1.0 Introduction

Utah is situated in the arid western United States. Based on annual precipitation, Utah is second only to Nevada as the driest state in the nation, according to the Utah Division of Water Resources (DWR). On the other hand, DWR notes that Utahns are one of the highest per capita water users while being charged among the lowest rates. Therefore, Utah's critical task is to properly manage its water resources.

The Utah legislature revised a bill in 2004 requiring water agencies with more than 500 service connections, as well as all water conservancy Districts, to submit a water conservation plan to the Utah Division of Water Resources. The purpose of this Water Conservation and Management Plan (2011) is to provide a planning document for the District to guide its water conservation activities for the next five years.

2.0 Water System Profile

2.1 Current Status of the District

Since establishment in 1997, the Central Iron County Water Conservancy District (CICWCD) has been working towards development of a regional water system in the Cedar Valley area to serve private independent water systems and larger public water systems within the District.

As the Cedar Valley water users have grown beyond the boundaries of the incorporated cities, individual water systems have been established to service rural developments. As these water companies have grown older, drinking water quality has diminished along with the ability of these systems to comply with new water quality regulations.

To remediate the existing water quality problems and to become a water purveyor in Cedar Valley area, the District has planned for financed and constructed a water system that combines many of the existing small water companies into a single public water supplier. The District has incorporated approximately 15 existing subdivisions with water systems into a basin wide public water supply.

2.2 District's Goals

The District's goals and objectives are listed below:

- With the availability of diverse resources, develop and maintain a regional water system which distributes system costs across a larger population.

- Leverage financial and other resources to establish itself as a reputable and sustainable water purveyor in Iron County.

- Develop a centralized water infrastructure and technical resources with adequate quantity and quality water supply in Iron County.

- Provide an alternative for consolidation of existing independent water systems rather than costly rehabilitation for many of these infrastructures.

- Be the primary water provider to serve District residents and be considered a supplemental water provider to other municipalities (such as Enoch City and ultimately Cedar City and Kanarraville).

- Propose construction standards and specification for smaller systems within the District's boundary. Using the District's standards and specifications, these systems will be able to upgrade and maintain its systems.

- Allocate resources efficiently, enforce standards and promote water conservation.

2.3 Description of the District

The Central Iron County Water Conservancy District includes the central portion of Iron County in south central Utah with an approximate area of **1,380** square miles. Based on the Iron County Zoning Map, the total vacant land which remains available for development is approximately **1068** square miles or **81%** of the total land area. **Figure 1** depicts the current boundaries of the District while **Figure 2** delineates the Iron County Zoning Map. In **Figure 1**, the District is identified as **Water District**.

The District's northern and southern boundaries coincide with the northern and southern boundaries of the county. The western boundary of the District is the dividing line between Range 14 West and Range 15 West in the Salt Lake Base and Meridian coordinate system. The District's eastern boundary generally follows the section lines located in Range 9 West and Range 10 West from the southern county line to the northern county line. It passes immediately east of Cedar Breaks National Monument and immediately west of Summit in the process of excluding Parowan and Paragonah.

Figure 1. Central Iron County Water Conservancy District's Boundary
(IRON COUNTY WATER DISTRICT MAP)
(WATER DISTRICT 10)
(Obtained from: www.ironcounty.net , by clicking on "gis services")

Figure 2. Central Iron County Zoning Map
(Obtained from: www.ironcounty.net , by clicking on "gis services")

Cedar City, Enoch City and Kanarraville have their own water systems and are not current customers of the District. The potential for connection in a wholesale fashion to Enoch City and Cedar City exists and will continue to be available into the future. The District's current capacities would augment some of the needs of these public water supplies and would provide redundancy in the event of shortages.

The water management and conservation plan described in this report will include the residential subdivisions, and projected institutional, industrial, commercial and recreational developments.

2.4 Description of Service Areas

A brief description of the service areas (subdivisions and school district) is provided below.

