WATER MANAGEMENT AND CONSERVATION PLAN FOR THE BEAVER DAM VILLAGE SPECIAL SERVICE DISTRICT

FINAL

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PREPARED FOR: Beaver Dam Village
Special Service District
Garfield County, Utah

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1.0 INTRODUCTION

The Beaver Dam Village Special Service District (BDVSSD) is located at approximately 8,600 feet above sea level on the eastern rim of the Great Basin area of the United States, near the head waters of the Sevier River. The District is located at the Western end of Garfield County, 17 miles southwest of Panguitch City, Utah; 13 miles East of Brian Head, Utah; (see Figure 1).

The Panguitch Lake area has become increasing more popular as a resort community for retired people. The area is seeing more people than ever before becoming year-round residents. As with other small growing communities, a question that is often faced is “where will the water come from?” In order to effectively answer this question, this water conservation plan establishes goals, identifies and evaluates alternative measures, and presents implementation strategies to help ensure the availability of water for future growth. This water conservation plan is written to address concerns of leaders and citizens of the BDVSSD and the State of Utah.

2.0 ANALYSIS OF EXISTING AND FUTURE CONDITIONS

2.1 Current Water System Use

The BDVSSD area could have an estimated seasonal population of approximately 527 with all of the lots within the area occupied. The total 216 lots could utilize approximately 54 acre-feet (at 0.25 acre-feet per lot) annually. This water will be produced from four wells, which will meet basic indoor needs.

The BDVSSD has the following breakdown of user groups: 520 seasonal residents 6 year-round residential, and 1 commercial.

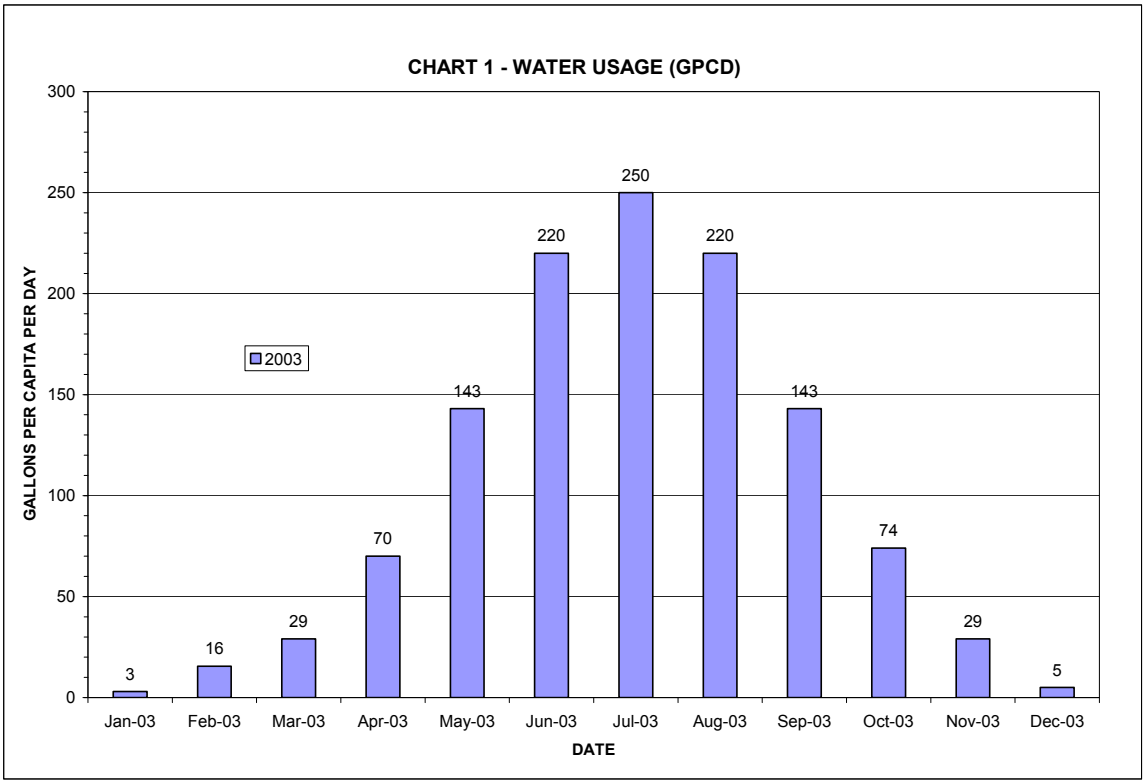
The following table shows the estimated water system inflows for 2003.

