annexation of the Painted Hills Subdivision.

Forecasted Service Area Water Demands at 1% Growth Rate

<u>Year</u>	<u>Service Population</u>	<u>Average Day (MG)</u>	<u>Maximum Day (MG)</u>
1998	983	0.162	0.360
2008	1162	0.192	0.425
2018	1284	0.212	0.470
2028	1418	0.234	0.519

Forecasted Service Area Water Demands at 4% Growth Rate

<u>Year</u>	<u>Service Population</u>	<u>Average Day (MG)</u>	<u>Maximum Day (MG)</u>
1998	1225	0.165	0.358
2008	1915	0.259	0.559
2018	2835	0.383	0.828
2028	4197	0.567	1.225

Subdivision Water Demands

Not all people living in the Dubois area will be receiving water from the Dubois central system. Many will remain on private wells. The forecast below is the average daily potable water demand in the Union Pass area, Stoney Point, and Painted Hills subdivisions.

<u>Forecasted Water Demands in Selected Subdivisions</u> (Shown in 1000 gallons per day)						
Year	<u>Forecast Growth Rate 1%</u>			<u>Forecast Growth Rate 4%</u>		
	<u>Union Pass</u>	<u>Stoney Point</u>	<u>Painted Hills</u>	<u>Union Pass</u>	<u>Stoney Point</u>	<u>Painted Hills</u>
1998	3.70	3.70	6.90	3.70	3.70	6.90
2008	4.09	4.09	7.62	5.30	5.48	10.21
2018	4.47	4.47	8.42	5.30	6.40	15.12
2028	4.99	4.99	9.30	5.30	6.40	22.38

WATER SUPPLY

Dubois has two water supplies available to it: surface water and groundwater. This is an uncommon situation and allows the town to enjoy greater supply flexibility than most communities. The town now uses groundwater and is expected to continue to do so for the foreseeable future.

The primary groundwater source for Dubois is the unconfined alluvial sands and gravels that underlies the Dubois area. The town has used this aquifer as its primary water source almost from the inception of the town.

The Town of Dubois does not use any surface water for its municipal supply. The cost of treating surface water to the EPA standards and the availability of an acceptable groundwater supply in Dubois makes surface water a non-viable option.

Groundwater

This Master Plan included a review of previous groundwater investigations and reports, the performance of the aquifer, and testing of the four active Town of Dubois municipal wells. It also involved a check on the accuracy of the Town of Dubois' flowmeters used to monitor the production from each of the individual wells. A hydrogeologic investigation was also made to ascertain the feasibility of providing a central system and groundwater supply to several developments in the rural Fremont County area surrounding Dubois and to select a future well site for the Town of Dubois. The primary focus of this investigation was to evaluate the condition of the existing Town of Dubois water supply wells and to provide recommendations for the long-term operation of the town well field. A secondary element of the investigation is to determine the best future well site to meet projected demands for the Town of Dubois. Another goal of this Master Plan is to provide a better water supply source to the surrounding developed areas of Dubois, and to gather water temperature data to determine whether the Dubois water supply may be under surface influences according to EPA regulations. If so, Dubois could face having to filter treat the town's water supply.

This investigation met the above objectives and found no indication of surface water influence on the town's wells and no need for further treatment.

Dubois Well Field

The Dubois well field consists of four wells, Well Nos. 6, 7, 8, and 10, three of which are currently operational. Well No. 6 is not operational. Wells 8 and 10 are the main water supply wells, and wells 6 and 7 serve in a back-up capacity. Well No. 6 has a questionable pump installation, which does not have

the head capacity to pump against the distribution system pressure. With Well No. 8 and Well No. 10, Dubois has a maximum groundwater supply potential of approximately 800 gpm. The capacity in Well No. 10 is only limited by the size of the current pump installed. Aquifer parameters calculated near Well 10 (Nelson, 1992) indicate that this well could produce more than 1,000 gpm (increased friction loss would require the size of the motor to be increased). The size of the well casing at Well No. 8 could accommodate a larger pump. However, because of the limited design of its perforations, pumping more water through these small perforations would cause water velocities high enough to draw sand into the well. The aquifer in the area of Well No. 8 is capable of producing in excess of 1,000 gpm. However, to capture this water, a more efficient modern design well must be installed.

