200520608
Page: 1 of 45
08/11/2005 09:45A
Missoula County Vickie M Zeier RES Bk-757 Pg-1488

RESOLUTION NO. 2005- 071

WHEREAS, Missoula County has previously created Rural Special Improvement District No. 901; and

WHEREAS, Missoula County owns and operates the Lolo, Montana water and wastewater system through Rural Special Improvement District No. 901; and

WHEREAS, the Board of County Commissioners has determined that it is in the best interest of the District to have long term water system facility plan in which to manage it; and

WHEREAS, the Lolo Water and Wastewater Advisory Board has reviewed and approved the water system facility plan at their regular meeting;

NOW THEREFORE BE IT REVOLVED that the Board of County Commissioners adopts the attached Lolo RSID No. 901 Water System Facilities Plan dated October, 2004.

Done, made and rendered this 9th day of August, 2005

BOARD OF MISSOULA COUNTY COMMISSIONERS

Jean Curtiss

Jean Curtiss, Chairman

Bill Carey

Bill Carey, Member

Barbara Evans

Barbara Evans, Member

Attest:

Vickie M Zeier

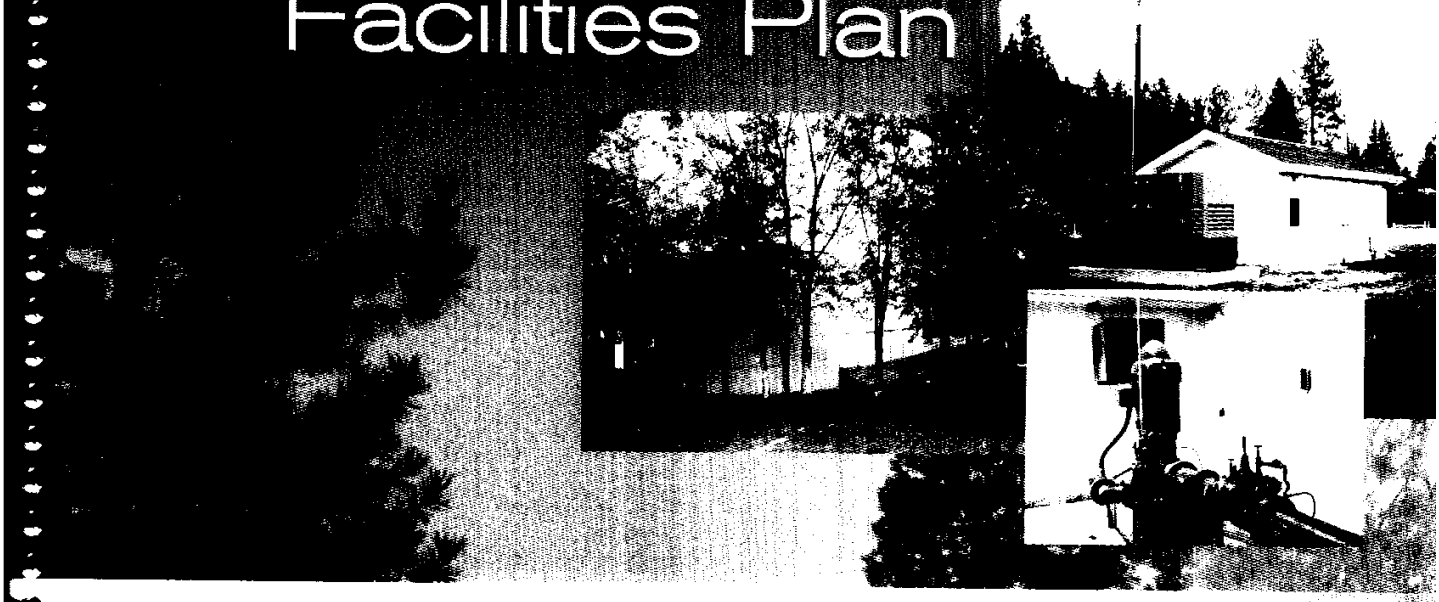
Clerk and Recorder

Approved as to Form and Content

Deputy County Attorney

Lolo RSID 901

Water System Facilities Plan



HDR

October 2004

1.0 Executive Summary

Introduction

In January of 2004, Missoula County undertook the task of planning for the future of the Lolo RSID 901 water system. The goals for the planning effort were to define the conditions of the existing infrastructure, evaluate growth trends and estimate future demand, describe improvements necessary to protect water resources, accommodate existing users and future growth, and develop a capital improvements plan and financial program that will ensure the goals of the utility are accomplished.

Basis of Planning

Determination of the demand on the water system is dependent on land use, population density, the magnitude and type of commercial and industrial activity to be served, the condition of the existing system and regulatory requirements. The water service area and the population to be served, for the purposes of this study, coincide with the population and sewer service area set forth by the Missoula County Lolo RSID 901 Wastewater Facility Plan completed in January of 2000. Projections indicate that moderate growth in population and employment can be expected for the Lolo area.

Existing Water Supply, Storage, and Distribution

The Lolo RSID 901 Water System consists of three production wells, a small emergency well, three above grade steel storage reservoirs, and a booster pumping station. The distribution system consists of 6-inch and 8-inch asbestos cement and Poly-Vinyl Chloride (PVC) piping dating back to 1969. A single main crossing the Montana Rail Link railroad tracks and Highway 93 carries water from Production Wells No. 1 and No. 2 to the storage reservoirs. There are eight pressure zones with service elevations ranging from approximately 3,556 feet to 3,146 feet above sea level.

There are a total of approximately 982 service connections ranging from 3/4-inch to 1-1/4-inch in size.

The water system is monitored and controlled via a UHF radio system. The central telemetry unit (CTU) is located at the Lolo RSID 901 wastewater treatment plant. Remote telemetry units (RTUs) exist at the Reservoir No. 2, the Booster Pumping Station, Well House No. 1 (Wells No. 1 and No. 2), and Well House No. 3. The average daily water production and peak daily demand for year 2003 were 695,000 gallons, and 2,086,600 gallons respectively. It is estimated that approximately 30% of the total water produced by the system is lost to leakage.

Water System Analysis

Population and employment in the study area is projected to increase from approximately 1,670 and 410 respectively starting from year 2000 to 4,478 and 762 by year 2015; 4914 and 989 by year 2025; and 5,786 and 1,444 by year 2045. Recent growth has confirmed this expected growth rate. Demand on the water system will

increase similarly. The existing water supply wells have adequate capacity to meet all future demands in accordance with MDEQ Circular DEQ1.

The upper storage reservoir has adequate capacity to meet the minimum storage capacity requirements of MDEQ Circular DEQ 1 for systems not providing fire protection. The upper reservoir could not meet a 2-hour, 1000 GPM fire demand during a power outage unless emergency power is provided. The booster station is wired to accept a portable generator and RSID 901 owns an 85 KVA generator. The lower reservoirs can meet a 4-hour, 2000 GPM fire through year 2045 provided they are at their upper operating level at the beginning of the event.

System Recommendations and C.I.P.

The existing water system has adequate capacity to meet predicted future demand under normal operating conditions. Due to a recent purchase of a portable engine generator and installation of a permanent generator at Well No. 3, the system is no longer vulnerable to meeting system demand during power outages.

The distribution system has adequate capacity to serve the current RSID 901 residents. As the system expands, it will be important to evaluate the impact of growth on the system's ability to convey water. It is recommended that a hydraulic model of the system be developed to allow the RSID the ability to analyze the impact of growth. A single crossing of the Montana Rail Link railroad tracks and Highway 93 conveys water from Wells No. 1 and No. 2 to the storage reservoirs and the west half of the RSID. It is recommended that a second crossing be planned.

A significant amount of leakage occurs in the existing distribution system. It is recommended that a leak detection and renewal and replacement program be implemented.

Installation of water meters would allow the utility to more accurately and equitably charge customers and evaluate lost water due to leakage. Installation of water meters would also encourage conservation. It is recommended that the RSID proceed with installation of meters on non-residential customers and that, at a minimum, meters be installed on all new service connections.

The existing water system controls located at the wastewater treatment plant are vulnerable to extended periods of power loss. It is recommended that a new uninterruptible power source be installed.

The current population served by the RSID 901 water system does not warrant performance of a vulnerability assessment (VA) and emergency response plan (ERP) per Title IV of Bioterrorism Preparedness Bill H.R. 03448. Once the population served exceeds 3,300 persons, a VA and ERP will be required. It is recommended that the RSID plan for performance of this work in approximately year 2010 and that security improvements be implemented as the system is improved and expanded.

Financial Plan

A spreadsheet-based finance plan model was developed to assess the financial impacts of implementing the recommended capital improvements developed in Sections 4 and 5 of this facility study.

Average day usage, peak day usage, and other aspects of demand were first characterized for current and future users. Future capital and future operation, maintenance, and replacement costs were estimated and a cash flow analysis was run to determine whether the projected user charge revenues will be sufficient to recover all capital, O&M, and other costs. The analysis shows that the District will generate sufficient funds to meet obligations through 2013 provided the beginning balance for 2004 was $120,000, it collected $278,615 in user charges in 2004, and the number of District customers grows at an annual rate of approximately 6.8 percent through 2013.

The District currently recovers the cost of providing water service on the basis of assessed real property valuation, collected through the County tax assessment. This method of recovering costs has likely worked well for the District for various reasons, including:

- The District is small with a relatively low budget.
- A near 100 percent collection rate results from this method.
- There is an implicit relationship between housing values and water usage.

There are some significant issues the District should consider when deciding whether to continue to use the property valuation, tax assessment method as it grows, including:

- There is no connection between water usage and its cost to the consumer, providing little incentive to conserve.
- There is no easy method to determine if there are major leaks in the system.
- Having an un-metered system can affect the District's ability to receive funding from state and federal agencies.

It is recommended that the District transition to metering all service connections and charging for water service based on the volume and timing of water demand.

2.0 Basis of Planning

Study Area

Introduction

To plan for future water facility needs, it is necessary to project water usage. Determination of the demand on the water system is dependent on land use, population density, the magnitude and type of commercial and industrial activity in the area to be served, the condition of the existing system and regulatory requirements. The purpose of this chapter is to identify current demand and project future conditions.

Study Area Boundary Development

In January of 2000, Missoula County completed a Wastewater Facility Plan. Through the Wastewater Facility Planning process, meetings were conducted with stakeholders, including the Lolo Community Council, Lolo RSID 901 Board, Missoula County Chief Executive Officer, Missoula County Office of Planning and Grants, and the Lolo RSID 901 District Water and Wastewater Superintendent. A proposed sewer service area was determined through these discussions. It is the intent of Missoula County and RSID 901 to provide water service to all areas served by sewer; therefore, the proposed sewer service area has been adopted as the proposed water service area for the purposes of this study. Figure 2.1 depicts the boundaries of the proposed water service area.

Population and Growth

Introduction

The size of the water facilities, including distribution, wells, booster pumping facilities, and storage is directly proportional to the population served by the infrastructure. Determining existing population and projecting future population to be served is therefore a key early step in water facility planning.

Existing and Projected Population and Employment

The 2000 Wastewater Facility Plan established existing population and employment data as well as population and employment projections for 1995, 2015 and 2045. The Transportation Analysis Zones developed for the Missoula County Transportation Plan were utilized in the development of these projections. The intent of this study is to provide a planning horizon that mirrors that of the wastewater utility. For this reason, population and employment data from the 2000 Wastewater Facility Plan will be utilized in analysis of the water utility. Table 2.1 summarizes existing and projected population and employment data for the proposed Lolo RSID 901 service area.