It should be noted here that the Unit “B” well was operated for the most part continually for the entire year.

Total monthly use was estimated at 3,040 gallons per month per person during winter months and 2.5 times that amount in summer months or 7,600 gallon per month per person.

TABLE 1 – 2003 WATER SYSTEM INFLOW (ESTIMATED)		
Month	**Quantity Pumped from Wells (gallons)**	**Total Average Monthly Use (gallons)**
January	1,620,000	19,426
February	1,620,000	100,413
March	1,620,000	187,781
April	1,620,000	453,264
May	1,620,000	925,954
June	1,620,000	1,424,544
July	1,620,000	1,618,800
August	1,620,000	1,424544
September	1,620,000	925,954
October	1,620,000	479,165
November	1,620,000	187,781
December	1,620,000	32,374
TOTAL	**19,440,000**	**7,780,000**

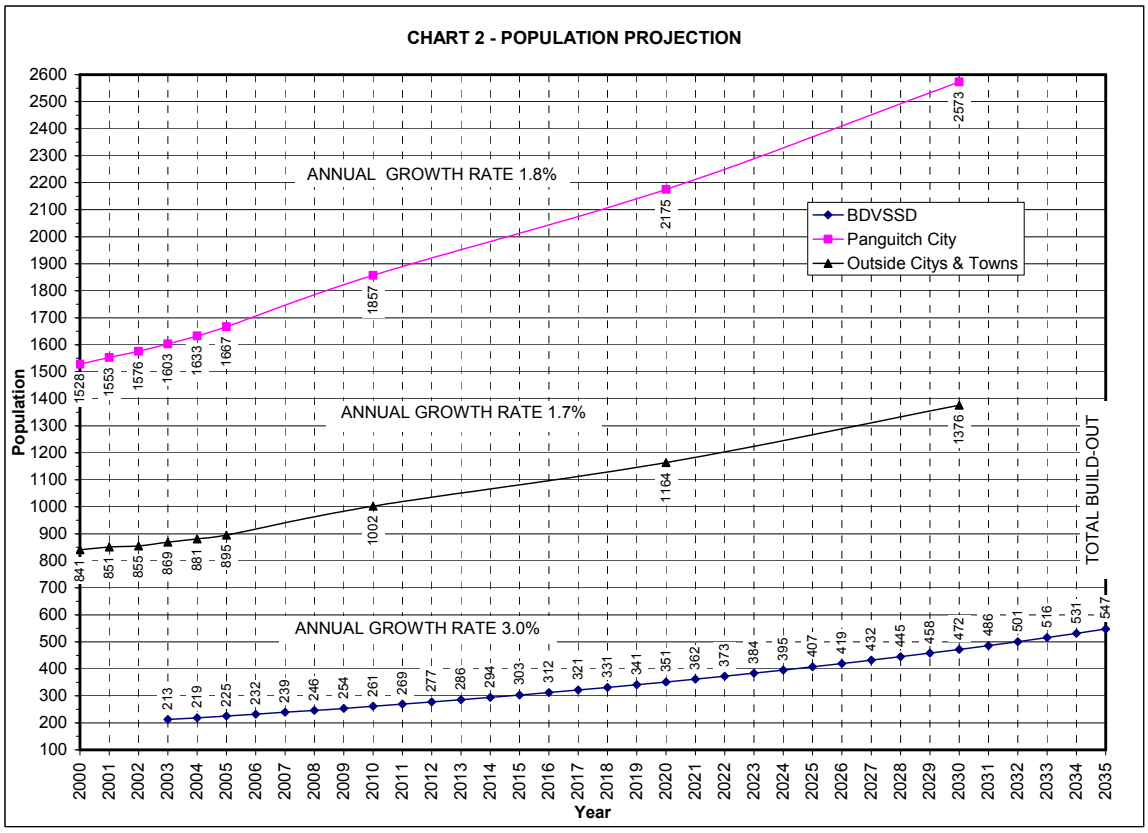
Actual monthly usage rates for billing purposes are not available because the BDVSSD has elected to use a fixed yearly fee for billing purposes. This fee in included in the $500.00 per year charged for each lot within the BDVSSD.



