9. OPERATION, MAINTENANCE, AND REPLACEMENT COSTS AND RATE STRUCTURE

9.1 Summary

This chapter presents annual operation, maintenance and replacement costs for the project facilities in the Fort Peck and Dry Prairie areas of the project. Each of the project facilities that constitutes a construction item in Chapter 7 was re-evaluated here to determine its life, number of replacements during a 50 year life, present value of costs at the time of replacement, annual payment to a sinking fund with accrual to the amount necessary at the time of replacement and annual operation and maintenance costs. Permanent staff costs, project equipment costs and electrical costs at the intake, treatment plant and pumping stations were determined throughout the project.

Table 9-1 summarizes the annual operation, maintenance and replacement (OMR) costs. The annual costs of the Assiniboine and Sioux Rural Water System were estimated at $1,995,000, and the annual costs of the Dry Prairie Rural Water System were estimated at $1,545,000: a total annual cost of $3,540,000. OMR costs are listed in Table 9-1 by major component: water system facility costs, staff and supporting facilities, and equipment needed for OMR.

TABLE 9-1

SUMMARY OF ANNUAL OPERATION, MAINTENACE AND REPLACEMENT COSTS

Cost Item	Fort Peck	Dry Prairie	Total
Water System Facilities			
Electrical	$528,000	$332,000	$860,000
Chemicals	55,000	46,000	101,000
Replacement	317,000	247,000	564,000
Pump Station and Reservoir OM	87,000	121,000	208,000
Staff and Support Facilities	844,000	645,000	1,489,000
Equipment	164,000	154,000	318,000
Total	$1,995,000	$1,545,000	$3,540,000

PL 106-382 provides for congressional appropriations through the Bureau of Indian Affairs to finance OMR costs within the Assiniboine and Sioux Rural Water System. Water users will be required to finance OMR costs within the Dry Prairie Rural Water System through a billing mechanism to be discussed later in this chapter.

9.2 Assiniboine and Sioux Rural Water System

The details of the cost components of OMR are presented in the following sections for the Assiniboine and Sioux Rural Water System. Water system replacements, electrical, chemical, pump

station and storage tank operation and maintenance costs are presented in the first section. Costs of staff and support facilities are presented in the next section, and the final section discusses the costs of OMR equipment.

9.2.1 Facility Replacements, Electrical and Related

Table 9-2 summarizes the facility replacement, pump station operation and maintenance, electrical and chemical costs for the Assiniboine and Sioux portion of the project. This includes the intake on the Missouri River, the water treatment plant, common pipelines and pumping stations along U.S. Highway 2 and Montana Highway 13 and branch lines throughout the Reservation. Annual operation, maintenance and replacement costs, not including staff or equipment costs, were estimated at $1,003,000.

Replacement costs were determined for each of the major and minor items in the construction cost estimate depending on the life of the element of the project. Most facilities have a life of 25 or 50 years. Replacement costs were based on the present value of a single payment at the end of the life of the component.

The intake and water treatment plant were divided into their separate components, and project lives of the components were estimated to determine the replacement costs that are presented in Table 9-2. In the case of pipelines, the assumption was made that one break could be expected for each 100 miles of pipeline on an annual basis. It was assumed that one 20 foot section of pipe would be replaced for each pipeline break. Table 9-2 only includes the material costs associated with pipeline breaks. Labor and equipment costs are presented separately, (Sections 9.2.2 and 9.2.3).

Annual electrical costs were based on a full supply of power from the Western Area Power Administration and kilowatt hour rates from the local rural electrical cooperatives for wheeling electrical power. Electrical costs were developed for the intake, water treatment plant and main transmission and branch pipeline pumping stations. An additional 1% of the total power demand was added for incidental power, including an impressed current for cathodic protection.

Historic water use by communities supplying three or more years of record were used to establish the monthly pattern of demand. In the winter months (October through March) per capita water use from this record ranged from 123 to 141 gallons per capita per day, and in the summer months (April through September) water use ranged from 140 to 299 gallons per capita per day (gpcd). The average of all months was 181 gpcd or virtually the same as the average daily use assumed in project design for communities (Chapter 4). Moreover, the 299 gpcd in August is consistent with the maximum day design for municipal supply of 396 gpcd. The average water use for the highest month of the year is expected to be significantly less than the maximum day during that highest month. Of the total water use, 36% occurs during the six winter months and 64% occurs during the six summer months.