Entity	Description
Fife Town	This is a water company on 2300 West that was replaced with a regional water supply from the District and is currently serviced by the regional water supply.
Angus Water Company	This is a water company at the north end of 2300 West that was transferred to the District and has subsequently been rebuilt to District standards and is supplied by the regional water supply from the District.
Big Meadows	This system is located on the north end of 2300 West and is part of the regional water supply from the District
Rancho Bonita	This is a subdivision on 2300 West just north of Mid Valley Road and is supplied water by the regional water supply from the District.
Monarch Meadows	This is a subdivision on 2300 West just south of Mid Valley Road and is supplied water by the regional water supply from the District.
(Three Peaks Elementary)	This is a school located on Mid Valley Road that is supplied water by the regional water supply from the District.
Mountain View	This is a water company at the north end of 2300 West that was transferred to the District and has subsequently been rebuilt to District standards and is supplied by the regional water supply from the District.
Eagle Valley	This is a water company north of Mid Valley Road that was transferred to the District and has subsequently been rebuilt to District standards and is supplied by the regional water supply from the District.
Deer Hollow	This is a subdivision just south of Mid Valley Road that is supplied water by the regional water supply from the District.
Sunrise Meadows	This is a subdivision on 2300 West just south of Mid Valley Road and is supplied water by the regional water supply from the District.
Mid Valley Estates	This is a public water company located just north of Mid Valley Road that is supplied a wholesale connection from the District's regional water supply.
Sky View	This is a water company north of Mid Valley Road that was transferred to the District and has subsequently been rebuilt to District standards and is supplied by the regional water supply from the District.

Park West	This is a water company located along 4500 West that was transferred to the District and has subsequently been rebuilt to District standards and is supplied by the regional water supply from the District.
West Slope Water Company	This is a subdivision just south of Iron Springs Road that is supplied water by the regional water supply from the District.
Northridge at Cross Hollows	This is a subdivision south of Highway 56 along Westview Drive that is supplied water by the regional water supply from the District.
Spring Creek	This is a public water company located just west of Westview Drive that is supplied a wholesale connection from the District's regional water supply.

The source development and infrastructure improvement projects help to provide adequate supply of culinary water to the aforementioned subdivisions and other entities in the future to meet the growing needs of the District.

2.5 Existing Water Systems in the District

Currently, there are about 45 residential subdivisions, cities, towns, or entities with approximately 4,415 Equivalent Residential Units (ERCs) (excluding Cedar City, Enoch City and Kanarraville) in the Cedar Valley area. These entities are under the jurisdiction of the District and are potential water customers of the District in the future. These connections consist of approximately 15 public companies (denoted as public in Table 1, see below) and 30 private companies. The existing systems in these subdivisions are fragmented and are not connected to each other. Some are dilapidated, malfunctioning and require rehabilitation or updating. **Table 1** provides a list of these subdivisions along with the number of ERCs in each.

2.6 Water System Identification

The 5-digit water system Identification Number assigned by the Utah Department of Environmental Quality (DEQ) for the District is **11085**.

Table 1. Entities in Central Iron County Water Conservancy District Jurisdiction.

Subdivision (type)	Equivalent Residential Connections (ERCs)/Water Connections
Buena Vista, (public)	135
Cedar City (public)	6247 water connections
Cedar Highlands (public)	40
Cross Hollows Estates (public)	115
Enoch City (public)	**1240**
Flying "L" Ranch (public)	17
Kanarraville (public)	**167**
Meadows Ranch Homeowners (public)	141
Mid Valley Estates/Old Meadows Ranchos (public)	208
Monte Vista (public)	47
Golden West	20
Hidden Valley Ranchos	32
Kanarra Kove	6
Kanarra Kove II	7
Little Eden	28
M&N Ranch	4
Midvalley Acres	60
Mt. Valley	46
Old Iron Town Units 1 & 2	193
Pinto Creek Ranchos	61
Rancho Circle	2
Rainbow Ranchos (public)	72
Spring Creek Water Users (public)	87
3200 Subdivision Phase	137
Cooley Stucki	11
CVA 1 & 2	1698
D&L Ranch	4
El Monte	47
Englestead Estates	40
Far West	28
Sheridan Hills	14
Sun Valley Estates Unit C	541
Sunset	58
SVE Unit B, F-H	48
The Remuda	9
Thorley Ranch	82
Trossach Lock	27

2.7 Organizational Structure and Personnel

At the present time, CICWCD consists of seven board members, a General Manager, a Office Administrator, and two Water Operators as listed below. In addition to the staff they share in one employee with USU extension service which is responsible for helping the District to implement water conservation measures. The board members provide voluntary services and meet once per month.