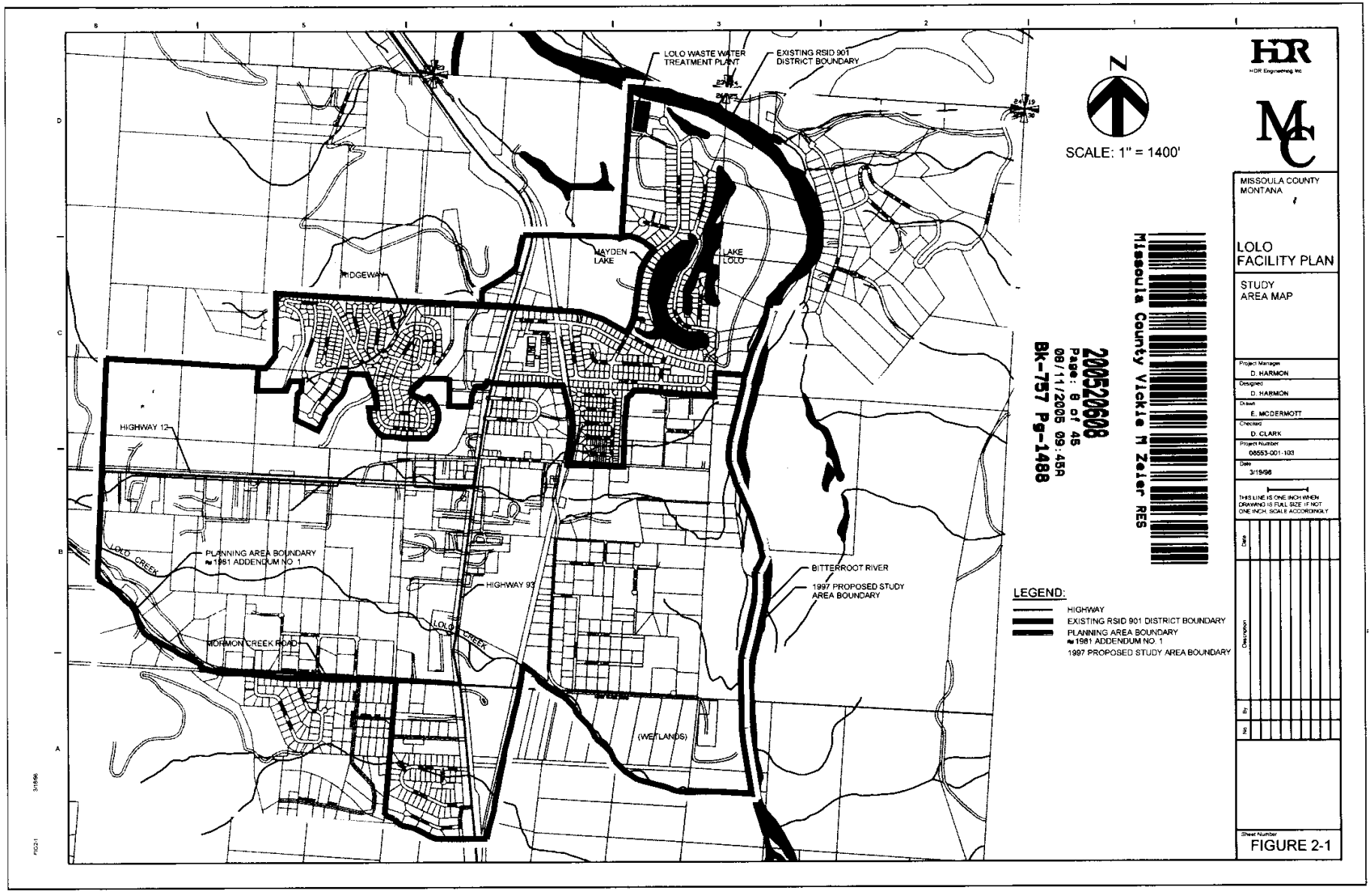
Table 2.1 – Existing and Projected Population and Employment

Category	1995		2015		2045	
	Population	Employment[1]	Population	Employment[1]	Population	Employment[1]
Proposed Service Area	4137	540	4478	762	5786	1444
Current RSID 901	1668	409				

[1]Employment estimated as visiting population.

The projections indicate moderate growth for the Missoula County Lolo Area and an increase in the demand for water service. Table 2.1 indicates that the proposed service area will increase in residential population by slightly less than 1 percent per year.

The Lolo area serves as a bedroom community with a small commercial center remote from the City of Missoula. A limited amount of people from outside of the current RSID service area travel to Lolo for schools, employment, businesses, etc. A result of these activities is a minor generation of additional water demand beyond typical residential rates. It is difficult to determine the number of people that currently visit the Lolo area and to estimate how this may change in the future; however, this influx of visiting population is directly related to employment and the greater the visiting population, the greater the employment. Forecasts of future employment can be made from growth and economic trends, which allows future commercial, institutional and industrial water demands to be projected. Table 2.1 indicates that employment growth is expected to closely match the growth rate of the residential population over the planning horizon.



3.0 Existing Water Supply, Storage, and Distribution

Introduction

Water for the Lolo RSID 901 District is supplied by three deep production wells (Wells No. 1, No. 2 and No. 3). A small supplemental well is also available for emergency use in the lower system (Pressure Zones No. 4, No. 5, No. 6, No. 7 and No. 8). Three steel reservoirs provide storage. A single booster pumping station pumps water from Pressure Zone No. 2 to Pressure Zone No. 1. A total of eight pressure zones exist in the system. The distribution system consists of 6-inch and 8-inch water mains of asbestos cement and PVC.

Water Supply

Well No. 1

Well No. 1 is located just east of the Montana Rail Link railroad tracks and just north of the intersection of Glacier Drive and Dorie Drive. The 154 foot deep well was drilled in 1969 and consists of an 18-inch steel casing to 117 feet, a 304 stainless steel Wire Wound Johnson Well Screen from 117 to 137 feet and a solidly closed tail pipe from 137 to 154 feet. The well log indicates that the well has a rated capacity of 1,600 GPM. Actual test pumping reached 2,000 GPM at a drawdown of 59 feet. According to the Edward E Johnson Well Screen Company, the stainless steel well screen has a capacity of 1,400 GPM. The well log for this well is included in Appendix A. The static water level is at 31 feet and draws down to 34 feet with the pump running. Well pump information is included in Table 3.1.

Well No. 2

Well No. 2 is located approximately 200 feet from Well No. 1, just east of the Montana Rail Link railroad tracks and just north of the intersection of Glacier Drive and Dorie Drive. The 107 foot deep well was drilled in 1975 and consists of 14-inch steel casing to 64 feet, a 14-inch stainless steel Johnson Watermark well screen from 64 to 89 feet and a 12-inch steel tailpipe with a solid steel plate bottom from 89 feet to 107 feet. The well log indicates that the well produced 1,356 GPM during a 4-hour pump test with a drawdown of 19 feet. The static water level in this well is approximately 20 feet and it experiences a drawdown of approximately 7 feet during pumping at 800 GPM. The well log for this well is included in Appendix A. Well pump information is included in Table 3.1.

Well No. 3

Well No.3 is located just north of Highway 12 approximately 1,600 feet west of the intersection of Highway 93 and Highway 12. The 115 foot deep well was drilled in 1995 and consists of 16-inch steel casing to 115 feet with 3-inch by 1/2- inch perforations from 80 to 100 feet. The well log indicates that the well produced 1600 GPM during a 24-hour pump test with a drawdown of 21 feet. The static water level in

this well is approximately 17 feet and it experiences a drawdown of approximately 21 feet during pumping at 1,150 GPM. The well log for this well is included in Appendix A. Well pump information is included in Table 3.1.

Emergency/Supplemental Well

A 6-inch diameter test well was drilled near production Well No. 1 prior to drilling the larger well. The 87 foot deep well is 6-inches in diameter and was reported to have a test flow of 150 GPM. The well has a 5 horsepower submersible pump with a capacity of 60 GPM. It is used mainly for emergency and supplemental use for the lower part of the system. A pressure switch on a 315 gallon pressure tank controls the pump. During periods of low flow this well is useful in helping reduce the cycling of the pumps in larger production Wells No. 1 and No. 2.

Table 3.1 – Well Pump Data

Water Source	Capacity (GPM)	Horsepower	Pump Type	Static Water Level (FT)	Auxiliary Power	Well Depth (FT)	Casing Diameter (IN)
Well No. 1	720	100	Vertical Turbine	31	No	154	18
Well No. 2	800	100	Vertical Turbine	20	No	107	14
Well No. 1 and No. 2 Combined	1400						
Well No. 3	1050	125	Vertical Turbine	17	No	115	16
Emergency Well	60	5	Submersible	31	No	87	6

Storage

Reservoir No. 1

Reservoir No. 1 is located just below Cumberland Street and has a floor elevation of 3,447 feet. An 8-inch water transmission line from Wells No. 1 and No. 2 and a separate 8-inch water transmission line from Well No. 3 supply the reservoir. It is a 24-foot high, 30-foot diameter steel tank with an overall capacity of 125,000 gallons. The reservoir was constructed in 1969. It was painted inside and out in 1991 and is inspected annually by the County Staff. No significant coating failure has been reported; however, it is recommended that re-coating be performed every 10-15 years. Reservoir data is summarized in Table 3.2:

Reservoir No. 2

Reservoir No. 2 is located on top of the hill above Ridgeway and has a floor elevation of 3,673 feet. Water is pumped to the reservoir through a 6-inch transmission line from the booster pumping station. It is a 24-foot high, 30-foot diameter steel tank with an overall capacity of 125,000 gallons. The reservoir was constructed in 1971. It was painted inside and out in 1991 and is inspected annually by the County Staff. No significant coating failure has been reported; however, it is recommended that re-coating be performed every 10-15 years. Reservoir data is summarized in Table 3.2.

Reservoir No. 3

Reservoir No. 3 is located adjacent to Reservoir No. 1 just below Cumberland Street and has a floor elevation of 3,447 feet. An 8-inch water transmission line from Wells No. 1 and No. 2 and a separate 8-inch water transmission line from Well No. 3 supply it. It is a 30-foot high, 60-foot diameter steel tank with an overall capacity of 500,000 gallons. The reservoir was constructed in 1991. It has not been inspected since it was constructed in 1991.

Reservoir data is summarized in Table 3.2.

Table 3.2 – Reservoir Data

Reservoir	Volume (GAL)	Depth (FT)	High Water Elevation	Footprint	Pressure Zone	Vintage (Year)	Construction
No. 1	125,000	24	3469.0	30 FT Dia.	2	1969	At grade, steel
No. 2	125,000	24	3695.0	30 FT Dia.	1	1971	At grade, steel
No. 3	500,000	30	3471.2	60 FT Dia.	2	1990	At grade, steel

Supplemental Well Pressure Tank

There is a 315-gallon pressure tank located in the Well No. 1 Pump House that is used to control the flow from the supplemental well.

Booster Pumping Station

The Booster Pumping Station is located adjacent to Reservoir No. 1 and Reservoir No. 3, just below Cumberland Street. The booster pumps are used to transfer water from Reservoirs No. 1 and No. 3 in Pressure Zone No. 2 to Reservoir No. 2 in Zone No. 1 through a 6-inch transmission line. The original Booster Pumping Station and pump were constructed in 1971 in conjunction with the construction of Reservoir No. 2. In 1979 an additional booster pump was added and placed in a bypass line to provide additional capacity to Zone No. 1. In 1988, a new 4-inch bypass line was installed to allow water from Reservoir No. 2 to transfer back to Reservoir No. 1. The two booster pumps alternate during periods of low demand. Both pumps can operate together during periods of high demand. Table 3.3 summarizes booster station pump data.

Table 3.3 – Booster Pump Data

Pumping Unit	Capacity (GPM)	Horsepower	Pump Type	Auxiliary Power
Booster Pump No. 1	400	30	6-stage vertical turbine	No[1]
Booster Pump No. 2	310	30	End suction centrifugal	No[1]
Combined Capacity	590			

[1]A three-phase auxiliary power connection exists at the Booster Station for operation via a portable generator upon power failure.

Distribution

Distribution Mains

The distribution system consists of 6-inch and 8-inch asbestos cement and PVC piping that was installed beginning in 1969. There is a single 8-inch water main crossing the Montana Rail Link railroad tracks and Highway 93, which carries water from production Wells No. 1 and No. 2 to the water reservoirs. A 12-inch water main carries water from Well No. 3 to the reservoirs. A 2-inch line from the supplemental well is connected to a 6-inch main feeding the lower Lake View Addition and is therefore only useful for this lower area.