TABLE 9-2

ANNUAL OPERATION, MAINTENANCE AND REPLACEMENT COSTS
FORT PECK ASSINISBOINE AND SIOUX RURAL WATER SYSTEM

									Annual O and M			
	Initial			Life	Replacement				Electrical	Total	Annual	PV
Project Cost Accounts	Cost	Units	Quantity	(years)	Number	Future Cost	Fut Salvage	Net	Costs	OM	OMR	OMR
Contract Items												
Intake	$2,380,000	L.S.	1	–		$266,621	$53,324	$213,297	$8,370	$8,370	$23,504	$504,912
Water Treatment Plant	14,438,000	L.S.	1	–	0	1,639,037	327,807	1,311,229	26,156	80,878	175,611	3,772,510
24" Welded Steel / Ductile Iron Pip	7,450,000	L.F.	128,244	50	14	16,393	0	16,393	0	0	16,393	352,154
20" Welded Steel / Ductile Iron Pip	0	L.F.	- -	50	0	0	0	0	0	0	0	0
18" Welded Steel / Ductile Iron Pip	0	L.F.	- -	50	0	0	0	0	0	0	0	0
16" Welded Steel / Ductile Iron Pip	5,478,000	L.F.	158,656	50	10	7,165	0	7,165	0	0	7,165	153,919
14" PVC Pipe	7,649,000	L.F.	278,257	50	14	7,965	0	7,965	0	0	7,965	171,102
12" PVC Pipe	1,472,000	L.F.	75,490	50	3	1,087	0	1,087	0	0	1,087	23,357
10" PVC Pipe	0	L.F.	- -	50	0	0	0	0	0	0	0	0
8" PVC Pipe	2,283,000	L.F.	- -	50	4	889	0	889	0	0	889	19,097
6" PVC Pipe	5,058,000	L.F.	255,893	50	10	1,418	0	1,418	0	0	1,418	30,457
4" PVC Pipe	2,385,000	L.F.	900,477	50	5	398	0	398	0	0	398	8,539
3" PVC Pipe	4,306,000	L.F.	1,128,191	50	8	535	0	535	0	0	535	11,493
2" PVC Pipe	10,009,000	L.F.	4,310,549	50	19	990	0	990	0	0	990	21,257
Easements												
Donation	0	L.F.	4,344,239		0	0	0	0	0	0	0	0
Fair Market	666,000	L.F.	2,896,160		0	0	0	0	0	0	0	0
Bends, Tees, F and P Control	237,000	EA.	823	25	1	88,903	17,781	3,311	0	0	3,311	71,122
Air Relief Valves	979,000	EA.	221	25	1	367,239	73,448	13,676	0	0	13,676	293,791
Drains	621,000	EA.	962	25	1	232,948	46,590	8,675	0	0	8,675	186,358
Isolation Valves	374,000	EA.	318	25	1	140,294	28,059	5,225	0	0	5,225	112,235
Rural Meter Pits	2,026,000	EA.	2,701	25	1	759,987	151,997	28,302	0	0	28,302	607,989
Road Crossings	457,000	L.F.	13,566	50	0	0	0	0	0	0	0	0
Railroad Crossings	102,000	L.F.	2,244	50	0	0	0	0	0	0	0	0
Stream Crossings	167,000	L.F.	3,366	50	0	0	0	0	0	0	0	0
Transmission Pumping Stations	3,360,000	EA.	7	25	1	1,260,392	252,078	46,937	416,253	481,145	528,082	11,344,360
Branch Pumping Stations	4,037,000	EA.	73	25	1	1,514,347	302,869	56,395	77,015	102,543	158,938	3,414,325
Reservoirs	2,641,000	EA.	80	50	0	0	0	0	0	13,205	13,205	283,672
SCADA	576,000	L.S.	80	25	1	216,067	43,213	8,046	0	0	8,046	172,854
O and M Buildings	1,000,000	L.S.	1	50	0	0	0	0	0	0	0	0
Electrical Distribution	500,000	L.S.	1	–								
Total Contract Cost	$80,651,000					$6,522,672	$1,297,167	$1,731,931	$527,794	$686,141	$1,003,413	$21,555,504

Based on the pattern of monthly water use, consideration was given to the number of hours per day required to meet demands assuming pumping at the maximum capacity although actual operation will be governed by a lower pumping rate extending over a longer period of time each day. The number of hours required at pump station capacity ranged from 7.43 hours in December to 18.12 hours in August. Because friction losses are minimized by pumping throughout the day at lower flow rates (thereby reducing energy requirements), adjustments were made in the number of hours required for pumping based on the use of pumping unit combinations with 1/4, 1/2 and 3/4 of maximum day capacity (see section 7.5.1). Pumping hours with this scenario ranged 15.59 to 20.25 hours: more hours with a narrower range of variance. During the peak summer months, this methodology did not significantly reduce friction losses from the amount to be expected when pumps are operating to deliver maximum day demand, but in other months friction losses were reduced to as little as 28% of the amount expected with pumps operating at full capacity.

From all pumping stations on the main transmission pipeline, there is a total dynamic head of 6,192 feet. The amount of pumping required to overcome changes in elevation is 2,460 feet (40%), and the amount of pumping required to overcome friction losses is 3,730 feet (60%). On the branch pipelines similar relationships between elevation gain and friction losses are expected to apply. That portion of the energy use attributed to friction losses (60%) can be managed by the pumping pattern described above to reduce energy requirements. Some additional energy savings can be achieved by extending the hours of pumping closer to 24 hours daily and over longer periods than assumed in the previous paragraph.