Name	Title	Contact
Brent Hunter	Chairman	**Address:** 88 E. Fiddlers Canyon Road Suite A Cedar City, Utah 84720 **Phone**: (435) 865-9901 **Fax**: (435) 865-9902 **E-mail**: rswilson@infowest.com
Rick Bonzo	Vice Chairman	
Leon Hyatt	Secretary-Treasurer	
Sheridan Hansen	Member	
Roy Urie	Member	
Dale Brinkerhoff	Member	
Laurence Ashdown	Member	
Scott Wilson	General Manager	
Kelly Crane	District Engineer	
LeIla Pehrson	Office Administrator	
Ray Ross	Water Operator	
George Mason	Water Operator	

Figure . Current System Map
(Central Iron County Water Conservancy District)

3.1 Population Projections and Water Connection Growth

3.1.1 Residential population projections: The population projection described herein is estimated based on the following procedures:

- The population projection of Iron County for 2005-2050; and total land areas (in acres) for Iron County and CICWCD were obtained from Utah Division of Water Resources. It was estimated that total land area of Iron County is 2.11 million acres and CICWCD occupies **42.6%** of the land areas (with approximately 0.9 million acres).

- Based on Utah Governor's Office of Planning and Budget, average number of persons per household in Utah is 3.46. Based on 3.46 persons per household, number of households in Iron County was estimated as **11,963** for 2005.

- The number of households in CICWCD was estimated as **5,091** in 2005 assuming the District includes **42.6%** of the Iron County households.

- Since CICWCD will not service all the entities (such as Cedar City, Kanarraville, and other entities) within its boundary, the number of water connections or households that the District will actually service was estimated as a portion (**see page Table 4 below**) of the total projected connections.

- Then CICWCD population was estimated based on 3.46 persons per household.

A summary of water connections and population projection for CICWCD is summarized below.

Table 4. Summary of Population Projections for 2010-2050 in Central Iron County Water Conservancy District.

Year	2010	2015	2020	2025	2030	2040	2050
Iron County population	48,772	58,190	64,865	71,540	78,851	93,127	103,920
Iron County households	14,084	16,804	18,732	20,659	22,770	26,893	30,010
Total CICWCD households	5,994	7,151	7,971	8,791	9,690	11,444	12,771
Portion of total households that will be served by CICWCD	**8.6%**	**25%**	**50%**	**50%**	**50%**	**50%**	**50%**
Residential service connection in CICWCD	515	1788	3986	4396	4845	5722	6385
Population in CICWCD	***5,189***	***12,381***	***13,802***	***15,222***	***16,777***	***19,815***	***22,111***

Information used for population projections

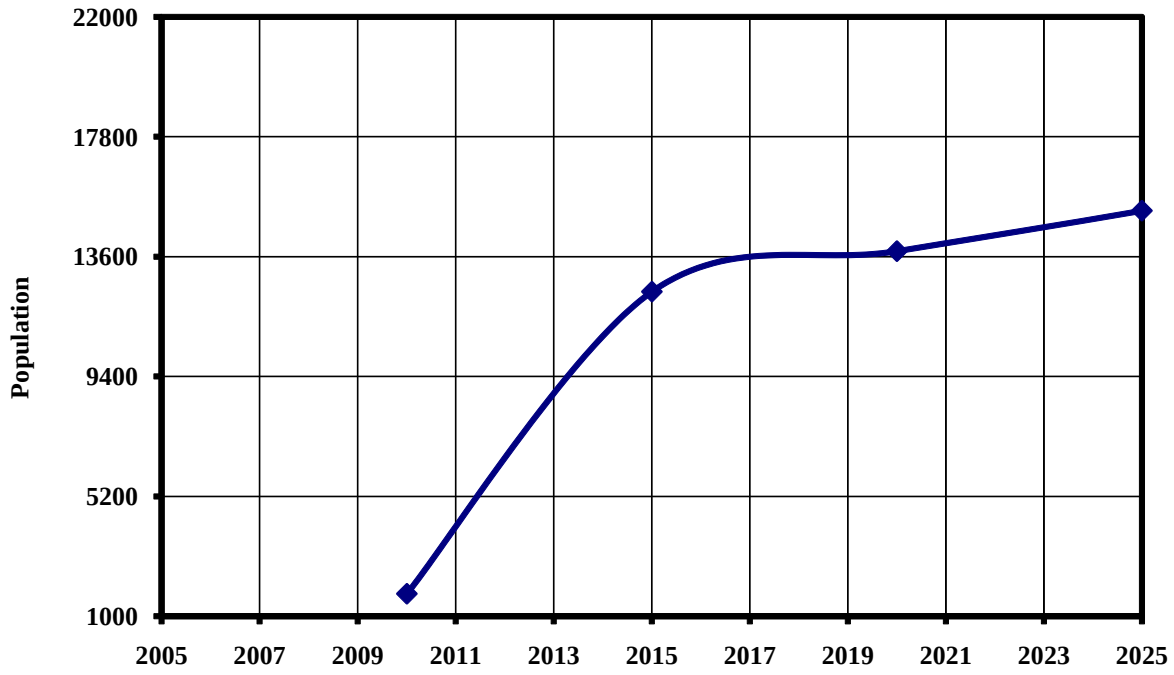
Total Iron County area = 2.11 million acres; Total CICWCD area = 0.90 million acres