Because of its location, next to the RVEA yard and in the middle of an alley, Well No. 7 should be plugged and abandoned.

Groundwater Quality

The quality of the water from Dubois' alluvial aquifer is very good. It is a hard water and slightly high in iron. Because of the location of Well No. 10 near the Wind River, there was a concern that the groundwater produced from this well could be under the direct influence of surface water. To quickly and inexpensively check this, the water temperature of both Well No. 10 and the Wind River were tracked preceding, during, and following spring runoff.

It was found that the groundwater temperature did not fluctuate by more than 1.5° from the mean temperature of 46.6° F. The EPA has also run a microscopic particulate analysis (MPA test) on Well No. 10. The water was found to be acceptable.

Protecting the Town's Water Quality for the Future

Protecting the future quality of the Town of Dubois water supply is a concern. It is recommended that the Town of Dubois initiate a wellhead protection program. If implemented, this would both physically protect the shallow aquifer system and educate the public so that they are aware of how their actions can impact the water they drink. The initial step should be to plug all of the abandoned municipal wells in town. Given the amount of residential and commercial development around the town's existing municipal wells and the vulnerability of the shallow alluvial aquifer system, a wellhead protection plan is something that the Town of Dubois should actively pursue.

WATER STORAGE, TRANSMISSION, AND DISTRIBUTION

To evaluate the adequacy of the current system and identify its weaknesses, James Gores and Associates computer modeled the storage, transmission, and distribution system. The objective of this work was first to identify the system's deficiencies, and second to plan system improvements needed for in the future. The system was modeled under a variety of demand scenarios. These focused on maximum day and fire demands.

Current Maximum Day Demand

Maximum day demand is the highest recorded water use for a single day in any given year. For Dubois this usually occurs in mid-July when both temperatures and watering demands are at their annual high. Maximum day demands were modeled at a total system demand of 374 gallons per person per day (gpcd). Peak hour demand was modeled at 595 gpcd. This was based on 3.5 times average day flow rate of 170 gpcd. Modeling the system under maximum day conditions showed that the present system has adequate capacity to meet this demand.

Current Fire Flow Demands

The model indicated that the system has adequate capacity to meet present fire flow demands for all residential areas and most commercial buildings. The exceptions are the Dubois High School and downtown between First Street and Second Street on Ramshorn Street (Highway 26/287). Both line sizes and the number of fire hydrants in these two areas will have to be increased to meet recommended fire deliveries.

Future Demands

The system was also modeled under the future loads expected by the year 2028, the end of the planning horizon. Under this scenario, the model was set up as though the system was serving the increased population in Dubois itself, plus the addition of the Painted Hills subdivision. Maximum day usage at the year 2028 is estimated to be 520,000 gallons per day. That compares to 360,000 per day in 1998.

Storage System Evaluation

The storage system was evaluated against standard criteria for fire, emergency, and equalization storage needs. The Town of Dubois storage system has the capacity to serve a population of approximately 2,240 people without considering fire demand. The evaluation concluded that Dubois should build between 400,000 and 600,000 gallons of additional storage to meet fire protection needs. Making a final selection of storage volume is a design consideration that needs to be decided at the time when design is taken up.

Transmission System

Dubois' existing transmission system has four primary transmission mains that carry water from the tanks to the distribution system. The transmission lines are adequate for Dubois' current and future needs and are in good condition from all indications.

Distribution System

The existing system consists of approximately 14.2 miles of lines that are 12-inches or less in diameter. Nearly 3.7 miles (or 26%) of these lines are 4-inches in diameter and thus undersized under current regulations. This is a high proportion of undersized lines in a distribution system. These undersized mains are located throughout system. There are also a number of inoperable and missing valves in the system. If it were not for the large number of undersized lines, the Town of Dubois distribution system could be judged to be in good condition. As is, it is judged to be in fair condition.

SYSTEM OPERATIONS

Operations Records

The present record system does not provide data essential to sound operation of the system. Operation could significantly benefit both from improved record keeping and changing some operation procedures that have been in place for much of the system's history. Records need to be kept on daily water production, installed well pumps, system mapping, and construction record drawings. A formal maintenance program for the wells and pumping equipment also needs to be developed.