During the summer months, the Western Area Power Administration (Western) will provide power at a firm, wholesale composite rate of about 15.5 mills per kilowatt hour ($0.015/kilowatt hour). During the winter months Western will provide power to the project at the same rate, to the extent that power is available, but power during the winter months will not be available on a firm basis. At such times that Western cannot supply energy from the hydropower facilities of the Eastern Division of Pick-Sloan, Missouri River Basin Program, Western will purchase power for the project at available rates. There is probability that some supply can be purchased from other power marketing administrations at wholesale rates comparable or slightly higher than Pick-Sloan rates. However, in the winter months, the assumption made was that power would be purchased exclusively outside Pick-Sloan and outside other power marketing agencies at market rates closer to 40 mills per kilowatt hour ($0.040/kilowatt hour). The 40 mill per kilowatt hour rate was used in the winter months when 36% of water use occurs, and the rate of 15.5 mills per kilowatt hour was used in the summer months when 64% of water use occurs. The methodology produced the highest energy rate expected for the project. In actual practice, lower power rates during the water months are considered achievable.

The remaining factor in the cost of power is the cost of the distribution (wheeling) from Western's point of interconnection across the rural electric cooperatives serving the regional project. It was assumed that wheeling costs would be negotiated with each of the rural electric cooperatives in a manner that would benefit both the project and the membership of each cooperative. Before undertaking those negotiations, it was assumed that the highest cost to the project would be the total costs of each rural electric cooperative less the cost of energy. Western will provide the energy for the project at the rates discussed above. Table 9-3 is typical of the costs of distribution from the records of each of the three rural electric cooperatives serving parts of the project.

TABLE 9-3

HISTORICAL DISTRIBUTION COSTS
OF REGIONAL RURAL ELECTRIC COOPERATIVES

	Rural Electric Cooperatives		
Cost Element	Sheridan Electric	Northern Electric	Valley Electric
Total Revenue	$ 5,133,624	$ 1,946,020	$ 1,443,265
Total Operating Deductions	4,678,417	1,621,076	1,269,463
Cost of Power	3,101,987	635,404	544,726
Total Less Cost of Power	$ 1,576,430	$ 985,672	$ 724,737
Total MWH Sales	74,313	27,315	19,738
Average Revenue per kwh	$ 0.069	$ 0.071	$ 0.073
Total Less Cost of Power, mills/Kwh	21.2	36.1	36.7

Costs of distribution (total costs less costs of power) range from 21 to 37 mills per kilowatt hour and average 31.3 mills per kilowatt hour.[1] Most of the power delivered by the project will be through Sheridan Electric with the lowest historic cost of distribution. The cost of wheeling included in the analyses was 29.5 mills per kilowatt hour.

Power costs for the project of $860,000 annually constitute approximately 25% of the total OMR estimate. Therefore, increases in future power costs can significantly impact the total estimate. The power supply and rates from Western have been relatively stable historically. The current rate is expected by Western to require re-examination at the end of the five-year period for which the rate was established. Future increases are unknown, but due to the completed federal investment in hydropower generation and transmission facilities, the cost of power from Western should not be subject to the same level of increases as those power sectors with rapidly increasing demands and requirements to build new generation and transmission facilities, including coal, wind or gas-powered generation facilities requiring a much higher electric rate than Western's current rate to recover costs. The project's power supply should not be subject to radically increased rates based on the history of the Western rate in the Eastern Division of Pick-Sloan.

There are risks that Congress could revise preference power law in the future to make a wholesale federal power available at higher rates approaching market rates. Such legislative efforts in the past have not progressed far. The discussion here is highly speculative but is intended to provide minimal guidance in assessing the risk or lack of risk of future power cost increases that have significantly impacted other areas of the western United States in recent times.

Chemical costs were estimated at $101,000 annually and were divided proportionally between the Assiniboine and Sioux and Dry Prairie rural water systems based on projected demands. Chemical costs will be refined in design level investigations involving pilot testing (Chapter 6).

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[1]Rural Electrification Administration, July 1993, *1992 Statistical Report, Rural Electric Borrowers, Informational Publication 201-1*, United States Department of Agriculture, pp. 140-141.

Operation and maintenance costs of pumping stations were divided into labor and material estimates based on Bureau of Reclamation estimating procedures for irrigation pumping stations. Operating costs were based on unattended plants with regular visits for maintenance. Plant sizes range from 0.5 to 2,000 horsepower. The following were the basic equations developed by the Bureau of Reclamation for pumping plant operation costs.[2]

$$C_1 = 2.1\, Q^{.47}\, h^{.26}\, T^{.34}\, W_o$$
$$C_2 = 1.8\, Q^{.47}\, h^{.26}\, T^{.34}\, I$$

Where:

C_1	--	labor costs
C_2	--	other cause such as supplies and transportation
Q	--	total discharge, cubic feet per second (cfs)
h	--	total designed head, feet
T	--	length of operation season in weeks
W_o	--	pump operators hourly wage rate (see Table 9-4)
I	--	ratio of current price level to 1962 price level

Maintenance costs were also determined. The Bureau of Reclamation cost estimating procedures require determination of the total horsepower of the pumping station before estimating labor and material costs. For pumping stations with less than 149 horsepower, the following equations apply:[3]

$$C_1 = 2.0\, Q^{.84}\, h^{.40}\, W_m$$
$$C_2 = 4.0\, Q^{.84}\, h^{.40}\, I$$

and for pumping stations with more than 149 horsepower, maintenance costs were computed by the following equations:[4]

$$C_1 = .96\, Q^{.11}\, h^{.41}\, G^{.43}\, W_o$$
$$C_2 = 2.0\, Q^{.11}\, h^{.41}\, G^{.43}\, I$$

Where:

G	--	annual volume pumped in acre-feet
W_o	--	a mechanic's hourly wage rate (see Table 9-4)

[2]Eyer, 1965, p. C-8a.