CICWCD land area/Iron County land area = **42.6%;** Persons/household = **3.46** in Utah

Figure 4 shows the residential populations that are expected to be served by CICWCD over the next 20 years (2006-2025).

3.1.2 Non-residential population projections: Non-residential connections include institutional (such as Iron County School District), industrial, commercial, and recreational connections. Non-residential connections were assumed to be **4%** of residential connections, while industrial, and commercial connections were assumed to be **60%** and **40%** of non-residential connections (excluding institutional and recreational connections), respectively.

Figure 3. Population projection that is expected to be serviced by CICWCD for for 2005-2025.



The summary of residential and non-residential water connections in CICWCD is provided in Table 5 below. The detail of water connection projections is provided in **Appendix A.**

3.2 Forecasting Water Source and Storage Demand

Currently, the District is in the process of construction of Phase I of the project. For forecasting water source and storage demand estimates for current and future use, the framework of **UAC *R 309-510*** was used as described below. Additionally, in the absence of specific (such as acreage area for irrigation) information, several assumptions were also made for these estimates.

Table 5. Projections of Water Connections for Central Iron County Water Conservancy District.

Year	Residential connections (1)	Non-residential Connections (6)				Total connections (7)
		Institutional (2)	Industrial (3)	Commercial (4)	Recreational (5)	
2010	515	1	1	2	1	520
2015	1788	2	83	43	2	3720
2020	3986	2	93	48	2	4147
2025	4396	3	102	53	3	4574
2030	4845	4	111	58	4	5042
2040	5722	4	133	69	4	5954
2050	6385	4	148	77	4	6644

Assumptions and Explanations

(1) = Approximations subject to revisions;
(2) = Includes Iron County School.
(3) = 60% of non-residential connections (excluding institutional and recreational connections).
(4) = 40% of non-residential connections (excluding institutional and recreational connections).
(5) = Same as institutional connections.
(6) = 4% of residential connections.
(7) = Sum of residential and non-residential connections.

3.2.1 Water source demand: Based on **UAC *R 309-510***, water source must meet two separate source requirements for indoor and outdoor water demand. First, each system must maintain adequate sources to satisfy their respective peak-day demand. Secondly, a system is required to supply water at the average yearly demand rate.

The summary of water source demand projections is provided in **Table 6** below. **Figures 5-a and 5-b** show peak and average source demands for the District. The detail of water source demand estimates is provided in **Appendix A.**

Table 6. Summary of Water Source Demand for Central Iron County Water Conservancy District (2006-2050).