The daily average per capita use is estimated at 100 gallons, with a peak daily use of 250 gpcd.

2.2 Population Projection

With the estimated current seasonal population of the BDVSSD at 213 and with an estimated growth rate of approximately 3.0% per year, the estimated maximum seasonal population of 547 will be reached in the year 2035. This growth is expected to occur due to the increasing popularity of the Panguitch Lake Area for retiring people. The following graph shows the BDVSSD, Panguitch City and Garfield County's expected future growth rate over the next 31 years.



2.3 Fiscal Structure

Residential and commercial monthly water use rates are estimated at $25.00. With this rate schedule, a yearly income of $64,800 could be realized. Total revenue generated per year from all 216 lots within the BDVSSD is $108,000.

The BDVSSD charges a $500 Standby Fee and Connection Fees per service is $800.

The total estimated value of the water utility system, buildings and equipment is valued $2,500,000. The water system's total long-term debt is $550,000.

2.4 Inventory of Water Resources

Current supply sources for the BDVSSD include four well which produce approximately 138 gpm. All of these sources provide high quality water and presently do not show any signs of source depletion.

A potential supply source for the BDVSSD includes locating of additional wells within the boundaries of the BDVSSD. The existing wells are currently pumping at the maximum rate it can produce.

2.4.1 Analysis of Supply Sources

To determine the adequacy of existing and future supply sources, the State standards for water source capacity were compared to the actual source capacity available. The State regulations require sources be legally and physically able to meet water demands under two separate conditions. First, they shall meet the anticipated water demand on the day of highest water consumption, the peak day demand. Second, they shall be able to provide one year's supply of water, the average yearly demand. For indoor use, the State regulations require a culinary source be capable of delivering 800 gallons per day per connections to meet peak demands and 146,000 gallons per connection per year to meet the average yearly demand. Residential users are only to irrigate the natural vegetation within their properties. For outdoor use, it is assumed that residents will irrigate ¼ acre of natural vegetation per connection with the culinary water system. From Table 5-2, Map Zone 1, the BDVSSD water system should be capable of delivering 2.26 gpm per irrigated acre for peak day demand and 1.17 acre-feet per irrigated acre for average yearly demand.

All of the 216 connections of BDVSSD are assumed to be using the culinary water system for irrigation purposes.

TABLE 2 – PEAK DAY DEMAND	
Indoor Use Full Time (800 gpd/conn. X 7 conn. x 1 day/1440 min.)	3.89 gpm
Indoor Use Part Time (800 gpd/conn. X 78 conn. x 1 day/1440 min. x 30 days/365 days/year)	3.56 gpm
Outdoor Use Full Time (0.25 irr. Acres / conn. x 7 conn. x 2.26 gpm / acre)	3.96 gpm
Outdoor Use Part Time (0.25 irr. acres / conn. x 78 conn. x 2.26 gpm / acre x 30 days/365 days/year)	3.62 gpm
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Present Total	**15.03 gpm**
Indoor Use Full Time (800 gpd/conn. x 45 conn. x 1 day/1440 min.)	25.00 gpm
Indoor Use Part Time (800 gpd/conn. x 171 conn. x 1 day/1440 min. x 60 days/365days/year)	15.62 gpm
Outdoor Use Full Time (0.25 irr. acres / conn. x 45 conn. x 2.26 gpm / acre)	25.42 gpm
Outdoor Use Part Time (0.25 irr. Acres / conn. x 171 conn. x 2.26 gpm / acre x 60 days/365days/year)	15.88 gpm
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Future Total	**81.92 gpm**