Pressure Zones

Service elevations range from 3,556 feet on the west end of the system to 3,146 feet on the east end providing a total elevation difference of 410 feet. This is equivalent to a pressure difference of 177 psi. The minimum desired operating pressure for residential areas with one- and two-story houses is 35 psi. A minimum pressure of 20 psi must be maintained to provide adequate pressure for fire flow. The Lolo RSID 901 water system is segregated into eight pressure zones separated by pressure reducing stations. Table 3.4 outlines system pressure zone data.

Table 3.4 – Pressure Zone Data

Pressure Zone	Pressure Range (psi)
1	50-55
2	55-80
3	45-70
4	30-60
5	45-70
6	30-35
7	80-85
8	50-70

Service Connections

There are 493 service connections on the lower system (Pressure Zones No. 4, No. 5, No. 6, No. 7, and No. 8). Of these connections, four are 1-1/4-inch that serve a total of 88 apartment units. Of the remaining 489, approximately 25 are 1-inch and 464 are 3/4-inch. There are 332 service connections in the upper system (pressure zones 1, 2, and 3). Of these, approximately 17 are 1-inch and 315 are 3/4-inch.

Controls

Remote monitoring and control of the water system is accomplished with a Digitronix digital telemetry system communicating via a UHF radio system provided by Healy-Ruff. A master station (CTU) and radio transceiver is located at the Wastewater Treatment Plant with remote stations (RTU) and radio transceivers at Reservoir No. 2, the Booster Pumping Station, Well House No. 1 (Wells No. 1 and No. 2), and Well House No. 3. There is a single pressure transducer located at Reservoirs No. 1 and No. 3 and a single pressure transducer located at Reservoir No. 2.

The Reservoir No. 2 RTU transmits the reservoir level analog signal from the pressure transducer to the CTU located at the WWTP for control of the booster pumps. The Reservoir No.2 and 3 RTU transmits the reservoir level analog signal from the pressure transducer to the CTU for control of Well Pumps No. 1, No. 2, and No.3.

Alarms displayed on the CTU include:

- Reservoir No. 2 High Level
- Reservoir No. 2 Low Level
- Reservoir No. 2 Power/Data Fail
- Reservoir No. 1 and No. 3 High Level
- Reservoir No. 1 and No. 3 Low Level
- Reservoir No. 1 and No. 3 Power/Data Fail
- Well Pump No. 1 and No. 3 Power/Data Fail

- Well Pump No. 3 Power/Data Fail

An annunciator panel located at the WWTP displays the following water system alarms:

- Reservoir No. 2 High Level
- Reservoir No. 2 Low Level
- Reservoir No. 1 and No. 3 High Level
- Reservoir No. 1 and No. 3 Low Level

An auto-dialer located at the WWTP calls operations staff upon un-acknowledged high and low water level alarms for Reservoirs No. 1, No. 2, and No. 3. A UPS (uninterruptible power source) is connected to the control system and provides approximately 12 hours of backup power upon main power failure. The RTU's have approximately 3 hours of backup battery life upon power failure.

During periods of low demand, Well Pumps No. 1, No. 2 and No. 3 alternate operation. During periods of high demand all three can operate at the same time. During periods of low demand, Booster Pumps No. 1 and No. 2 alternate operation. During periods of high demand both booster pumps can operate at the same time.

The current control system is configured to operate as follows:

When the level in Reservoir No. 2 drops to the 19.5-foot mark the system calls for the lead booster pump to start. The lag pump is called to start when the level in the reservoir reaches the 17.5-foot mark. The lag pump will then shutdown when the level reaches the 21.3-foot mark and the lead pump will shut down when the level reaches 21.9 feet. The overflow alarm is activated at the 22.4-foot mark and low-level alarm is activated at 10.5 feet.

When the level in Reservoirs No. 1 and No. 2 drops to the 19.4-foot mark the system calls for the lead well pump to start. The first lag pump is called to start when the level reaches the 17.4-foot mark. The second lag pump is called to start when the level reaches the 16.5-foot mark. The lead pump will then shutdown when the level reaches the 21.3-foot mark, the first lag pump will shutdown when the level reaches the 21.5-foot mark and the second lag pump will shutdown when the level reaches 21.7 feet. The overflow alarm is activated at 22.4 feet and the low-level alarm is activated at 10 feet.

Current Water Demand

Production Records

Table 3.5 summarizes water production data for the last five years. Table 3.6 summarizes data with regard to the quantity of water pumped from the lower reservoirs to the upper reservoir for the last five years. Operations staff provided data reported in Tables 3.5 and 3.6. The current (2003) annual use is 255,007,600 gallons. This equates to an average daily flow of 695,000 gallons or 483 GPM. The peak daily use for the system occurred in July of 2003 and was 2,086,600 gallons or 1,449 GPM. The peak daily demand has averaged 3.0 times the average daily demand over the 5 year period reported in Table 3.5 and has also been the historical peaking factor for the system as

reported in the Water System Analysis Report completed by Stensatter, Druyvestein and Associates in 1988.

The current (2003) annual flow at the Booster Station is 37,466,200 gallons. This equates to an average daily flow of 102,073 gallons or 71 GPM. The peak for the Booster Station that occurred in July of 2003 was 355,000 gallons or 247 GPM. The peak daily demand has averaged 3.59 times the average daily demand over the 5-year period reported in Table 3.6. The 1988 Water System Analysis Report completed by Stensatter, Druyvestein and Associates reported a peaking factor of 3.13.

Table 3.5 – Water Production Data Summary

Month	1999			2000			2001			2002			2003		
	Ave Day	Peak Day	Total Mo.	Ave. Day	Peak Day	Total Mo.	Ave. Day	Peak Day	Total Mo.	Ave. Day	Peak Day	Total Mo.	Ave Day	Peak Day	Total Mon.
Jan	.173	.207	5.349	.254	.302	7.860	.236	.290	7.315	.272	.334	8.433	.273	.336	8.473
Feb	.191	.255	5.337	.254	.308	7.667	.254	.320	7.113	.224	.328	6.274	.261	.315	7.317
March	.272	.294	8.440	.274	.365	8.496	.259	.326	8.020	.276	.326	8.552	.257	.330	7.962
April	.436	.927	13.086	.444	.602	13.67	.317	.474	9.509	.351	.535	10.546	.391	.456	11.735
May	.761	1.251	23.576	.891	1.261	27.61	.899	1.626	27.871	.613	.947	18.999	.535	1.038	16.571
June	.732	1.248	21.966	1.302	1.747	39.43	.965	1.588	28.959	.866	1.410	25.977	1.137	1.698	34.112
July	1.343	1.581	41.639	1.513	1.794	46.90	1.382	1.674	42.852	1.490	1.956	46.203	2.148	2.087	66.583
Aug	1.122	1.406	34.782	1.435	1.898	44.49	1.558	1.799	48.299	.812	2.006	25.176	1.385	1.920	42.941
Sept	.776	.877	23.271	.493	1.023	15.09	1.064	1.689	31.918	.820	1.129	24.587	.973	1.397	29.190
Oct	.354	.509	10.983	.299	.391	9.28	.426	.869	13.191	.398	.548	12.328	.456	.709	14.126
Nov	.261	.323	7.824	.239	.323	7.36	.256	.339	7.673	.280	.360	8.413	.268	.360	8.043
Dec	.268	.394	8.308	.244	.294	7.57	.271	.325	8.391	.241	.328	7.481	.257	.313	7.956
Ave Day	.557			.637			.657			.554			.695		
Peak Day	1.581			1.898			1.799			2.006			2.087		
Ave Month	17.047			19.616			20.092			16.914			21.251		
Peak Month	41.639			46.897			48.299			46.202			42.941		
Total Year	204.561			235.40			241.109			202.969			255.008		

[1]Table values are in million gallons

Table 3.6 – Booster Pumping Station Water Summary

Month	1999			2000			2001			2002			2003		
	Ave Day	Peak Day	Total Mo	Ave Day	Peak Day	Total Mo	Ave Day	Peak Day	Total Mo	Ave Day	Peak Day	Total Mo	Ave Day	Peak Day	Total Mo
Jan	.045	.094	1.38	.046	.062	1.44	.047	.061	1.46	.044	.048	1.35	.044	.053	1.35
Feb	.048	.104	1.33	.048	.067	1.33	.046	.066	1.28	.043	.043	1.21	.040	.051	1.11
March	.049	.079	1.52	.049	.068	1.51	.047	.062	1.45	.044	.066	1.37	.041	.055	1.28
April	.074	.139	2.21	.078	.124	2.35	.054	.084	1.63	.051	.068	1.52	.051	.075	1.52
May	.135	.282	4.19	.161	.286	5.00	.155	.314	4.81	.087	.176	2.71	.071	.118	2.19
June	.129	.251	3.87	.244	.391	7.32	.153	.292	4.59	.126	.288	3.77	.172	.118	5.17
July	.264	.372	8.18	.296	.399	9.18	.237	.326	7.35	.239	.308	7.41	.313	.355	9.69
August	.201	.296	6.23	.279	.472	8.65	.293	.389	9.07	.190	.284	5.89	.230	.303	7.14
September	.131	.194	3.94	.078	.176	2.34	.166	.272	4.98	.117	.243	3.52	.122	.234	3.65
October	.056	.082	1.74	.055	.069	1.69	.058	.085	1.80	.053	.097	1.67	.060	.105	1.89
November	.046	.058	1.38	.049	.069	1.47	.043	.088	1.28	.042	.055	1.27	.042	.055	1.25
December	.045	.063	1.40	.047	.068	1.45	.047	.064	1.45	.041	.041	1.27	.040	.055	1.24
Ave Day	.102			.119			.112			.090			.102		
Peak Day	.372			.472			.389			.308			.355		
Ave Month	3.11			3.64			3.43			2.75			3.12		
Peak Month	8.18			9.18			9.07			7.41			9.69		
Total Year	37.36			43.72			41.15			32.95			37.47		

[1]Table values are in million gallons.

The District has a current water sprinkling regulation that is in effect year round. This regulation limits the sprinkling from 6:00 A.M. to 12:00 noon and 6:00 P.M. to 12:00 midnight each day with odd number addresses using odd days only and even number addresses using even days only.

Typical winter month (November through February) daily flows have averaged 249,000 GPD over the last five years. Typical summer month (July and August) daily flows have averaged 1,419,000 GPD over the last five years. Examination of sewer flow records at the wastewater treatment plant shows that there is no significant difference between summer and winter flows. This indicates there is no significant increase in domestic water usage (with inflows excluded) from the winter to the summer and that the increase in water use during the summer months is due to irrigation.

Leakage

Leakage can place a significant demand on the system. In order to determine the extent that leakage may be occurring within the system, a comparison was made between the average daily water use for the winter months (November through February) and the sewer influent for the same period. Table 3.7 shows the comparison in these flows.

Table 3.7 – Leakage Analysis Data

Average Daily Water Use and Sewer Flow (GPD) for November through February					
	1999	**2000**	**2001**	**2002**	**2003**
Water	223,250	247,750	254,250	254,250	264,750
Metered Sewer Flow	209,888	212,199	205,716	174,257	201,003
Average Infiltration[1]	32,000	32,000	32,000	32,000	32,000
Estimated Actual Sewer Flow	177,888	180,199	173,716	142,257	169,003
Difference (GPD)	**45,362**	**67,551**	**80,534**	**111,993**	**95,747**

[1]Per the Lolo RSID Wastewater Facility Plan, January 2000.

Typically, we would expect the sewer flows to be slightly higher than the water use due to groundwater infiltration into the sewer system and a small amount of water used that doesn't make it to the sewer. It is difficult to accurately quantify the amount of water leaking from the system. The data in Table 3.7 indicates that leakage is increasing over time. It appears that leakage over the last three years has ranged between 80,000 and 110,000 gallons per day.

Another approach is to compare the average expected per capita usage with the actual usage. There are 345 equivalent dwelling units (EDU's) in the upper system and 521 EDU's in the lower system for a total of 866. This would equate to a per capita usage of between 164 and 208 GPD per dwelling unit according to the data in Table 3.7. Typical values for EDU demand would be expected to fall between 200 – 350 GPD. If a per capita usage of 200 GPD per dwelling unit value is used, the current leakage rate would be approximately 90,000 GPD. This equates to approximately 30 percent of the total water produced. A typical system operations goal is to reduce leakage to less than 10 percent of the total supply.