[3]*Ibid*, p. C-8d.

[4]*Ibid*, p. C-8e.

These costs were included in Table 9-2 and were re-presented in Table 9-1. Costs were also included for the maintenance of the storage tanks throughout the system. Maintenance of storage tanks will primarily relate to painting. Part of the cost of operation, maintenance and replacement of pumping stations and storage tanks was duplicated in the computation of staff costs as presented below. Staff costs were computed in the equations given above and were re-computed as part of the permanent labor force requirements for OMR.

9.2.2 Staffing Costs

In addition to the material, chemical and energy costs presented in Table 9-2, staffing costs within the Fort Peck Indian Reservation will total $844,000 annually for a Board of Directors, a project manager and staff, a water treatment plant manager and staff and nonlabor expenses. These costs are summarized in Table 9-4. The project will employ 14 full-time individuals.

TABLE 9-4

ANNUAL COSTS OF OMR STAFF
ASSINIBOINE AND SIOUX RURAL WATER SYSTEM

Item/Description	Staff	Unit	Unit Cost	Annual Number	Annual Cost
Fort Peck					
Board	6	Hours	$15.00	100	$9,000
Manager	1	Hours	36.00	2,080	74,880
Secretarial	1	Hours	24.00	2,080	49,920
Bookkeeping	1	Hours	21.60	2,080	44,928
WTP Manager	1	Hours	33.60	2,080	69,888
WTP Operator	2	Hours	30.00	2,080	124,800
Maintenance Foreman	1	Hours	26.40	2,080	54,912
Pumping Plant Mechanic	3	Hours	24.00	2,080	149,760
Electrician	1	Hours	24.00	2,080	49,920
Meters/Laborers	3	Hours	18.00	2,080	112,320
Travel					
Lodging		Days	75.00	50.00	3,750
Meals		Days	25.00	50.00	1,250
Air Fare		Days	10.00	1,000	10,000
Fees		ea	200.00	6	1,200
Electrical Utilities		Month	200.00	12	2,400
Water, Sewer, Solid Waste		Month	75.00	12	900
Telephone		Month	500.00	12	6,000
Photocopy		Pages	0.10	7,200	720
Fax		Pages	2.00	720	1,440
Computers		ea	1,500.00	2	3,000
Software		ea	2,000.00	2	4,000
Legal/Accounting		Hours	75.00	200	15,000
Consulting		Hours	100.00	400	40,000
Insurance		Month	1,000.00	12	12,000
Mail		Month	200.00	12	2,400
	14				$844,388

Table 9-5 summarizes annual equipment costs for the Fort Peck portion of the project. An initial investment in operation and maintenance equipment will total $763,000, and annual operation, maintenance and replacement costs will total $164,000. Operation and maintenance equipment will include vehicles for staff and necessary equipment to maintain and repair pipelines, pumping stations, reservoirs and other facilities within the project.

TABLE 9-5

ANNUAL COSTS OF OMR EQUIPMENT
ASSINIBOINE AND SIOUX RURAL WATER SYSTEM

Item	Number	Inital Cost	Total Cost	Annual Hours	Life Hours	Per Hour OM	Annual OMR Cost
Fort Peck							
Pickups (1/2 Ton)	8	$22,000	$176,000	400	2,400	$16.00	$71,395
Pickups (1 Ton)	1	35,000	35,000	400	2,400	25.00	14,015.99
Service Trucks	1	40,000	40,000	200	2,400	25.00	7,012.01
Backhoe	1	150,000	150,000	500	10,000	30.00	20,299.54
200 hp 4 cy Deisel Dump	1	125,000	125,000	500	5,000	18.00	17,329.09
Semi Tractor and Trailer	1	125,000	125,000	500	5,000	18.00	17,329.09
Power Tamping Equipment	1	40,000	40,000	500	5,000	1.00	3,165.31
200 CFM Compressor	1	22,000	22,000	500	4,000	10.00	6,841.01
Welder	1	10,000	10,000	500	5,000	5.00	3,166.33
Air Power Tools	1	5,000	5,000	200	2,000	2.00	733.16
Hand Tools	7	5,000	35,000	200	2,000	0.00	2,332.15
Total			$763,000				$163,618

9.3 Dry Prairie Rural Water System

Tables 9-6, 9-7 and 9-8 present operation, maintenance and replacement information for the Dry Prairie portion of the project in the same form as for the Fort Peck portion. In Table 9-6, annual operation, maintenance and replacement costs of facilities outside the Reservation total $730,000. Of the total, $322,000 is for annual electrical costs.

Table 9-7 summarizes the costs of the Dry Prairie staff of 11 at $645,000. These costs assume that all staff of Dry Prairie will be newly hired and separate from the staff in the communities that operate established public water systems. There is potential for savings by combining staff of Dry Prairie with staff of existing public water systems. Staff in those public water systems will no longer be responsible for operation and maintenance of water treatment plants and will have capacity to assist in operation of the Dry Prairie pipelines and pumping stations in the rural areas surrounding the communities.