TABLE 3 – AVERAGE YEARLY DEMAND	
Indoor Use Full Time (146,000 gal/conn. x 7 conn. x 1 acre-ft / 325,850 gal.)	3.14 AF
Indoor Use Part Time (146,000 gal/conn. x 78 conn. x 1 acre-ft / 325,850 gal. x 30 days/365 days/year)	2.87 AF
Outdoor Use Full Time (0.25 irr. acres / conn. x 7 conn. x 1.17 AF/ irr. acre)	2.05 AF
Outdoor Use Part Time (0.25 irr. acres / conn. x 78 conn. x 1.17 AF/ irr. Acre x 30 days/365 days/year)	1.87 AF

Present Total	**9.93 AF**
Indoor Use Full Time (146,000 gal/conn. x 45 conn. x 1 acre-ft / 325,850 gal.)	20.16 AF
Indoor Use Part Time (146,000 gal/conn. x 171 conn. x 1 acre-ft / 325,850 gal. x 60 days/365 days/year)	12.60 AF
Outdoor Use Full Time (0.25 irr. acres / conn. x 45 conn. x 1.17 AF/ irr. acre)	13.16 AF
Outdoor Use Part Time (0.25 irr. acres / conn. x 171 conn. x 1.17 AF/ irr. Acre x 60 days/365 days/year)	8.22 AF

Future Total	**54.14 AF**

Currently, the wells are capable of supplying water at 138 gpm cumulatively or 222.58 acre-feet. These water sources are adequate to meet present as well as future peak day demands.

2.4.2 Analysis of Storage Capacity

State Public Drinking Water Regulations have also established standards for evaluation of the adequacy of culinary water storage facilities. The three components of recommended storage capacity are indoor/culinary use, outdoor/irrigation use, and fire flow requirements.

The BDV CC & R's, Article VII. USE RESTRICTIONS, Paragraph 11. Restriction on Watering, states that "due to limitation on use of water, by virtue of limited water rights, water use is restricted to inside use only, watering of animals, and for the preservation of natural landscape (lawns may not be watered). Abuse of this rule may result in the imposition of a fine, or additional charge by the Board for improper use". In order to preserve the natural landscape, some outdoor watering should be calculated into the overall system.

The suggested standard for indoor use is 400 gallons of storage capacity per equivalent residential connection. The recommended capacity for irrigation purposes is 1,782 gallons per irrigated acre. A minimum fire flow of 1,000 gpm for 2 hours should be met by the storage facility.

Currently the BDVSSD has a total of 199,000 gallons of storage capacity in six steel water tanks. The larger of the tanks has a volume of 80,000 gallons and the smallest tank has a volume of 12,000 gallons.

Combining the before mentioned standards with the present and future number of equivalent connections, the following storage capacities were determined.

TABLE 4 – STORAGE CAPACITY	
Indoor Use Full Time (400 gallons/conn x 7 conn)	2,800 gallons
Indoor Use Part Time (400 gallons/conn x 78 conn x 30 days / 365 days/year)	2,564 gallons
Outdoor Use Full Time (0.25 irr. acres / conn x 7 conn. x 1,782 gallons / irr. acre)	3,118 gallons
Outdoor Use Part Time (0.25 irr. acres / conn x 78 conn. x 1,782 gallons / irr. acre x 30 days / 365 days/year)	2,856 gallons
Fire Flow (1,000 gpm x 2 hrs. x 60 min/hr.)	120,000 gallons

Present Total	**131,338 gallons**
Indoor Use Full Time (400 gallons/conn x 45 conn)	18,000 gallons
Indoor Use Part Time (400 gallons/conn x 171 conn x 60 days / 365 days/year)	11,244 gallons
Outdoor Use Full Time (0.25 irr. acres / conn x 45 conn. x 1,782 gallons / irr. acre)	20,047 gallons
Outdoor Use Part Time (0.25 irr. acres / conn x 171 conn. x 1,782 gallons / irr. acre x 60 days / 365 days/year)	12,523 gallons
Fire Flow (1,000 gpm x 2 hrs. x 60 min/hr.)	120,000 gallons

Future Total	**181,814 gallons**

With a present storage capacity of 199,000 gallons, the existing facility is sufficient for both present and future needs.