It is important to note that this leakage analysis is an estimate and is in part based on estimated values for average infiltration. The absence of meters makes it impossible to accurately determine the amount of water lost due to leakage.

4.0 Water System Analysis

Future Demand Forecast

The future demand within the system is primarily dependent upon population and employment growth within the service area. Utilizing the data summarized in Table 1.1 and the 2000 Wastewater Facility Plan results in the population and employment forecast outlined in Table 4.1.

Table 4.1 – Population and Employment Forecast

Category	1995		2015		2025[2]		2045	
	Pop	Emp[1]	Pop	Emp[1]	Pop	Emp[1]	Pop	Emp[1]
Proposed Service Area	4137	540	4478	762	4914	989	5786	1444
Current RSID 901	1668	409						

[1]Employment estimated as visiting population.

[2]Population and employment forecast interpolated between 2015 and 2045 estimates summarized in Table 2.1.

The population and employment forecast recorded in Table 4.1 will be used in conjunction with per capita flow information and the peaking factors established in paragraph 2.5.1 to estimate the future demand on the system. The 2000 Wastewater Facility Plan reported a ratio of residential to employment flow contribution of 1.22. Utilizing this same ratio for residential and employment water demand, and 2003 water production (including leakage), results in per capital demand factors of 132 gallons per capita per day (GPCD) and 108 GPCD respectively. Table 4.2 summarizes population and water demand for 2015, 2025, and 2045.

Table 4.2 – Future Water Demand Forecast

	2015[1]	2025[1]	2045[1]
Population	4478	4914	5786
Employment	762	989	1444
Population Demand Factor (GPCD)	132	132	132
Employment Demand Factor (GPCD)	108	108	108
Peaking Factor	3.0	3.0	3.0
Average Day Demand (GPD)	673,392	755,460	919,704
Peak Day Demand (GPD)	2,020,176	2,266,380	2,759,112

[1]Year 2015, 2025, and 2045 population and employment values are based on the assumption that the service area is extended to study area boundary shown in the wastewater facility plan before Year 2015.

Future Water Supply Analysis

The existing water supply wells, as outlined in Table 4.1 above, have a total capacity of 2,510 GPM, or 3,614,400 GPD, if run continuously. The capacity of the system per MDEQ Circular DEQ 1 must equal or exceed the design maximum day demand and equal or exceed the design average day demand with the largest producing well out of service. The capacity of the system with the largest well out of service (Well No. 3) is 1,460 GPM or 2,102,400 GPD. This analysis shows that the system has adequate capacity to meet all future demands in accordance with MDEQ Circular DEQ 1.

Future Storage Analysis

Storage facilities must function to provide an adequate supply of water during all demand conditions. Demands on storage include average and peak day operating demand from residential and employment use, fire flow demand, and emergency demand. Emergency demand would include providing water for residential and employment use as well as fire flow during events when supply wells and/or booster pumps are undergoing maintenance or during power outages. Standby power is available at Well No. 3 and the water district owns a portable generator that can be used at the booster pumping station.

To adequately analyze the capacity of the upper and lower storage reservoirs, it is essential to identify the demands on each. For the purposes of this analysis it is assumed that the area served by the upper reservoir is built out and that all of the growth in the district will occur in the area served by the lower reservoirs. There are 345 EDU's in the upper system and 521 in the lower system. Utilizing the 2003 average day water use (including leakage) equates to a per capita demand factor of 305.7 gallons per dwelling unit per day, which in turn equates to 2.32 people per dwelling unit. Table 4.3 estimates population in the upper reservoirs service area and summarizes water demand for the upper reservoir based on booster pumping records for 2003.

Table 4.3 – Upper Reservoir Capacity Summary

Population	799
Average Day Demand (GPD)	102,000
Peak Day Demand (GPD)	355,000

The total volume of storage in the upper reservoir is 125,000 gallons. This is adequate to meet the minimum storage capacity requirements of MDEQ Circular DEQ 1 for systems not providing fire protection. It was reported in the 1988 Water System Analysis, completed by Stensatter, Druyvestein and Associates, that the fire flow requirements for RSID 901 as determined using the Insurance Services Office (ISO)-Fire Suppression Rating Schedule are as reported in Table 4.4.

Table 4.4 – Fire Flow Requirements

Zone	Required Flow
Residential (Upper System)	1000 GPM
Residential (Lower System)	1750 GPM
Commercial and School	2000 GPM

The largest demand on the system would be to service a fire and the peak day demand during a power outage. Under this scenario, the system could maintain a 1,000 GPM fire flow for 1.7 hours. With standby power provided at the Booster Station and the largest pump out of service, the system could maintain a 1,000 GPM fire flow under peak day demand conditions for 2.2 hours. If both pumps are available, the system can maintain a 1,000 GPM fire under peak day demand conditions for 3.2 hours. These values assume that the reservoir is at its upper operating level when the power outage and fire event occurs.

Current and future population and employment in the area served by the lower reservoirs is summarized in Table 4.5.

Table 4.5 – Lower System Population and Employment

	Current RSID 901	2015[1]	2025[1]	2045[1]
Population	869	3679	4115	4987
Employment	409	762	989	1444
Population Demand Factor (GPCD)	132	132	132	132
Employment Demand Factor (GPCD)	108	108	108	108
Peaking Factor	3.0	3.0	3.0	3.0
Average Day Demand (GPD)	158,880	567,924	649,992	814,236
Peak Day Demand (GPD)	476,640	1,703,772	1,949,976	2,442,708

[1]Year 2015, 2025, and 2045 population and employment values are based on the assumption that the service area is extended to study area boundary shown in the wastewater facility plan before Year 2015.

The total current storage volume in the lower system is 625,000 gallons. This is adequate to meet the minimum storage capacity requirements of MDEQ Circular DEQ 1 considering that Well No. 3 has standby power capability.

The largest demand on the system would be to service a fire and the peak day demand during a power outage. Under this scenario, only Well No. 3 would be available since it has standby power capability. Table 4.6 summarizes the fire flow capacity of the system for current, 2015, 2025, and 2045 peak day demand conditions.

Table 4.6 – Lower System Fire Flow Capacity

Year	Fire Demand (GPM)	Peak Day Demand (GPM)	Total Demand (GPM)	Service Capacity (Hours)
Current	2000	331	1281	8.1
2015	2000	1183	2133	4.9
2025	2000	1354	2304	4.5
2045	2000	1696	2646	3.9

The values reported in Table 4.6 assume the lower reservoirs are at their upper operating level when the power outage and fire event occurs. The lower reservoirs were nearly run dry during a 6-hour power outage event during the summer of 2003 prior to standby power being installed at Well No. 3. The system could not have sustained a fire during this time. Since standby power is provided at Well No. 3, the system's capacity to provide fire service has improved dramatically.

Future Distribution

Significant expansion of the existing distribution system will be required to serve the entire study area. The majority of this expansion will be constructed and paid for by development. It is recommended that proposals for expanding the RSID 901 water system be analyzed in detail utilizing a hydraulic mode. The Wastewater Rate Study and Finance Plan, December 20, 2000; the Water System Rate Evaluation, December 5, 2000; and the Wastewater Facilities Plan, January 25, 2000 all recommended the installation of water meters. Installation of water meters would allow the utility to more accurately and equitably charge customers and evaluate lost water due to leakage. Installation of water meters would also encourage conservation.

Water System Security

In June 2002, H.R. 03448 Bioterrorism Preparedness bill became public law. Title IV of the bill addressed drinking water security and safety be amending the Safe Drinking Water Act to require each community water system serving a population of greater than 3,300 persons to:

- Conduct an assessment of the vulnerability of its system to a terrorist attack or other intentional acts intended to substantially disrupt the ability of the system to provide a safe and reliable supply of drinking water.
- Certify that the system has conducted the assessment and submit a written copy of the assessment; and
- Prepare or revise, where necessary, an emergency response plan that incorporates the results of the vulnerability assessments.

A Vulnerability Assessment is a systematic analysis used to develop a security protection plan for water supply, treatment, and distribution systems. It identifies a

system's vulnerabilities and provides a prioritized plan for security upgrades, modifications of operational procedures, and/or policy changes to mitigate identified risks to critical assets. The vulnerability assessment also provides a basis for comparing the cost of protection against the risks posed.

The Lolo RSID 901 water system currently serves a population of approximately 1,668 so it is not required, at this time, to perform a vulnerability assessment of its system. Assuming that the service area is extended to the study area shown in the Wastewater Facility Plan, January 2000, the population served could exceed 3,300 prior to 2015. The RSID should be prepared to perform a vulnerability assessment at that time. It is recommended that the RSID budget for this work and proceed with minor security improvements as the system is expanded and improved.

5.0 Recommendations and Capital Improvements Plan

Water Supply

The existing water supply has adequate capacity to meet predicted future demand in accordance with MDEQ Circular DEQ 1 under normal operating conditions. Monitoring, inspection, maintenance, and wellhead protection programs should be continued to ensure the water supply remains reliable.

During peak demand periods the lower system reservoirs are vulnerable to loss of supply due to power outage as was the case during the summer of 2003. Without standby power, the system may not be able to reliably meet max day demands or fire flow requirements. It has been recommended that a standby power generator be installed on the largest of the system wells (Well No. 3). The RSID has now completed this recommendation.

Storage

The Upper Reservoir has adequate capacity to meet the minimum storage capacity requirements of MDEQ Circular DEQ 1. If a fire occurs during peak day demand conditions, the system can maintain a 2-hour fire supply, provided the reservoir is near its upper limit when the event occurs.

The Lower Reservoirs have adequate capacity to meet the minimum storage capacity requirements of MDEQ Circular DEQ 1 considering standby power is available at Well No. 3. If a fire occurs during peak day demand conditions, the system can maintain a 4-hour fire supply.

Distribution

The existing distribution system has adequate capacity to serve the current RSID 901 residents. This is evidenced by the fire flow data recorded in the 1988 Water System Analysis completed by Stensatter, Druyvestein and Associates. As the system expands, it will be important to evaluate impacts of growth on the existing system's ability to convey adequate water supply. It may be necessary to replace existing mains with larger piping depending on the configuration and location of future growth. It is recommended that RSID 901 develop a hydraulic model of the current system for use in evaluating impacts of proposed expansion.

The existing system contains a single crossing of the railroad tracks and Highway 93. It is recommended that, in conjunction with future growth, a second crossing be planned and constructed. The recommended hydraulic model would be useful in determining the appropriate location of such a crossing.

A significant amount of leakage seems to be occurring in the existing system. It is recommended that leak detection analysis of the system be conducted periodically on a rotational basis to determine areas needing repair or replacement. This should start in the oldest part of the system. Areas determined to need repair or replacement should be added to the Capital Improvements Program. A significant portion of the system is

constructed of asbestos cement and is over 30 years old. The potential deterioration of the system is evidenced by the significant amount of leakage that appears to be occurring.

The Wastewater Rate Study and Finance Plan, December 20, 2000; the Water System Rate Evaluation, December 5, 2000; and the Wastewater Facilities Plan, January 25, 2000 all recommended the installation of water meters. It is recommended that RSID 901 proceed with the recommendations beginning with installation of meters on non-residential customers. It is also recommended that, at a minimum, meter pits be installed on all new service connections.

Controls

The existing control system has been vulnerable to extended periods of power loss due to inadequate battery life on its UPS, as was the case during a power outage during the summer of 2003. A new battery was recently installed. It is recommended that the UPS be tested periodically. A minimum of 12 hours of back-up power capacity is recommended.

Security

It is likely that the RSID 901 Water System will be required to perform a vulnerability assessment within the planning horizon. It is recommended that security improvements be implemented as the system is expanded and improved and that a vulnerability assessment be included in the budget for 2010.

Capital Improvements Plan

Table 5.1 summarizes the recommended capital improvements by year.