	Residential		Non-residential (a)		Total	
	Peak demand (1)	Average demand (2)	Peak demand (1)	Average demand (2)	Peak demand	Average demand
Year	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)	(MGD)
2010	2.66	1.04	0.32	0.11	2.98	1.15
2015	6.35	2.49	0.53	0.19	6.88	2.68
2020	7.08	2.78	0.58	0.20	7.66	2.98
2025	7.81	3.06	0.70	0.24	8.51	3.31
2030	8.61	3.37	0.83	0.29	9.43	3.66
2040	10.16	3.98	0.92	0.32	11.08	4.31
2050	11.34	4.45	0.99	0.35	12.33	4.79

Explanations and Assumptions

(1) = Peak demand includes peak indoor and peak outdoor demand; (2) = Average demand includes average indoor and average outdoor demand; (a) = Non-residential demand includes institutional, industrial, commercial and recreational connections.

Peak indoor demand:

- 800 gpd/connection for residential based on UAC R 309-510.
- **Assumptions**: 20 gpd/persons/connection with 250 persons for institutional; 35 gpd/persons/connection with 30 persons for industrial; 25 gpd/persons/connection with 30 persons for commercial; 5 gpd/persons/connection with 100 persons for recreational connections.

Peak outdoor demand:

- 3.39 gpm/irrigated acre/connection based on UAC R 309-510.
- **Assumptions:** 0.2 acres of irrigable area/lot for residential; 6 acres of irrigable area/lot for institutional, 0.4 acres of irrigable area/lot for industrial and commercial; 10 acres of irrigable area/lot for recreational connections.

Average indoor demand

- **Assumptions**: 50% of peak indoor demand (400 gpd/connection for residential; 10 gpd/persons/connection with 250 persons for institutional; 17.5 gpd/persons/connection with 30 persons for industrial; 12.5 gpd/persons/connection with 30 persons for commercial; 2.5 gpd/persons/connection with 100 persons for recreational connections.

Average outdoor demand

- 1.66 acre-feet/irrigable acre/connection based on UAC R 309-510.
- **Assumptions**: 0.2 acres of irrigable area/lot for residential; 6 acres of irrigable area/lot for institutional, 0.4 acres of irrigable area/lot for industrial and commercial; 10 acres of irrigable area/lot for recreational connections).

Peaking factor

- The ratio of total average demand and average peak demand. Peaking factor was estimated to be 2.6.

Figure 5-a. Projected Peak Water Source Demand (gallons per minute) for Central Iron County Water Conservancy District Service Areas.

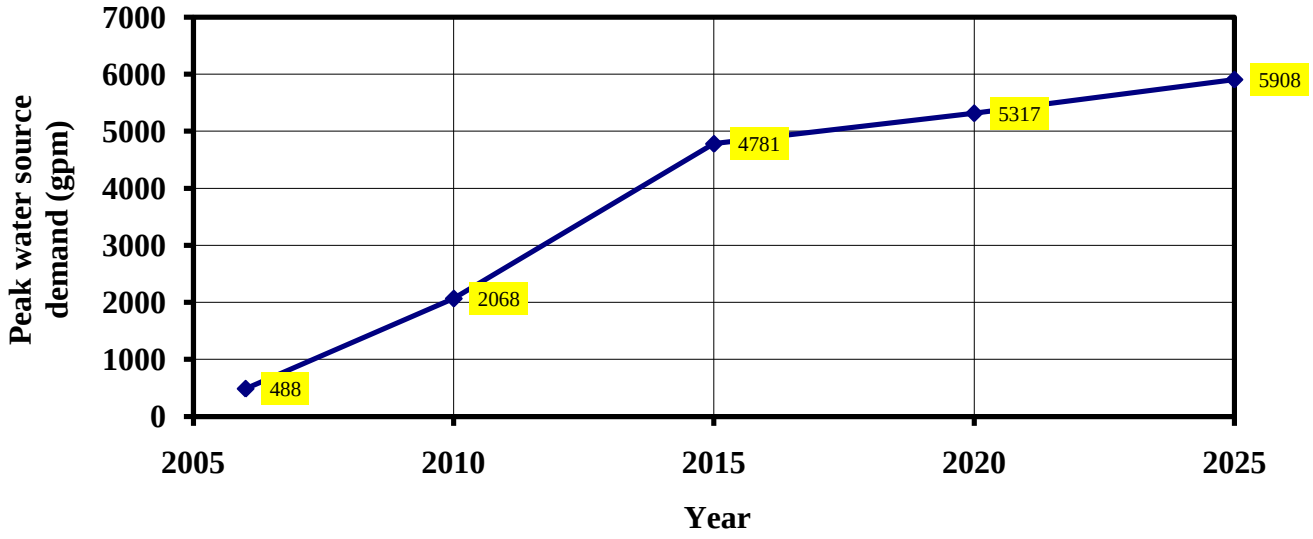


Figure 5-b. Projected Average Water Source Requirement (acre-feet/year) for Central Iron County Water Conservancy District Service Areas.