Table 9-8 summarizes equipment costs for Dry Prairie with an initial investment cost of $726,000 and an annual operation, maintenance and replacement cost of $154,000.

TABLE 9-6

ANNUAL OPERATION, MAINTENANCE AND REPLACEMENT COSTS
DRY PRAIRIE RURAL WATER SYSTEM

Project Cost Accounts	Initial Cost	Units	Quantity	Life (years)	Replacement Number	Replacement Future Cost	Replacement Fut Salvage	Replacement Net	Annual O and M Electrical Costs	Annual O and M Total OM	Annual OMR	PV OMR
Contract Items												
Intake	0	L.S.	0	–	0	$225,607	$45,121	$180,486	$7,082	$7,082	$19,888	$427,243
Water Treatment Plant	0	L.S.	0	–	0	1,386,908	277,382	1,109,527	22,132	68,437	148,597	3,192,196
24" Welded Steel / Ductile Iron Pipe	0	L.F.	0	50	0	0	0	0	0	0	0	0
20" Welded Steel / Ductile Iron Pipe	0	L.F.	0	50	0	0	0	0	0	0	0	0
18" Welded Steel / Ductile Iron Pipe	0	L.F.	0	50	0	0	0	0	0	0	0	0
16" Welded Steel / Ductile Iron Pipe	0	L.F.	0	50	0	0	0	0	0	0	0	0
14" PVC Pipe	1,686,000	L.F.	94,983	50	3	1,134	0	1,134	0	0	1,134	24,352
12" PVC Pipe	2,575,000	L.F.	206,370	50	5	1,217	0	1,217	0	0	1,217	26,150
10" PVC Pipe	1,502,000	L.F.	145,413	50	3	588	0	588	0	0	588	12,625
8" PVC Pipe	2,695,000	L.F.	409,629	50	5	672	0	672	0	0	672	14,430
6" PVC Pipe	3,618,000	L.F.	766,572	50	7	647	0	647	0	0	647	13,896
4" PVC Pipe	3,542,000	L.F.	1,269,576	50	7	374	0	374	0	0	374	8,041
3" PVC Pipe	4,149,000	L.F.	1,994,573	50	8	327	0	327	0	0	327	7,022
2" PVC Pipe	8,378,000	L.F.	5,077,347	50	16	524	0	524	0	0	524	11,249
Easements												
Donation	0	L.F.	7,473,347		0	0	0	0	0	0	0	0
Fair Market	722,000	L.F.	2,491,116		0	0	0	0	0	0	0	0
Bends, Tees, F and P Control	190,000	EA.	1,175	25	1	71,272	14,254	2,654	0	0	2,654	57,018
Air Relief Valves	1,076,000	EA.	359	25	1	403,626	80,725	15,031	0	0	15,031	322,901
Drains	626,000	EA.	382	25	1	234,823	46,965	8,745	0	0	8,745	187,858
Isolation Valves	283,000	EA.	500	25	1	106,158	21,232	3,953	0	0	3,953	84,926
Rural Meter Pits	1,163,000	EA.	1,550	25	1	436,261	87,252	16,246	0	0	16,246	349,009
Road Crossings	395,000	L.F.	17,344	50	0	0	0	0	0	0	0	0
Railroad Crossings	197,000	L.F.	8,874	50	0	0	0	0	0	0	0	0
Stream Crossings	119,000	L.F.	5,406	50	0	0	0	0	0	0	0	0
Transmission Pumping Stations	2,559,000	EA.	13	25	1	959,924	191,985	35,748	237,244	303,327	339,075	7,284,066
Branch Pumping Stations	3,995,000	EA.	49	25	1	1,498,592	299,718	55,808	65,509	92,039	147,847	3,176,072
Reservoirs	2,392,000	EA.	2	50	0	0	0	0	0	11,960	11,960	256,927
SCADA	744,000	L.S.	62	25	1	279,087	55,817	10,393	0	0	10,393	223,270
O and M Buildings	1,000,000	L.S.	1	50	0	0	0	0	0	0	0	0
Electrical Distribution	500,000	L.S.	1	–								
Total Contract Cost	$44,106,000					$5,607,740	$1,120,452	$1,444,073	$331,968	$482,845	$729,872	$15,679,250

TABLE 9-7

ANNUAL COSTS OF OMR STAFF
DRY PRAIRIE RURAL WATER SYSTEM

Item/Description	Staff	Unit	Unit Cost	Annual Number	Annual Cost
Dry Prairie					
Board	6	Hours	$15.00	100	$9,000
Manager	1	Hours	36.00	2,080	74,880
Secretarial	1	Hours	24.00	2,080	49,920
Bookkeeping/Billing	2	Hours	21.60	2,080	89,856
Maintenance Foreman	1	Hours	26.40	2,080	54,912
Pumping Plant Mechanic	2	Hours	24.00	2,080	99,840
Electrician	1	Hours	24.00	2,080	49,920
Meters/Laborers	3	Hours	18.00	2,080	112,320
Travel					
Lodging		Days	75.00	50	3,750
Meals		Days	25.00	50	1,250
Air Fare		Days	10.00	1,000	10,000
Fees		ea	200.00	6	1,200
Electrical Utilities		Month	200.00	12	2,400
Water, Sewer, Solid Waste		Month	75.00	12	900
Telephone		Month	500.00	12	6,000
Photocopy		Pages	0.10	7,200	720
Fax		Pages	2.00	720	1,440
Computers		ea	1,500.00	2	3,000
Software		ea	2,000.00	2	4,000
Legal/Accounting		Hours	75.00	200	15,000
Consulting		Hours	100.00	400	40,000
Insurance		Month	1,000.00	12	12,000
Mail		Month	200.00	12	2,400
	11				$644,708