2.4.3 Water Rights

The BDVSSD currently has water rights for culinary purposes in four wells (1) BDV Unit “A” well, (2) BDV Unit “B” well, (3) BDV Unit “C” well and (4) Beaver Dam Estates Well. Water rights from these four well total 105 acre-feet per year. Since the average yearly demand is 9.93 acre-feet per year for present conditions and 54.14 acre-feet per year for future conditions, present water rights are sufficient. BDVSSD water rights are summarized in the following Table 5.

TABLE 5 - BEAVER DAM VILLAGE SPECIAL SERVICE DISTRICT
WATER RIGHT SUMMARY

NAME	WATER RIGHT #	QUANTITY	SOURCE	USE	LIMITATION	LOCATION
Beaver Dam Village Unit 'A' Association	a21322 (61-1871)	3.500 acre-feet	Well	Domestic Part Time 14 Families		S 2230' W 594' from NE Cor, Sec 32, T35S, R7W, SLBM
Beaver Dam Village Unit 'A' Association	a11889a (61-1718)	6.850 acre-feet	Well	Domestic 33 Families 05/15-11/01	0.207 acre-feet per connection	S 2230' W 594' from NE Cor, Sec 32, T35S, R7W, SLBM
Beaver Dam Village Unit 'A' Association	E1372 (61-1633)	4.800 acre-feet	Well	20 Summer Homes		S 1068' W 2665' from N4 Cor, Sec 33, T35S, R7W, SLBM
Beaver Dam Village Unit 'B' Association	a11118 (61-971)	16.970 acre-feet	Well	68 Families		S 933' W 1098' from NE Cor, Sec 32, T35S, R7W, SLBM
Beaver Dam Village Unit 'B'	a23515 (61-1965)	1.600 acre-feet	Well	6 Families 01/01-12/31		S 927' W 94' from NE Cor, Sec 32, T35S, R7W, SLBM
Beaver Dam Village Unit 'C' Association	a11889 (61-978)	7.650 acre-feet	Well	37 Families 05/15-11/01	0.207 acre-feet per connection	S 2230' W 594' from NE Cor, Sec 32, T35S, R7W, SLBM
Clear Creek Water Company	a11930a (61-1190)	0.625 acre-feet	Wells (2)	1 Family, 0.13 acres irrigation		(1) S 100' W 100' from NW Cor, Sec 33, T35S, R7W, SLBM
Clear Creek Water Company	a11930 (61-981)	63.000 acre-feet	Wells (2)	70 Families, 21 acres Irrigation 01/01-12/31	0.73 acre-feet per connection,	(1) S 520' W 1150' from NW Cor, Sec 33, T35S, R7W, SLBM
					3.0 acre-feet per acre irrigation	(2) S 2540' W 2540' from NW Cor, Sec 33, T35S, R7W, SLBM
TOTAL		104.995 acre-feet		249 Domestic	0.422 acre-feet per connection	
WATER RIGHTS NEEDED		92.000 acre-feet				
OVER		12.995 acre-feet				

2.5 System Deficiencies

In 2002, the Unit “A” water system was replaced in an attempt to make the entire BDVSSD water distribution capable of providing water for year round use. The new water lines were not installed deep enough and the water lines froze during the winter of 2003/2004. Also the 1 ½” water line from Well A to the storage facilities was dug up by the contractor making it impossible to use Well A in the system. Pumping directly into the 6-inch distribution line has temporarily solved this. The 1 ½” line will have to be replaced prior to the need for chlorinating Well A.