Table 5.1 – Capital Improvements Summary

Project Description	Estimated Cost					
	FY 04-05	FY 05-06	FY 06-07	FY 07-08	FY 08-09	Future
Well 3 Standby Power	*$75,230					
Booster Station Standby Power	*$29,660					
Leak Detection	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000
Metering	$6,500	$6,500	$6,500	$6,500	$6,500	$34,500
Water System Modeling		$6,000				
Control System Back-up Power	*$500					
Highway 93 and Railroad Crossing						$140,880
Renewal and Replacement	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000
Security Improvements		$500	$1,000	$1,000	$1,000	$35,000
Total	**$146,890**	**$48,000**	**$42,500**	**$42,500**	**$42,500**	**$245,430**

* Recently completed

6.0 Financial Plan

Introduction

This section assesses the financial impacts of implementing the recommended capital improvements. To accomplish this, a spreadsheet-based Financial Plan Model was developed for the Water Enterprise. It determines the impacts to revenue requirements, water charges, and District cash flow resulting from the potential increase in District expenditures.

It should be noted that the District currently recovers their cost of providing water service on the basis of assessed real property valuation, collected through the County tax assessment. This characteristic simplifies the analysis because cost allocation is unnecessary, but there is no correlation between volume of water used and the user charge. The relative merits of recovering Water Enterprise costs through tax assessments will be focused upon in the concluding paragraphs of this financial analysis.

Procedurally, several steps were taken to develop the Financial Plan. The first step in financial planning for water utilities is characterization of the current and future water users, including their average day usage, peak day usage, and other aspects of demand. Following this are estimates of future capital and future operation, maintenance, and replacement (O,M,&R) costs. These cost estimates assist in defining how much the water charge needs to recover. Finally, a cash flow analysis determines whether the projected user charge revenues will be sufficient to recover all capital, O&M, and other costs when they occur.

The analysis covers the 10-year period 2004-2013. Although the previous engineering analysis considers nearly a 50-year time frame (1995-2000), the period of time in the recommended capital improvement plan is approximately 10 years. This period of time is about the maximum period of time that can be reliably considered when determining water rates, considering inflation and future uncertainties. The components of the Financial Plan are briefly discussed below and summarized in a series of tables.

Water Demand and Water User Characteristics

At the present time, water demand and usage do not play an explicit role in determining water rates and charges. However, it is probable that they will in the future. Table 6.1 identifies three types of water users (single family residential, multi-family residential, and commercial), their current estimated numbers, and their estimated numbers between 2004 and 2013. The growth rate associated with the number of customers is based on the difference between the current population of the District (1,670) and the estimated population within the District in 2015 (4,478). The compound annual growth rate that ties current population to future population is approximately 6.8 percent.

Table 6.1 – Water Customers

	FY 04-05	FY 05-06	FY 06-07	FY 07-08	FY 08-09	FY 09-10	FY 10-11	FY 11-12	FY 12-13
Working assumptions:									
Annual rate of growth in number of customers		6.80%	6.80%	6.80%	6.80%	6.80%	6.80%	6.80%	6.80%
Customers									
Number									
Single family residential units	575	614	656	700	748	799	853	911	973
Multi-family residential units	163	174	186	199	212	226	242	258	276
Commercial units	32	34	36	39	42	44	47	51	54
	770	822	878	938	1,002	1,070	1,143	1,220	1,303
Percentage									
Single family residential	75%	75%	75%	75%	75%	75%	75%	75%	75%
Multi-family residential	21%	21%	21%	21%	21%	21%	21%	21%	21%
Commercial units	4%	4%	4%	4%	4%	4%	4%	4%	4%
	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table 6.2 summarizes historical total water production and production assuming that 70 percent of the production is delivered to the three types of customers identified above. Since the District does not meter water usage, it is impossible to precisely estimate the amount of water lost within the system. It was previously estimated that per capita water consumption within the District is about 200 gallons per day. Comparing known water production with the demand implied by this per capita usage estimate indicates that about 30 percent of produced water is lost within the system.

Table 6.2 – Water Production

Year	Annual Well Production (gallons)	Water deliveries to customers (30% loss)
1977	89,509,000	62,656,300
1978	92,378,000	64,664,600
1979	145,438,000	101,806,600
1980	129,607,000	90,724,900
1981	152,554,000	106,787,800
1982	177,404,000	124,182,800
1983	154,124,000	107,886,800
1984	174,021,000	121,814,700
1985	204,414,000	143,089,800
1986	198,140,000	138,698,000
1987	192,778,000	134,944,600
1988	240,853,000	168,597,100
1989	185,947,000	130,162,900
1990	174,615,722	122,231,005
1991	186,982,000	130,887,400
1992	196,620,000	137,634,000
1993	159,270,256	111,489,179
1994	197,261,400	138,082,980
1995	169,778,176	118,844,723
1996	185,855,000	130,098,500
1997	197,975,866	138,583,106
1998	197,195,401	138,036,781
1999	204,561,000	143,192,700
2000	235,400,000	164,780,000
2001	241,109,000	168,776,300
2002	202,969,000	142,078,300
2003	255,007,600	178,505,320
Average, 1999-2003	**227,809,320**	**159,466,524**

Section 4 of this report (Water System Analysis) estimated that the system's maximum day peaking factor is approximately 3.0. This would indicate a strong seasonal component to usage, most likely the result of residential landscape demand. If the District ever desired to develop volumetric water rates, it is recommended that a base-extra capacity cost allocation approach be used to determine water rates by customer class. This method will recognize the difference in peak demands between residential users and commercial users, with the likely result of the residential users paying a slightly higher water rate due to their higher peak.

Annual Expenditures

Capital Improvements

Table 5.1 summarized recommended capital improvements. Table 6.3 restates these capital improvements with two adjustments:

- An annual inflation rate of 3 percent is assumed for capital costs

- Costs termed "Future" in Table 5.1 are specifically allocated to years

Two of the capital projects have already been funded with reserves held by the Lolo RSID 901: Well No. 3 Standby Power and Booster Station Standby Power. Therefore, these two projects should not impact water rates, unless the District desires to quickly re-establish previous reserve levels. The final line of Table 6.3 summarizes the annual expenditures for capital improvements.

Table 6.3 – Capital Improvement Plan Estimated Costs, Inflated Dollars

Assumed inflation rate	3.00%									
Capital Project	**F/Y 2004**	**F/Y 2005**	**F/Y 2006**	**F/Y 2007**	**F/Y 2008**	**F/Y 2009**	**F/Y 2010**	**F/Y 2011**	**F/Y 2012**	**F/Y 2013**
Well 3 Standby Power 1/	$ 75,230	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Booster Station Standby Power 1/	29,660	-	-	-	-	-	-	-	-	-
Leak Detection	5,000	5,150	5,305	5,464	5,628	5,796	-	-	-	-
Metering	6,500	6,695	6,896	7,103	7,316	7,999	8,239	8,486	8,741	9,003
Water System Modeling	-	6,180	-	-	-	-	-	-	-	-
Control System Back-up Power	500	-	-	-	-	-	-	-	-	-
Highway 93 and Railroad Crossing 2/	-	-	-	-	-	32,664	33,644	34,653	35,693	36,763
Renewal and Replacement	30,000	30,900	31,827	32,782	33,765	34,778	35,822	36,896	38,003	39,143
Security Improvements 2/	-	515	1,061	1,093	1,126	8,115	8,358	8,609	8,867	9,133
TOTAL	**$ 146,890**	**$ 49,440**	**$ 45,088**	**$ 46,441**	**$ 47,834**	**$ 89,352**	**$ 86,063**	**$ 88,644**	**$ 91,304**	**$ 94,043**

1/ Capital project to be funded with reserves.
2/ Future capital project cost assumed to be paid for over 5 years.

With the exception of FY 04-05, the annual capital costs are fairly uniform from year to year, changing only with inflation. Given that the major FY 04-05 expenditures are funded by reserves, there is no need for debt-financing the improvements. Alternatively stated, a pay-as-you-go approach is recommended for financing the capital improvements.

Operations, Maintenance, and Replacement Expenditures

Operations, maintenance, and replacement (O,M,&R) is a generic term for the annually occurring costs for personnel, materials, energy, chemicals, billing, and other functions necessary to keep the District running. It includes the budgetary categories of personnel, operations, and capital. The capital component consists of the capital improvement program and those "normally" occurring capital costs that occur outside of the capital improvement program, such as replacement of significant system components, plus the capital improvements shown in Table 6.3. Table 6.4 shows these estimated costs for fiscal years 2004 through 2013.

Personnel, operations, and "normal" capital expenditures for fiscal year 2000 through 2005 were provided by the District in their 2005 Proposed Budget. For the years 2006-13, these expenditures were estimated using the District's proposed growth rate (6.81 percent) plus inflation (assumed to be 3 percent). Table 6.4 below shows the adopted, proposed and estimated personnel, operations, and capital expenditures for fiscal year 2000 through 2013. Major future capital improvements, as shown in Table 6.3, are shown as a specific line-item in Table 6.4.