TABLE 9-8

ANNUAL COSTS OF OMR EQUIPMENT
DRY PRAIRIE RURAL WATER SYSTEM

Item	Number	Inital Cost	Total Cost	Annual Hours	Life Hours	Per Hour OM	Annual OMR Cost
Dry Prairie							
Pickups (1/2 Ton)	7	$22,000	$154,000	400	2,400	$16.00	$62,470
Pickups (1 Ton)	1	35,000	35,000	400	2,400	25.00	14,016
Service Trucks	1	40,000	40,000	200	2,400	25.00	7,012
Backhoe	1	150,000	150,000	500	10,000	30.00	20,300
200 hp 4 cy Deisel Dump	1	125,000	125,000	500	5,000	18.00	17,329
Semi Tractor and Trailer	1	125,000	125,000	500	5,000	18.00	17,329
Power Tamping Equipment	1	40,000	40,000	500	5,000	1.00	3,165
200 CFM Compressor	1	22,000	22,000	500	4,000	10.00	6,841
Welder	1	10,000	10,000	500	5,000	5.00	3,166
Air Power Tools	1	5,000	5,000	200	2,000	2.00	733
Hand Tools	4	5,000	20,000	200	2,000	0.00	1,333
Total			$726,000				$153,695

9.4 Dry Prairie Monthly Cost and Billing Basis

Table 9-9 summarizes a billing method assuming the design population (14,107) participates in the project and water is delivered at billing rates that tend toward balance between community and rural water users, while recognizing that the existing public water systems will continue to incur costs for the maintenance of their distribution systems. The same method is also presented for a declining population in Table 9-10 to test the billing sensitivity of the level of participation in the project.

Table 9-9 is based on water service to the design population with an average daily demand of 2,337,596 gallons per day. Debt service on 12% of the project construction cost has an annual payment of $647,750 to retire the obligation over 20 years at 5%. A longer term and a lower rate are possible. This is a fixed cost with a monthly cost per residential connection of $7.54.

An “equivalent residential connection” in this section of the chapter is an existing service connection with a 3/4 inch or 1 inch diameter service line. Larger diameter service lines were converted to equivalent residential connections by accounting for demand that 1-1/2 inch or 2 inch service connections can place on the system, namely 4.00 and 7.11 times demand, respectively, that a 3/4 service connection can demand. The "equivalent connection" is a common basis for community billing in the region. The method provides a billing schedule based (1) on demand and (2) on a variable billing schedule depending on gallons used. This is comparable to billing in the electrical industry for horsepower (demand) and energy use (consumption). The fixed and variable parts of the accounting result in a composite monthly water bill. Demand costs for “equivalents” are not to be confused with interconnection costs as part of construction, because those costs are included in the construction cost estimates. Dry Prairie may charge a higher fixed demand component for larger diameter service connections in the existing communities and in the rural areas.

Table 9-9 also presents the annual OMR costs for Dry Prairie in the "totals" column. OMR was divided into its components and totals $1,544,000 as presented previously in Table 9-1. The OMR costs by component were separated into fixed and variable amounts totaling $1,072,390 and $470,885, respectively. Variable costs include electricity and chemicals. All other costs were considered fixed costs although OMR staff and equipment costs have some variable component not considered in the analysis in Table 9-9.

The combination of debt service and annual OMR cost totals $2,191,025 and was divided into a monthly fixed cost of $143,345 and a monthly variable cost of $39,240. The sum of the monthly fixed and variable costs is $182,585. In the communities and rural areas of Dry Prairie there are an estimated 6,433 total service connections and 7,211 residential equivalent service connections. The larger 1-1/2 inch and 2 inch diameter connections are generally hospitals, schools and commercial or industrial establishments that require larger amounts of water than would normally be delivered at a residential connection.