All of the water distribution systems in Units “A”, “B”, “C” and the Beaver Dam Estates will need to be connected together so that all of the units can utilize all of the wells and storage facilities. Funding has been obtained for this purpose and to construct a SCADA system to control all of the wells and maintain levels in all of the water tanks. This will also solve the problem of having to run Well B continuously.

A computer model of the BDVSSD water system was previously created to aid in the determination of how to connect all of the water systems together and how to operate the combined water system.

Other than the above minor deficiencies, the BDVSSD water system can regularly meet peak demands and fire flows.

2.6 Intersystem Agreements

There are currently no intersystem agreements or connections with other water systems since the BDVSSD is geographically isolated from any other water system.

2.7 Water Quality

The BDVSSD water system historically has not encountered any problems with the quality of the water from the wells. Their future water source, if needed, would also be expected to produce acceptable quality water since the new well would be pumping from the same aquifer as the existing wells.

To ensure the continued high water quality from the wells, the BDVSSD has in place an approved Source Protection Plan.

2.8 Treatment System

Water that is pumped from the wells is currently going directly into the storage facilities, without any treatment.

2.9 Reuse Potential

Reuse of treated sewage water for irrigation purposes, as part of the water conservation plan, is not feasible at this time because all homes are on individual septic systems.

2.10 Political Factors and Environmental Aspects

There are no political factors or environmental aspects that bear on water resource planning. The existing and future well sites are located on land owned by the BDVSSD and will not impair the feasibility of developing future water sources.

2.11 Financial Resources

Sources of funds for proposed water system improvements are being obtained from State of Utah Safe Drinking Water Board.

2.12 Ability to Implement Plan

In order to make a water conservation plan work effectively, consumers must be convinced that changes in their use habits are essential and are to their and the community's interest. Mailing information about the plan to customers or posting informational signs throughout the community can accomplish this. Since the BDVSSD has jurisdiction over the water system, they will be responsible for implementation and enforcement of the water conservation plan.

3.0 GOALS ESTABLISHED

An active water conservation program can help delay the need to construct new facilities and develop new sources. As with any water conservation plan, the ultimate goal for this plan is to reduce water usage so that sufficient water will be available for growth of the system.

The money available to implement a water conservation plan is limited due to the small income realized and the existing debts the BDVSSD currently has. To effectively implement a water conservation plan, conservation actions need to be low cost with high as possible benefits. The following goals have been set to reduce water usage for the BDVSSD.

1. **Establish a public information and education program.** Water conservation education is aimed at enhancing the awareness and understanding of water-related problems through direct mailings, posters, presentations and demonstrations, etc. It is based on the premise that it will influence people to voluntarily use water more efficiently.

2. **Distribute retrofit devices to all residential connections.** Retrofit devices are typically installed in bathroom fixtures such as the toilet, showerhead, and faucet to reduce water usage. Since most water used inside the home is used in the bathroom, retrofitting plumbing can considerably reduce water consumption. In order to achieve a high degree of compliance, retrofit requirements should be mandatory or devices be provided free of charge.

3. **Water Meters.** Meters provide the basis for determining the system's income and promote water conservation. When all usage and supply points in a water distribution system are metered, water losses throughout the system can easily be identified. It is important to identify water losses and make repairs as necessary so that water is not wasted. The BDVSSD system is currently un-metered due to the seasonal nature of the area. At some point in the future the BDVSSD could possibly begin a program of installing individual water meters.

4.0 ALTERNATIVE EFFICIENCY MEASURES IDENTIFIED AND EVALUATED

The following section provides implementation options to accomplish the goals stated previously. The associated benefits and costs are determined for each option to better understand which options produce the highest benefit and smallest cost.

4.1 Public Information and Education Program

When sending newsletters and notices of the July annual Home Owners Association meeting, include pamphlets that inform users about water conservation tips. Water conservation information can also be added to the homeowner's web site (www.beaverdamvillage.com). Information could also be posted on the new kiosk located at the Aspen Cove Resort. The AWWA Bookstore and other agencies have several different types of water conservation pamphlets available for purchase. The pamphlets should also be made available at the office of the BDVSSD water superintendent.