Table 6.4 – Annual Expenditures for the Water Utility

		Real Growth Rate	6.80%									
		Inflationary Growth	3.00%									
			F/Y 2004 (Adopted)	F/Y 2005 (Proposed)	F/Y 2006 (Estimated)	F/Y 2007 (Estimated)	F/Y 2008 (Estimated)	F/Y 2009 (Estimated)	F/Y 2010 (Estimated)	F/Y 2011 (Estimated)	F/Y 2012 (Estimated)	F/Y 2013 (Estimated)
PERSONNEL												
430510-111	Permanent Salaries		$ 32,153	$ 32,153	$ 35,304	$ 38,764	$ 42,563	$ 46,734	$ 51,314	$ 56,342	$ 61,864	$ 67,927
430510-112	Temporary Salaries		6,031	6,031	7,161	7,863	8,634	9,480	10,409	11,429	12,549	13,778
430510-121	OT Full Time		1,600	1,600	1,757	1,929	2,118	2,326	2,553	2,804	3,078	3,380
430510-141	Fringe Benefits		9,526	9,526	10,460	11,485	12,610	13,846	15,203	16,693	18,329	20,125
430510-191	Termination Reserve		1,200	1,200	1,318	1,447	1,589	1,744	1,915	2,103	2,309	2,535
430510-192	Annual Merit Reserve		1,431	1,431	1,148	1,260	1,384	1,519	1,668	1,832	2,011	2,209
	TOTAL PERSONNEL		**$ 51,941**	**$ 51,941**	**$ 57,147**	**$ 62,747**	**$ 68,897**	**$ 75,648**	**$ 83,062**	**$ 91,202**	**$ 100,140**	**$ 109,954**
OPERATIONS												
430510-210	Office Supplies		$ 800	$ 840	$ 922	$ 1,013	$ 1,112	$ 1,221	$ 1,341	$ 1,472	$ 1,616	$ 1,775
430510-224	Janitorial Supplies		-	-	69	76	83	92	101	110	121	133
430510-231	Gas & Diesel Fuel		600	900	988	1,085	1,191	1,308	1,436	1,577	1,732	1,901
430510-233	Vehicle Repairs		1,200	1,200	1,318	1,447	1,589	1,744	1,915	2,103	2,309	2,535
430510-239	Tires		-	-	165	181	199	218	239	263	289	317
430510-241	Tools & Materials		300	300	329	362	397	436	479	526	577	634
430510-311	Postage		200	180	202	222	244	267	294	322	354	389
430510-317	Radio/Pager Service		450	450	494	543	596	654	718	789	866	951
430510-321	Printing/Litho Service		400	400	439	482	530	581	638	701	770	845
430510-324	Copy Costs		-	-	11	12	14	15	16	18	20	22
430510-331	Ad/Legal Publications		-	-	99	109	119	131	144	158	173	190
430510-334	Books/Res Mat. SU		150	150	165	181	199	218	239	263	289	317
430510-335	Dues & Memberships		400	420	461	506	556	610	670	736	808	887
430510-340	Heat, Light, Water		47,000	54,000	49,300	54,132	59,437	65,261	71,657	78,679	86,390	94,856
430510-341	Garbage Collection		500	480	527	579	635	698	766	841	924	1,014
430510-345	Phone basic charge		1,200	1,500	1,647	1,808	1,986	2,180	2,394	2,628	2,886	3,169
430510-346	LD Phone Charge		-	-	148	163	179	196	215	237	260	285
430510-353	County Chargeback		1,200	1,200	1,318	1,447	1,589	1,744	1,915	2,103	2,309	2,535
430510-357	Contracted Services		16,700	15,000	16,470	18,084	19,856	21,802	23,939	26,285	28,861	31,689
430510-362	Office Equipment Mtc		1,200	1,200	870	955	1,048	1,151	1,264	1,388	1,524	1,673
430510-365	Ground Mtc & Repair		1,200	1,200	1,318	1,447	1,589	1,744	1,915	2,103	2,309	2,535
430510-366	Bldg Mtc & Repair		800	800	878	964	1,059	1,163	1,277	1,402	1,539	1,690
430510-367	Water Syst Mtc/Repair		8,000	8,000	6,808	7,475	8,207	9,012	9,895	10,864	11,929	13,098
430510-368	Water Line Mtc/Repair		8,000	8,000	9,882	10,850	11,914	13,081	14,363	15,771	17,316	19,013
430510-369	Other Equipment Mtc		-	-	329	362	397	436	479	526	577	634
430510-372	Mileage-Private Vehicle		-	-	92	101	111	122	134	147	162	177
430510-373	Meals/Lodge/Incidental		1,200	1,800	1,976	2,170	2,383	2,616	2,873	3,154	3,463	3,803
430510-381	Tuition/Regis. Fees		600	-	369	405	445	488	536	589	646	710
430510-511	Insurance & Fidelity Bonds		1,800	1,800	1,976	2,170	2,383	2,616	2,873	3,154	3,463	3,803
430510-535	Tech Equipment R/L		200	-	110	121	132	145	160	175	192	211
	TOTAL OPERATIONS		**$ 94,100**	**$ 99,820**	**$ 99,681**	**$ 109,450**	**$ 120,176**	**$ 131,953**	**$ 144,885**	**$ 159,083**	**$ 174,673**	**$ 191,791**
CAPITAL												
521000-826	Transfer to General Fund		$ 250	$ 250	137	151	165	182	199	219	241	264
521000-877	Transfer - 7096 Water Escrow		5,000	5,000	5,490	6,028	6,619	7,267	7,980	8,762	9,620	10,563
430510-924	Capital-Improvements		146,890	49,440	45,088	46,441	47,834	89,352	86,063	88,644	91,304	94,043
430510-934	Cap, Water Sup, Sludge Disp.		-	-	-	-	-	-	-	-	-	-
430510-946	Capital-Tech Equipment		4,800	4,800	4,743	5,208	5,719	6,279	6,894	7,570	8,312	9,126
430510-947	Capital Vehicles		4,800	4,800	2,108	2,315	2,542	2,791	3,064	3,364	3,694	4,056
	TOTAL CAPITAL		**$ 161,740**	**$ 64,290**	**$ 57,567**	**$ 60,143**	**$ 62,879**	**$ 105,871**	**$ 104,200**	**$ 108,560**	**$ 113,171**	**$ 118,053**
TOTAL PERSONNEL, OPERATIONS, & CAPITAL			**$ 307,781**	**$ 216,051**	**$ 214,395**	**$ 232,340**	**$ 251,951**	**$ 313,473**	**$ 332,147**	**$ 358,845**	**$ 387,984**	**$ 419,798**

Assumptions

Average of previous 5 years times growth rates used to estimate future expenditures.

Previous year times growth rates are used to estimate all other future expenditures.

The final line in Table 6.4, "TOTAL PERSONNEL, OPERATIONS, AND CAPITAL," shows the annual revenue requirement for the District, or the amount of money it needs to collect each year. Existing reserves can be used to cushion near-term capital expenditures, but in the absence of any major debt issuance, current revenues will generally be relied upon to recover current costs.

Cash Flow

A simple cash flow analysis can determine whether the District's current user charge is sufficient to recover all future costs. It should be reiterated that the District uses an ad-valorem tax – a property tax – to recover costs. The 2004 assessment is set to recover

$278,615. Property values and the mil levy are adjusted in a manner to generate this level of income.

Table 6.5 summarizes the District's cash flow through 2013. The cash flow analysis considers sources of funds, uses of funds, and carryover reserves.

Table 6.5 – Projected Cash Flow

	F/Y 2004	F/Y 2005	F/Y 2006	F/Y 2007	F/Y 2008	F/Y 2009	F/Y 2010	F/Y 2011	F/Y 2012	F/Y 2013
Sources of Funds										
Beginning fund balance	120,000	92,197	176,312	283,908	396,837	514,981	597,472	688,966	783,270	879,890
User charges	278,615	297,561	317,795	339,405	362,485	387,134	413,459	441,574	471,601	503,670
Drinking Water SRF proceeds	-	-	-	-	-	-	-	-	-	-
Other debt issuance	-	-	-	-	-	-	-	-	-	-
Interest earnings	1,363	2,606	4,196	5,865	7,611	8,830	10,182	11,575	13,003	14,456
Total sources	399,978	392,363	498,303	629,177	766,933	910,945	1,021,112	1,142,115	1,267,874	1,398,016
Uses of Funds										
Operating expenditures	146,041	151,761	156,828	172,197	189,072	207,602	227,947	250,285	274,813	301,745
Capital expenditures	161,740	64,290	57,567	60,143	62,879	105,871	104,200	108,560	113,171	118,053
Debt service expenditures	-	-	-	-	-	-	-	-	-	-
Ending fund balance	92,197	176,312	283,908	396,837	514,981	597,472	688,966	783,270	879,890	978,219
Total uses	399,978	392,363	498,303	629,177	766,933	910,945	1,021,112	1,142,115	1,267,874	1,398,016

Sources of Funds

Sources of funds include:

- **Beginning fund balance.** For purposes of this analysis, this accounts for unrestricted cash on hand that can be used for capital improvements or O,M,&R expenditures. The 2004 beginning year balance is assumed to be $120,000, the approximate cost of providing standby power for Well No. 3 and a booster station. For years 2005 and beyond, the beginning fund balance is equal to the previous year's ending fund balance.
- **User charges.** This is the revenue requirement of the water enterprise and the level of funds generated by the ad valorem tax. For 2004, the District has set this level for $278,615 and has adjusted tax variables accordingly. For years 2005 and beyond, it is assumed that these revenues increase at a rate equal to the District's rate of growth in customers, or 6.81 percent annually.
- **Drinking Water State Revolving Fund (SRF) proceeds and other debt issuance proceeds.** In the event that the District should use debt financing for capital improvements, the cash flow model identifies the net funding needed and the corresponding debt service requirements, considering specific provisions of whatever source of financing is used. For this analysis, major capital improvements are assumed to be financed either through existing reserves and/or through current user charges. Therefore, these two line items are set to zero.
- **Interest earnings.** Within some years, there may be opportunities for the District to gain some interest revenue from reserve balances, unspent user charges, and unspent bond proceeds. In these cases, interest income is estimated on a portion of these balances, using a 3 percent interest rate.

Uses of Funds

Uses of funds include:

- **Operating expenditures** are defined as the personnel and operations expenditures shown in Table 6.4.
- **Capital expenditures** are defined as the capital expenditures shown in Table 6.4
- **Debt service expenditures** are zero because the capital improvements are funded on a pay-as-you-go basis.
- **Ending fund balance** is what remains after operating expenditures, capital expenditures, and debt service expenditures are paid. It carries over into the next year. Obviously, it is highly desirable to have a positive ending fund balance, although there are no firm rules about what level this should be maintained at. American Water Works Association (AWWA) guidelines indicate that several months worth of operating expenses be held in reserve.

Results of the Cash Flow Analysis

Table 6.5 shows that the District will generate sufficient cash flow to meet all obligations through 2013. This result hinges on three critical assumptions:

- The District will collect $278,615 in user charge revenue through ad valorem property assessments. Based on average valuations in the District, this amounts to a monthly equivalent charge of about $27.25.
- The District has approximately $120,000 in reserve to pay for two major capital projects during FY 2004, specifically backup power for water production and pumping.
- The number of District customers grows at an annual rate of approximately 6.8 percent through 2013. This is probably the most tenuous assumption of the analysis and will be more closely examined through a sensitivity analysis.

Sensitivity of the Cash Flow to Customer Growth Rate

The rate of system growth, represented by the growth in the number of customers, affects both revenues and costs. It is assumed that annual user charge revenues will grow at the rate of the number of customers. It is assumed that O,M,&R costs grow at the rate of system growth plus inflation.

Cutting the growth rate to 3 percent (by setting the growth rate to 3 percent in Tables 6.1 and 6.4) results in lower revenues and costs over time. These reductions offset each other and eliminate the need to adjust user charge revenue. Similarly, if the growth rate is set at 0 percent, the revenue and cost impacts offset, also eliminating the need for rate adjustments.

Alternative Methods for Recovering Revenue Requirements

The District currently recovers their revenue requirements through ad-valorem charges on customers' real property. This method of recovering costs has likely worked well for the District for various reasons, including:

- The District has historically been small with a relatively low budget. Using property assessments is inexpensive and practical because there are typically only two annual billing cycles, meters don't have to be read, and administrative costs are otherwise minimized.
- A near 100 percent collection rate will result from an ad-valorem charge because the leverage of the County's tax collection power is available.
- There is an implicit relationship between housing values and water usage. A range of statistical studies has shown that water usage, particularly for landscape irrigation, is affected by the household's income. Alternatively stated, the more expensive the house, the more water used. In this context, there is a rational basis for tying property value to water charges.

However, there are some significant issues that the District should consider when deciding whether to continue to use ad-valorem charges as it grows into a larger District:

- There is no connection between water usage and its cost to the consumer. This provides little incentive for the customer to conserve this valuable resource.
- There is no easy method to determine if there are major leaks in the system. Based on current water production records and industry standards, it is estimated that approximately 30 percent of water production is unaccounted for. Portions of this include leakage within the system's transmission system and between the customers' service connection and their residence.
- Federal and State agencies providing funding for new facilities, either through loans or grants, have an interest in water conservation. Although willing to show flexibility with the financial constraints of small systems, these agencies will often require that large water providers implement a range of Best Management Practices (BMP's) as a provision of funding. These BMP's are focused upon water conservation and particularly the use of volumetric pricing as a method of encouraging good water stewardship.

Based on the reasons stated above, and strengthened by what has become standard industry practice, it is recommended that the District transition to metering all service connections and charging for water service based on the volume and timing of water demand.

The cost associated with metering and subsequently using volumetric pricing for water would involve retrofitting currently non-metered customers and requiring that new customers install meters to the District's specifications. Currently, for larger utilities, standard practice is automated meter reading (AMR) that allows electronic reading of the meters, greatly reducing meter reading and data entry efforts. The cost of implementing an AMR program is uncertain, but could be estimated at the District's discretion, if desired. The cost of meter reading and subsequent data download typically ranges from about $0.90 to $1.50 per read. Therefore, for monthly billing, this would represent a portion of the cost of converting to monthly billing. Remaining costs would include bill processing, mailing, and possible collection costs for delinquent accounts.

7.0 Appendix A

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
LOLO WATER AND SEWER DISTRICT - WELL 1

Plot this site on a topographic map

Location Information

GWIC Id:	67396	Source of Data:	GW2
Location (TRS):	12N 20W 26 CDAAA	Latitude (dd):	46.7653
County (MT):	MISSOULA	Longitude (dd):	-114.0764
DNRC Water Right:		Geomethod:	NAV-GPS
PWS Id:	00278002	Datum:	NAD27
Block:	1	Altitude (feet):	3165.00
Lot:	1	Certificate of Survey:	
Addition:	LAKEVIEW ADDITION	Type of Site:	WELL

Well Construction and Performance Data

Total Depth (ft):	154.00	How Drilled:	CABLE
Static Water Level (ft):	22.00	Driller's Name:	LIBERTY
Pumping Water Level (ft):	66.00	Driller License:	WWC052
Yield (gpm):	1600.00	Completion Date (m/d/y):	6/30/1969
Test Type:	AIR	Special Conditions:	ACTIVE
Test Duration:	72.00	Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Geology/Aquifer:	112ALVM
Recovery Time (hrs):		Well/Water Use:	PUBLIC WATER SUPPLY
Well Notes:			

Hole Diameter Information

No Hole Diameter Records currently in GWIC.