TABLE 9-9

MONTHLY COSTS AND BILLING OPTION
STABLE POPULATION

Feature	Totals	Annual Costs Fixed	Annual Costs Variable	Monthly Costs Fixed	Monthly Costs Variable
Total Project Demand, gpd	5,100,146	5,100,146	5,100,146	5,100,146	--
Dry Prairie Demand, gpd	2,337,596	2,337,596	2,337,596	2,337,596	--
Dry Prairie Construction Cost	$67,270,000	--	--	--	--
Non-Federal Cost Share, %	24	--	--	--	--
Dry Prairie	12	--	--	--	--
Montana	12	--	--	--	--
Dry Prairie Cost Share, $	$8,072,400	--	--	--	--
Annual Dry Prairie Debt Service					
Rate, %	5	--	--	--	--
Term, yrs	20	--	--	--	--
Annual Payment, Years	$647,750	$647,750	$0	$53,979	$0
Monthly per Equivalent				$7.54	
Annual OMR					
Intake	$19,888	$12,806	$7,082	$1,067	$590
Treatment Plant	148,597	80,160	68,437	6,680	5,703
Valves, Crossings, etc	79,068	79,068	0	6,589	0
Pumping Stations	486,926	91,560	395,366	7,630	32,947
SCADA	10,393	10,393	0	866	0
OMR Staff	644,708	644,708	0	53,726	0
OMR Equipment	153,695	153,695	0	12,808	0
Subtotal	$1,543,275	$1,072,390	$470,885	$89,366	$39,240
Total Annual Costs	$2,191,025	$1,720,140	$470,885	$143,345	$39,240
Check				$143,345	$39,240
Total Service Connection Equivalents	7,211	7,211	7,211	7,211	7,211
Dry Prairie Cost Per Equivalent	$303.83	$238.53	$65.30	$19.88	$5.44
PWS Distribution Costs, Typical	$180.00	$180.00	$0.00	$15.00	--
Total Cost in PWS Per Equivalent	$483.83	$418.53	$65.30	$34.88	$5.44
Per 1,000 Gallons	--	--	--	--	$0.54
Rural Connection Cost	$303.83	$238.53	$65.30	$19.88	$5.44
Per 1,000 Gallons	--	--	--	--	$0.54
Rate Structure Option	Equivalents				
Existing				$15.00	--
PWS 3/4" Connection	4,116			17.00	$0.54
PWS 1" Connection	382			17.00	0.54
PWS 1 1/2" Connection	38			68.00	0.54
PWS 2" Connection	60			120.87	0.54
Rural	1,836			$32.00	$0.54
Total Revenue	6,433			$182,585	

If Dry Prairie were to charge $17.00 per month for 3/4 and 1 inch connections, $68.00 per month for 1-1/2 inch connections and $120.87 for 2 inch connections as a fixed charge and $0.54 as a variable charge in the communities and $32.00 per month as a fixed charge and $0.54 as a variable charge for a residential equivalent in the rural areas (Table 9-1), the monthly revenue generated would total $182,585, the amount needed to cover debt service and OMR. When combined with the cost of continued maintenance of distribution systems in the communities ($15 per month was considered representative), community users would have water bills with a fixed component of $34.88

TABLE 9-10

MONTHLY COSTS AND BILLING OPTION
DECLINING POPULATION

Feature	Declining Population	Annual Costs Fixed	Annual Costs Variable	Monthly Costs Fixed	Monthly Costs Variable
Total Project Demand, gpd	4,492,341	4,492,341	4,492,341	4,492,341	--
Dry Prairie Demand, gpd	1,729,791	1,729,791	1,729,791	1,729,791	--
Dry Prairie Cost	$67,270,000	--	--	--	--
Non-Federal Cost Share, %	24	--	--	--	--
Dry Prairie	12	--	--	--	--
Montana	12	--	--	--	--
Dry Prairie Cost Share, $	$8,072,400	--	--	--	--
Dry Prairie Debt Service					
Rate, %	5	--	--	--	--
Term, yrs	20	--	--	--	--
Annual Payment, Years	$647,750	$647,750	$0	$53,979	$0
OMR					
Intake	$18,047	$12,806	$5,241	$1,067	$437
Treatment Plant	130,803	$80,160	50,643	6,680	4,220
Valves, Crossings, etc	79,068	$79,068	0	6,589	0
Pumping Stations	384,126	$91,560	292,566	7,630	24,380
SCADA	10,393	$10,393	0	866	0
OMR Staff	644,708	$644,708	0	53,726	0
OMR Equipment	153,695	$153,695	0	12,808	0
Subtotal	$1,420,839	$1,072,390	$348,449	$89,366	$29,037
Total Costs	$2,068,589	$1,720,140	$348,449	$143,345	$29,037
				$143,345	$29,037
Total Residential Equivalents	5,410	5,410	5,410	5,410	5,410
Dry Prairie Cost Per Equivalent	$382.36	$317.95	$64.41	$26.50	$5.37
Existing PWS Distribution Costs	$180.00	$180.00	$0.00	$15.00	$0.00
Total Cost in PWS Per Equivalent	$562.36	$497.95	$64.41	$41.50	$5.37
Per 1,000 Gallons	--	--	--	--	$0.54
Rural Connection Cost	$382.36	$317.95	$64.41	$26.50	$5.37
Per 1,000 Gallons	--	--	--	--	$0.54
Rate Structure Option					
Existing				15.00	--
PWS 3/4" Connection	3,064			24.10	0.54
PWS 1" Connection	283			24.10	0.54
PWS 1 1/2" Connection	76			96.40	0.54
PWS 2" Connection	33			171.35	0.54
Rural	1,359			39.10	0.54
Total Revenue	4,816			$172,910	

per month and rural users would have water bills with a fixed component of $32.00 per month. Both would be billed at the same variable rate of $0.54 per 1,000 gallons.