Benefit - AWWA estimates the water savings from public education at 4 gpcd[1]. Using the BDVSSD 2003 population, this would save 310,980 gallons annually. The direct benefit to saving 310,980 gallons (0.95 acre-feet) annually would be the savings resulting from reduced pumping costs. From past data, the pumping cost in 2003 was $65.25 per acre-feet, which calculates to savings per year of $62. Indirect savings would also be realized by the delay in construction of new facilities.

Cost – The pamphlets range from $0.35 to $0.60 per pamphlet. If three different pamphlets are purchased, with a pamphlet of each kind for each current connection, plus extras for the office, the cost of this option is approximately $350.

4.2 Distribute Retrofit Devices to all Residential Connections

Distribute water conservation kits that contain items such as low flow showerheads, toilet-tank bags, faucet aerators, and leak detection tablets for toilets. Conservation kits should be provided free of charge in order to achieve a high degree of participation.
Benefit - The water saving for a typical conservation kit is estimated at 16 gpcd[1]. At the BDVSSD current population and assuming that 70% of the users would install the devices, this would save 870,744 gallons (2.67 acre-feet) annually. The resulting savings would be from pumping costs, or approximately $175 annually, and from the ability to delay construction of new facilities.

Cost – A typical conservation kit costs about $10 per kit. If one kit is bought for every existing connection, the total cost would be $850.

4.3 Establish a Meter Testing, Calibration, and Replacement Program

a. Replace old meters.

Benefit - Over time, all meters become less accurate in recording actual flows. This leads to lost revenue to any water utility and inaccurate data to the citizens.

Cost - Assuming 70% of the meters need to be replaced, the cost would be $150 per meter @ 200 meters = $30,000.

b. Install meters at currently un-metered connections and maintain current meters at all supply sources.

Benefit - By installing meters at un-metered connections, the water losses throughout the system can easily be tracked.

[1] *Water Conservation*. AWWA, Denver, CO (1987).

This could potentially save the BDVSSD large quantities of water that would otherwise be lost due to leaks in the water distribution system.

Cost – Assuming meters are installed at all of the existing connections, the cost would be $400 per meter @ 85 meters = $34,000 which would be cost prohibitive at the current time.

It is difficult to determine actual monetary values for the benefits and costs of this option since it is unknown as to the extent that water loss is occurring. However, the benefits of closely monitoring water losses throughout the system include reduced pumping cost and forgoing development of new sources.

5.0 IMPLEMENTATION

This section will need to be completed after the BDVSSD decides the following:

- Identify which implementation options will be adopted as part of the conservation plan.
- Prepare an implementation schedule that determines dates that certain actions are to begin and when goals are to be achieved.
- Develop criteria for monitoring the effectiveness of implementation options.

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APPENDIX A

WATER USAGE

BDVSSD Water Conservation Plan

Water Usage

	Present - 2003	Future - 2035
Population	213	547
Number of Connections	85	216
Annual Water Use (Gallons)	7,235,200	18,580,537
Annual Average Per Capita Use (Gallons)	33,968	33,968
Average Day (GPD)	19,822	50,906
Daily Average per Capita Use (Gallons)	93	93
Average Month (Gallons)	602,933	1,548,378
July, 2003 - Peak Month	1,130,500	5,652,500
Peak Month per Capita Use (GCPD)	171	333
Average Day (Gallons)	19,822	50,906
Peak Day (2.5 x Avg. Day)	49,556	127,264
Peak Day per Connection	583	589

APPENDIX B

CERTIFICATE OF ADOPTION

CERTIFICATE OF ADOPTION

We, the Beaver Dam Village Special Service District, do hereby certify that the forgoing Water Management and Conservation Plan has been established and adopted by the board of directors on September 14, 2004

Randal D. Cagle	Manager S.S.D.	Sept. 14, 2004
Name – Randal D. Cagle	Title	Date