Casing Information[1]

From	To	Dia	Wall Thickness	Pressure Rating	Joint	Type
-2.0	117.0	18.0				STEEL

Annular Seal Information

From	To	Description
0.0	22.0	CONCRETE GROUT

Completion Information[1]

From	To	Dia	# of Openings	Size of Openings	Description
117.0	137.0	18.0			WELL SCREEN

Lithology Information

From	To	Description
0.0	1.5	BLACK DIRT
1.5	8.0	GRAVEL MIXED IN TAN SILT
8.0	14.0	FINE WHITE SAND WITH A FEW SCATTERED GRAVELS
14.0	21.0	GRAVEL MIXED IN TAN SILTY
21.0	24.0	FINE TO COARSE GRAY SAND
24.0	30.0	GRAVEL MIXED IN TAN SILT
30.0	36.0	FINE TO COARSE GRAY SAND AND GRAVEL
36.0	43.0	GRAVEL MIXED IN TAN SILT
43.0	52.0	GRAVEL IMBEDDED IN TAN SILTY CLAY
52.0	71.0	FINE TAN SAND WITH SOME COARSE GRAVEL MIXED IN
71.0	77.0	BROWN CLAY

77.0	82.0	FINE TO COARSE GRAY SAND WITH A FEW GRAVELS MIXED
82.0	87.0	FIEN TO COARSE TAN SAND MIXED WITH FINE TO COARSE GRAVEL COBBLESTONES WITH SOME TAN SILT
87.0	91.0	FINE TO COARSE GRAY SAND MIXED WITH COARSE GRAVEL AND COBBLESTONES
91.0	92.0	FINE GRAY SAND
92.0	96.0	FINE GRAY SAND AND TAN SILT MIXED WITH GRAVEL AND COBBLESTONES
96.0	102.0	FINE TO COARSE BROWN SAND
102.0	104.0	PINK CLAY
104.0	109.0	ARGILLITE AND LIMESTONE BOULDERS
109.0	111.0	FINE TO COARSE TAN SAND GRAVEL & COBBLESTONES
111.0	115.0	ARGILLITE AND LIMESTONE BOULDERS
115.0	137.0	COARSE SAND FINE TO COARSE GRAVEL COBBLESTONE AND FEW LARGE BOULDERS
137.0	154.0	BROKEN ARGILLITE

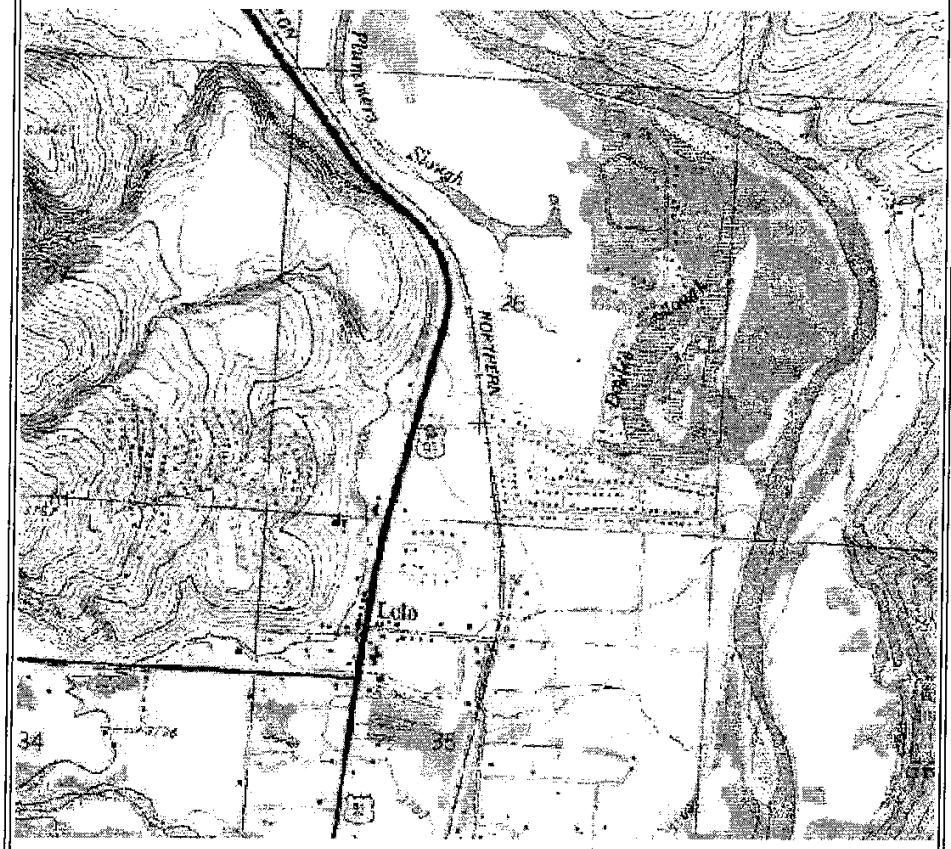
[1] - All diameters reported are **inside** diameter of the casing.

Montana Topographic Map Finder - The map is 1.86 miles wide.

Select a Map Control function, then click the Map

If you zoom in to a map less than three miles wide and a Digital Orthophoto is available for the area, you can display the photo.

○ Display Orthophoto ◉ Display 1:24,000 USGS Quadrangle Refresh



Map Contro

◉ ZoomIn Zoom Fac

○ ZoomOut 3

○ New Center Stat

Map Center Coor at Red +

Datum: NAD83 ○ N

Decimal Degr

Lat 46.7653 Long

State Plan

E 250824 N 2

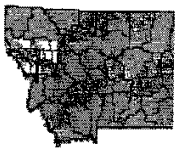
UTM Zone

E 723241 N 51

TRS T12N R2

Download 24K quadrangle:	
Download 100K quadrangle:	MI

Click the small map to n map center.



Orthophotos are availabl areas.

Legend | *He*

Map Size ○ Extra Large ○ Large ◉ Small Refresh

Click Here to view other map data for this area.

Search Too

Montana Natural Resource Information System

Technical questions about the application can be directed to:
nris@state.mt.us

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
LOLO WATER AND SEWER DISTRICT - WELL 2

Plot this site on a topographic map

Location Information

GWIC Id: 69020
Location (TRS): 12N 20W 26 CDAAA
County (MT): MISSOULA
DNRC Water Right:
PWS Id: 00278003
Block: 1
Lot: 1
Addition: LAKEVIEW

Source of Data: LOG
Latitude (dd): 46.7657
Longitude (dd): -114.0770
Geomethod: NAV-GPS
Datum: NAD27
Altitude (feet): 3162.00
Certificate of Survey:
Type of Site: WELL

Well Construction and Performance Data

Total Depth (ft): 107.00
Static Water Level (ft): 21.30
Pumping Water Level (ft): 40.00
Yield (gpm): 1356.00
Test Type: PUMP
Test Duration: 4.00
Drill Stem Setting (ft):
Recovery Water Level (ft):
Recovery Time (hrs):
Well Notes:

How Drilled: CABLE
Driller's Name: LIBERTY
Driller License: WWC052
Completion Date (m/d/y): 7/7/1975
Special Conditions: ACTIVE
Is Well Flowing?:
Shut-In Pressure:
Geology/Aquifer: 112ALVM
Well/Water Use: PUBLIC WATER SUPPLY

Hole Diameter Information

No Hole Diameter Records currently in GWIC.

Annular Seal Information

No Seal Records currently in GWIC.

Casing Information[1]

From	To	Dia	Wall Thickness	Pressure Rating	Joint	Type
-1.0	64.0	14.0				STEEL

Completion Information[1]

From	To	Dia	# of Openings	Size of Openings	Description
64.0	69.0	0.0			.18 SLOT SCRN
69.0	89.0	0.0			.25 SLOT SCRN

Lithology Information

From	To	Description
0.0	1.0	TOPSOIL MIXED WITH GRAVEL
1.0	23.0	SAND GRAVEL AND COBBLESTONES
23.0	61.0	LIGHT BROWN SILTY CLAY WITH FEW GRAVELS MIXED IN
61.0	64.0	GOOD SAND AND GRAVEL. SMALL
64.0	79.0	FIEN TAN SAND & GRAVEL. SOME LIGHT TAN CLAY STRINGERS
79.0	81.0	FINE TO COARSE SAND & GRAVEL. SOME SLIGHT SHOW OF TAN CLAY
81.0	90.0	CLEAN COARSE SAND & GRAVEL. SOME COBBLESTONE AND BOULDERS MIXED IN
90.0	97.0	TIGHT COBBLESTONES & BOULDERS SOME SAND AND GRAVEL MIXED IN
97.0	102.0	CEMENTED SAND GRAVEL COBBLESTONES AND BOULDERS
102.0	103.0	FRACTURED GRAY ROCK WITH STRINGERS OF RUSTY CLAY

103.0	105.0	PURPLE & GRAY ROCK IN THIN ALTERNATE LAYERS
105.0	107.0	LIGHT GRAY CLAY

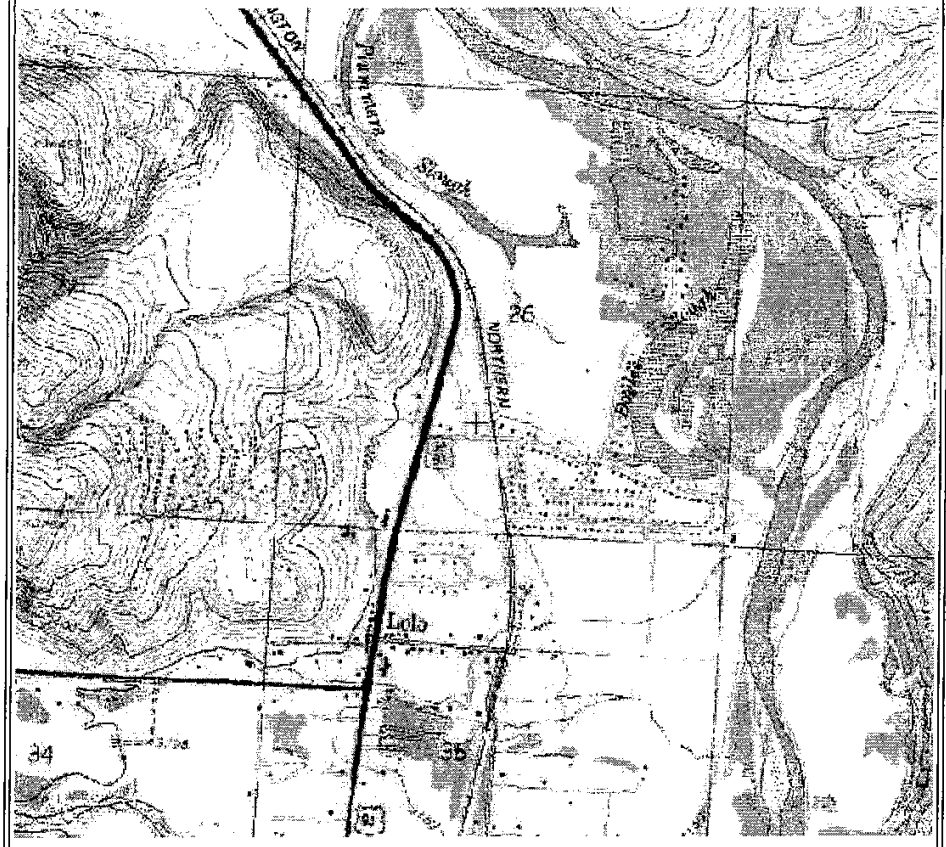
[1] - All diameters reported are **inside** diameter of the casing.

Montana Topographic Map Finder - The map is 1.86 miles wide.

Select a Map Control function, then click the Map

If you zoom in to a map less than three miles wide and a Digital Orthophoto is available for the area, you can display the photo.