Control and Alarm Systems

The present control system is a combination of different types of controls. Three of the wells are operated on an electromechanical switch system and Well No. 10 is operated on an analog radio control system. All of these work independently.

Presently there is no alarm system, with the exception of the one red warning light on Well No. 10. The town is vulnerable to having one or more wells out of service and not knowing a problem exists. This can leave the town's water tanks at dangerously low levels.

It is recommended that the town install a fully automated radio operated tank level control system. This system should be a digital system that allows each well to have adjustable set points (the tank level at which the well turns on and off). It is also recommended that the Town of Dubois install a sensaphone alarm system at each well. This system would automatically dial Town Hall with a message if a well failed to come on or shut down when it is signaled to do so. If there were no answer at Town Hall, it would dial another designated number, such as the town Maintenance Director's home.

Chlorination System

The Dubois system is configured so that there is no central location where chlorination can take place. The town has to chlorinate at each well. At present, each of the wells does not have an operational chlorinator. The only chlorinator that is operational is at Well No. 10. The chlorination systems on the other three wells are in such disrepair that they likely cannot be made operational.

It is recommended that the Town of Dubois install hypochlorinator systems on each producing well. Chlorination at each well would bring the Town of Dubois into compliance with regulatory disinfection requirements. Using liquid chlorine would allow the town to accomplish chlorination with a minimum of regulatory interference.

COST ESTIMATES

The costs of the improvements for which conceptual designs were assembled are summarized below. Costs are all shown in year 1999 dollars.

• Recondition Well #6	\$ 4,370
• Chlorination, Warning, and Control Systems	\$ 30,000
• New Storage Tank	\$ 345,489
• Replace Well #8	\$ 121,145
• Distribution System Upgrades	<u>\$1,528,232</u>
TOTAL	<u>\$2,029,236</u>

ECONOMIC ANALYSIS AND PROJECT FUNDING

A recommended financial plan and water user fee was formulated to support the Dubois water system needs through the planning horizon. That plan is summarized in Tables 8-4, 8-5 and 8-6 in the report. Much of the needed funding will have to be generated locally. To do that, it is recommended that water rates be adjusted so that the monthly average residential bill increases from the current \$16.21 to \$19.21 in the year 2000 and to \$23.71 by 2007.

PRIORITIZED MASTER PLAN

Year 1999 to 2009

If the Town of Dubois will increase their water rates by the modest amount recommended and use the proceeds to match the funding sources shown in Table 10-1 of the report, the community can correct all

of their water system deficiencies in the coming 10 years. The most important parts of the implementation process are highlighted below.

Water Supply

A new, larger well near Well No. 8 would provide production security. The reconditioning of Well No. 6 is economically feasible, but is limited in the additional supply it provides. If a new well is sought, application should be made to the WWDC for a Level II/III Feasibility and Preliminary Design study and construction of the project.

Water Storage

WWDC Level II Feasibility and Preliminary Design and Level III construction funding assistance should be sought for design and construction for increasing the town's water storage capacity. Both State Lands and Investments Board and Wyoming Water Development Commission funding assistance could be sought for this project.

Water Distribution

The distribution system deficiency of greatest concern is the inability to provide needed fire flow to the High School and Downtown area. The improvements recommended would alleviate the problem of adequate delivery of water to these areas.

The balance of the distribution system improvements should be constructed in the order shown in Table 10-1 in the report.

Operations

Operational priorities are broken into two categories; those which are record keeping and maintenance management related and those dealing with control and alarm system needs. The record keeping and procedural recommendations should be implemented immediately. There is no cost to implement these recommendations with the exception of copying maps. It is recommended that the well and tank level control system upgrading be done in the 1999/2000 budget year.

Year 2010 to Year 2028

This master plan should be updated no later than the year 2010. By that time many of the assumptions made about population growth rates, land development patterns, and many other parameters essential to sound planning of the water needs of the Dubois area may have changed significantly.

The system should be able to operate in a non-deficiency mode after 2010 if the improvements recommended are constructed in the first years of the plan. Beyond that time, the town should only have to address growth of its transmission and distribution system to serve new service areas. Those extensions should be self-funding from the standpoint that they should require no contribution of town revenues.