Monthly water bills in the communities and rural areas would total $40.32 and $37.54, respectively, based on the analysis presented in Table 9-9. This compares with the theoretical willingness to pay of $24.12 (Chapter 10). The foregoing analysis does not account for costs or rates for livestock pasture taps, which will lower billing slightly from that presented.

As shown in Chapter 3, the Dry Prairie population has declined markedly over the past several decades. In the event the decline continues at the rate projected in Chapter 3 or for some other reason participation in the Dry Prairie project is limited to about 10,500 persons (1,729,791 gallons per average day), monthly costs of water from the project would rise (Table 9-10). Community users (residential equivalents) would pay an estimated $46.87 per month or $6.55 per month more than with a larger population or participation base. Rural users would pay an estimated $44.54 or $7.00 per month more than with a larger population. These latter estimates were based on continuation of the same level of Dry Prairie debt service, irrespective of the number of connections in the Dry Prairie project, and some reduction in electrical and chemical costs throughout the project to reflect a lowering demand for water. Under these circumstances, the annual cost of debt service, operation, maintenance and replacement would decline from $2,191,000 to $2,069,000 annually.

9.5 Existing Water Costs, Sewer Costs and Water System Debt

Table 9-11 presents information furnished by the public water systems in the project respecting the level of debt for each water system and the portion of debt associated with treatment facilities and source water. Of the public water systems reporting, debt totaled $4,432,000, and debt for water treatment plants and water sources totaled $1,647,000. Public water systems will continue to invest in their distribution systems but would expect lower monthly water rates when existing water source and water treatment debt is retired. Debt payment for source and water treatment in Table 9-11 averages $5.53 per month for the 1,242 occupied households in those communities that have reported debt.

Current operation, maintenance and replacement (OMR) costs for water treatment are also presented in Table 9-11 and range from $3,000 annually (Outlook) to $302,000 annually (Glasgow). These are costs that would be replaced by OMR costs of a regional water treatment plant with intake on the Missouri River. Existing costs would be avoided, and new costs would be incurred. The average existing water bill of $32.72 would be reduced by an average $14.56 per month if the $550,718 annual cost were eliminated for the 3,152 households associated with the reported OMR cost for treatment and water source.

Removal of water treatment and source debt and OMR costs would reduce the average water bill of $32.72 to $12.64 per month for the distribution system.

The existing monthly costs for both water and sewer are presented in Table 9-11 based on slightly more than 11,000 gallons of monthly water use per household or equivalent. Household water use was based on an average 135 gallons per capita per day used for regional project and 2.69

persons per occupied household for the public water systems in "places". From the rate structures provided by the communities and an assumed 11,000 gallons, monthly water bills range from $17.00 (Westby) to $58.11 (Froid). Monthly sewer bills range from $5.76 per month (Wolf Point) to $20.09 per month (Glasgow).

The 1999 Montana Department of Commerce survey[5] of water system rates in Montana is also presented in Table 9-11 for those communities in the regional project that were part of the survey.

Most community water rates involve a fixed and variable component. The variable component depends on the gallons used per month. Exceptions are Nashua and Westby with flat rates per month irrespective of water use. Some of the community sewer rates also involve a fixed and variable component where the variable component is based on metered water use. More communities, however, charge a flat rate for sewer.

[5]Montana Department of Commerce, September 10, 1999, *Survey of Water and Sewer Rates in Montana* (with accompanying tables).

TABLE 9-11

WATER AND SEWER COSTS: WATER SYSTEM DEBT

Place/Rural	Census PWS Population	Census PWS Total Housing	Estimated Occupied Housing	1999 MT Survey Water Monthly Rate	Water System Debt	Treat System Debt	Annual Treat OMR	Monthly Water Bill	Monthly Sewer Bill
Place									
Bainville	166	109	79	$32.66					
Brockton	507	142	123						
Culbertson	784	363	309		$394,208	$356,708		$37.94	
Flaxville	0	0	0						
Frazer	422	139	114						
Froid	253	157	125	54.00	213,753	181,690	$57,000	58.11	$14.00
Glasgow	3,662	1,852	1,633	38.80	2,233,673	0	301,868	41.24	20.09
Medicine Lake	381	202	144		370,800	350,000	48,000	30.75	7.00
Nashua	379	226	171	21.25	68,445	0	52,833	21.25	11.50
Opheim	144	99	72						
Outlook	143	67	49		294,000	147,000	3,000	26.03	15.00
Plentywood	2,119	1,100	893		773,987	577,000	57,845	33.05	8.50
Poplar	2,114	904	814	20.08					
Scobey	1,160	632	488					32.07	–
Westby	265	132	107		17,417	0	14,582	17.00	10.00
Wolf Point	3,518	1,535	1,350					24.16	5.76
	16,017	7,659	6,472		$4,366,283	$1,612,398	$535,128		
Not Place									
Whitetail	112	61	46						
Peerless	17	10	6						
Oswego	--	--	--						
Fort Kipp	--	--	--						
Raymond	--	--	--						
Antelope	79	39	30		65,863	35,000	15,590	37.04	
St. Marie	--	1,223	22		0	0	0	34.04	
	208	1,333	105		$65,863	$35,000	$15,590		
Total	16,225	8,992	6,577		$4,432,146	$1,647,398	$550,718		
Average								$32.72	$11.48