○ Display Orthophoto ◉ Display 1:24,000 USGS Quadrangle Refresh



Map Size ○ Extra Large ○ Large ◉ Small Refresh

Click Here to view other map data for this area.

Map Contro

◉ ZoomIn Zoom Fac

○ ZoomOut 3

○ New Center Stat

Map Center Coor at Red +

Datum: NAD83 ○ N

Decimal Degr

Lat 46.7657 Long

State Plane

E 250781 N 2

UTM Zone

E 723193 N 51

TRS T12N R2

Download 24K quadrangle:	
Download 100K quadrangle:	MI

Click the small map to n map center.

Orthophotos are availabl areas.

Legend | *He*

Search Too

Montana Natural Resource Information System

Technical questions about the application can be directed to:
nris@state.mt.us

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
LOLO WATER AND SEWER DISTRICT - EMERGENCY WELL

Plot this site on a topographic map

Location Information

GWIC Id:	167655	Source of Data:	INV
Location (TRS):	12N 20W 26 CDAAA	Latitude (dd):	46.7653
County (MT):	MISSOULA	Longitude (dd):	-114.0764
DNRC Water Right:		Geomethod:	NAV-GPS
PWS Id:	00278004	Datum:	NAD27
Block:	1	Altitude (feet):	3162.00
Lot:	1	Certificate of Survey:	
Addition:	LAKEVIEW	Type of Site:	WELL

Well Construction and Performance Data

Total Depth (ft):		How Drilled:	
Static Water Level (ft):		Driller's Name:	
Pumping Water Level (ft):		Driller License:	
Yield (gpm):		Completion Date (m/d/y):	
Test Type:		Special Conditions:	ACTIVE
Test Duration:		Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Geology/Aquifer:	112ALVM
Recovery Time (hrs):		Well/Water Use:	PUBLIC WATER SUPPLY

Well Notes: WELL IN EVERGREEN BUSHES BEHIND (NORTH) OF NUMBER ONE WELL HOUSE. ONLY USED IN SUMMER AT PEAK USAGE.

Hole Diameter Information

No Hole Diameter Records currently in GWIC.

Casing Information[1]

No Casing Records currently in GWIC.

Annular Seal Information

No Seal Records currently in GWIC.

Completion Information[1]

No Completion Records currently in GWIC.

Lithology Information

No Lithology Records currently in GWIC.

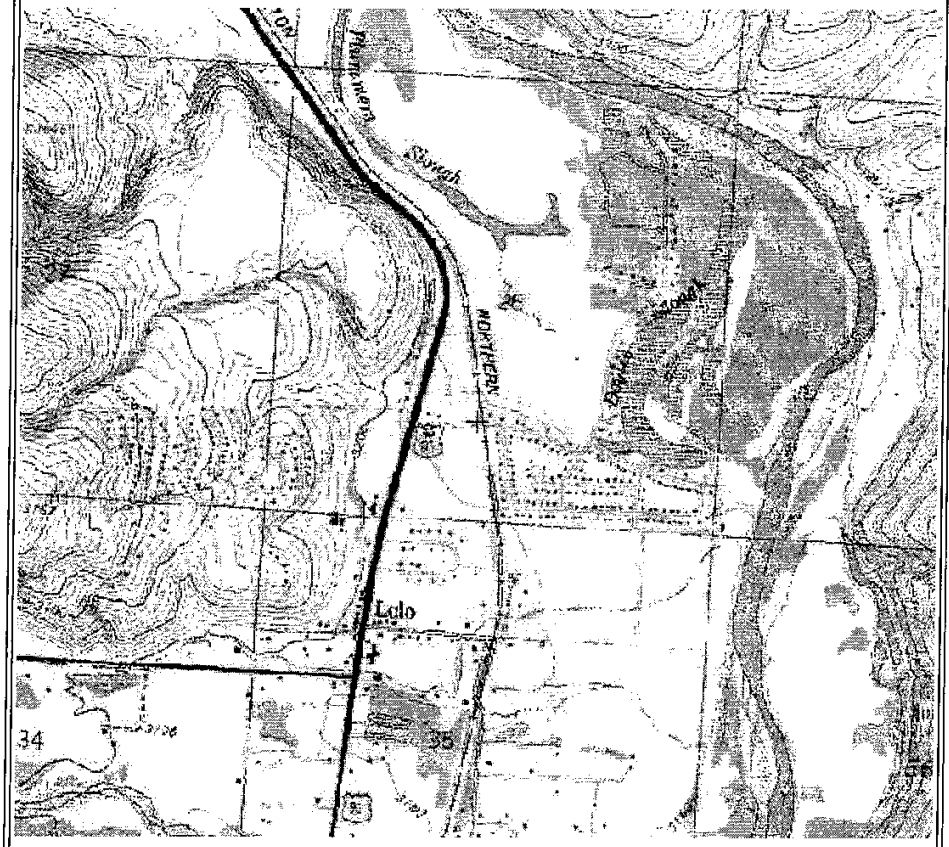
[1] - All diameters reported are **inside** diameter of the casing.

Montana Topographic Map Finder - The map is 1.86 miles wide.

Select a Map Control function, then click the Map

If you zoom in to a map less than three miles wide and a Digital Orthophoto is available for the area, you can display the photo.

Display Orthophoto | Display 1:24,000 USGS Quadrangle | Refresh



Map Control

ZoomIn | Zoom Fact

ZoomOut | 3

New Center | Stat

Map Center Coor at Red +

Datum: NAD83 | N

Decimal Degr

Lat 46.7653 Long

State Plane

E 250824 N 2

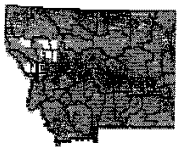
UTM Zone

E 723241 N 51

TRS T12N R2

Download 24K quadrangle:	
Download 100K quadrangle:	MI

Click the small map to m map center.



Orthophotos are availabl areas.

Legend | *He*

Map Size Extra Large | Large | Small | Refresh

Search Too

Click Here to view other map data for this area.

Montana Natural Resource Information System

Technical questions about the application can be directed to:
nris@state.mt.us

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
LOLO WATER AND SEWER DISTRICT - WELL 4

Plot this site on a topographic map

Location Information

GWIC Id: 149678
Location (TRS): 12N 20W 35 BCBB
County (MT): MISSOULA
DNRC Water Right:
PWS Id: 00278005
Block:
Lot:
Addition:

Source of Data: LOG
Latitude (dd): 46.7589
Longitude (dd): -114.0800
Geomethod: MAP
Datum: NAD27
Altitude (feet):
Certificate of Survey:
Type of Site: WELL

Well Construction and Performance Data

Total Depth (ft): 115.00
Static Water Level (ft): 17.00
Pumping Water Level (ft): 38.00
Yield (gpm): 1600.00
Test Type: PUMP
Test Duration: 24.00
Drill Stem Setting (ft):
Recovery Water Level (ft):
Recovery Time (hrs):
Well Notes:

How Drilled: CABLE
Driller's Name: CAMP
Driller License: WWC007
Completion Date (m/d/y): 5/26/1995
Special Conditions:
Is Well Flowing?:
Shut-In Pressure:
Geology/Aquifer: 111ALVM
Well/Water Use: PUBLIC WATER SUPPLY

Hole Diameter Information

From	To	Diameter
0.0	115.0	16.0

Annular Seal Information

From	To	Description
0.0	20.0	CEMENT

Casing Information[1]

From	To	Dia	Wall Thickness	Pressure Rating	Joint	Type
-1.0	115.0	16.0				STEEL

Completion Information[1]

From	To	Dia	# of Openings	Size of Openings	Description
80.0	100.0	16.0			3 X 1/2 KNIFE

Lithology Information

From	To	Description
0.0	35.0	CLAY SAND & GRAVEL
35.0	55.0	CLAY SAND GRAVEL & WATER
55.0	73.0	SAND GRAVEL COBBLESTONES & WATER
73.0	76.0	SAND & WATER
76.0	91.0	CLAY SAND GRAVEL COBBLESTONES & WATER
91.0	100.0	CLAY BROKEN ROCK & WATER
100.0	115.0	FRACTURED ROCK

[1] - All diameters reported are **inside** diameter of the casing.

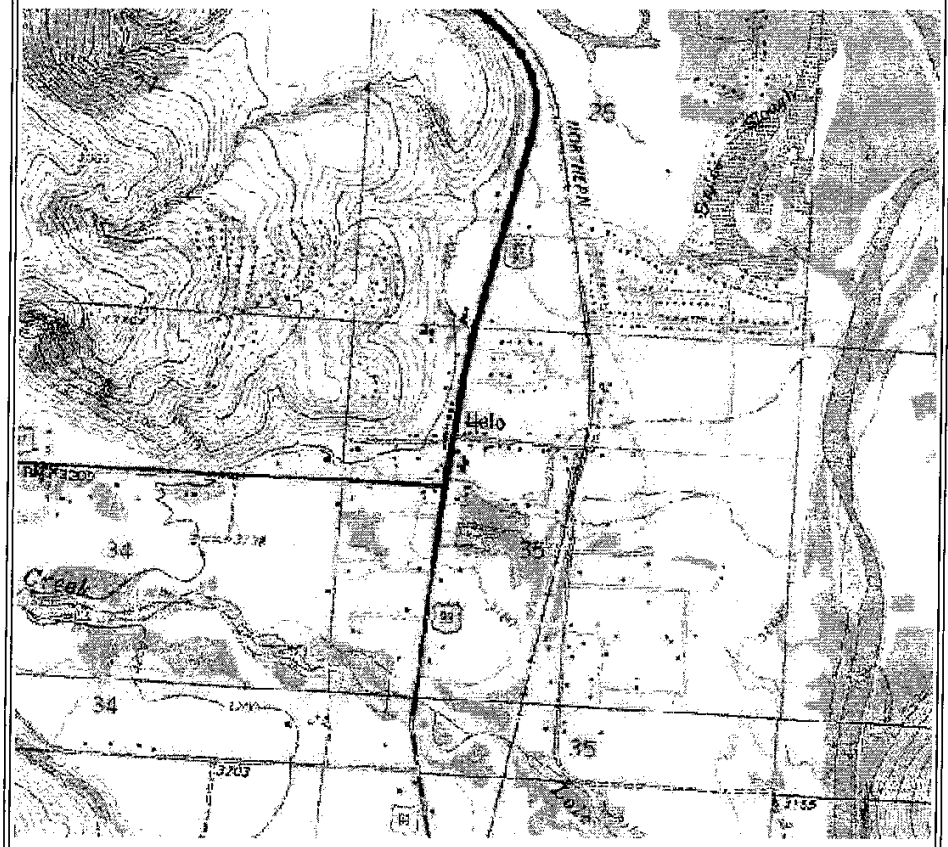
transmission of the data to the original end user. Retransmission of the data to other users is discouraged and the Bureau claims no responsibility if the material is retransmitted. Note: non-reported casing, completion, and lithologic records may exist in paper files at GWIC.

Montana Topographic Map Finder - The map is 1.86 miles wide.

Select a Map Control function, then click the Map

If you zoom in to a map less than three miles wide and a Digital Orthophoto is available for the area, you can display the photo.

○ Display Orthophoto ◉ Display 1:24,000 USGS Quadrangle Refresh



Map Contro

◉ ZoomIn Zoom Fac:

○ ZoomOut 3

○ New Center Stat

Map Center Coor at Red +

Datum: NAD83 ○ N

Decimal Degr

Lat 46.7589 Long

State Plan

E 250508 N 2

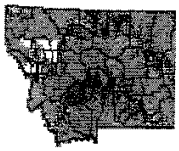
UTM Zone

E 722992 N 51

TRS T12N R2

Download 24K quadrangle:	
Download 100K quadrangle:	MI

Click the small map to n map center.



Orthophotos are availabl areas.

Legend | *He*

Map Size ○ Extra Large ○ Large ◉ Small Refresh

Search Too

Click Here to view other map data for this area.

Montana Natural Resource Information System

Technical questions about the application can be directed to:
nris@state.mt.us

200520608
Page: 45 of 45
08/11/2005 09:45A
Missoula County Vickie M Zeier RES
Bk-757 Pg-1488