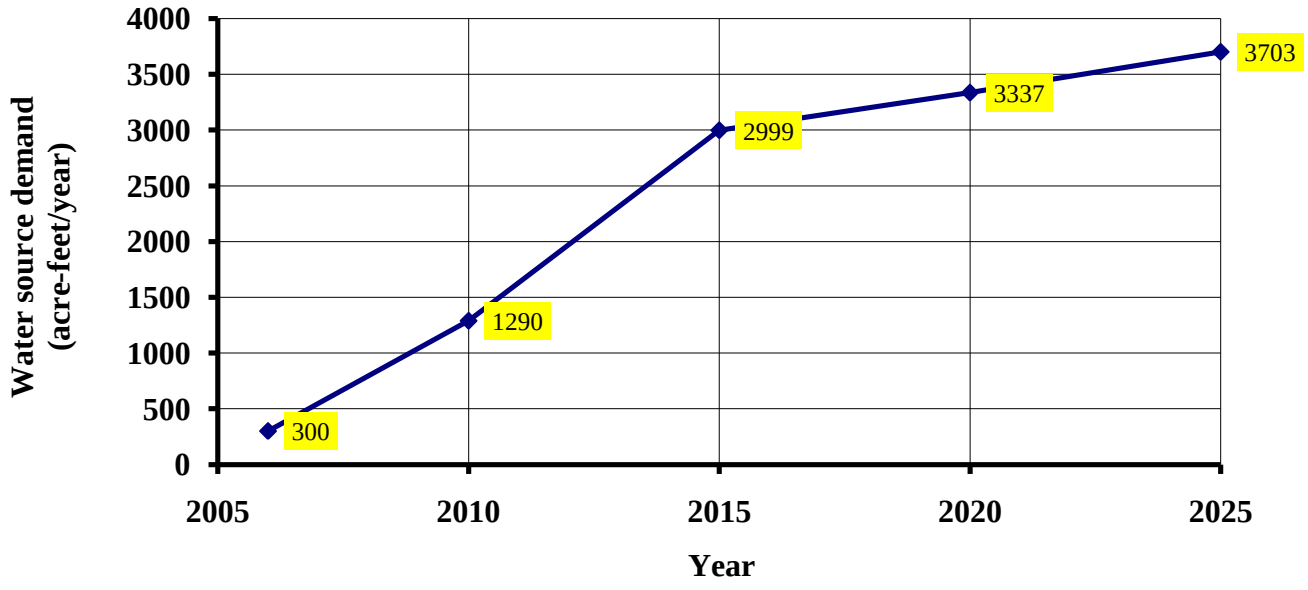


Figure 5-a indicates that the proposed water source (i.e., well system) must have capacity of 6,000 gallons per minute to meet peak demands in 2025.

3.2.2 Current water source: The following water sources are currently in use.

Table 7: Current Wells and Their Capacities in Central Iron County Water Conservancy District

Water source name	Capacity (gpm)	Construction phase
Derby Well No. 1	400	Existing well
Derby Well No. 2	250	Existing well
District Well No. 1	1000	Existing well
District Well No. 2	500	Existing well
Eagle Valley Ranches Well	250	Existing well
Northridge Well	400	Existing well
Chekshani Cliffs Well	250	Existing well
West Slope Well	200	Existing well
Total capacity	3,250	--

The above table indicates that total capacity of water source is approximately 3,250 gpm. Based on peak water source demand presented on Figure 5-a, the District will have adequate water source only until 2013. Based on projection of water source demand illustrated in Figure 5-a, more sources will be developed to meet future needs.

3.2.3 Other water resources: Cedar City, Enoch City and other urban areas in the District's boundary are growing rapidly. Based on population projections described earlier in this report (Table 4 and 6; Figure 6), the District will service over 15,000 people and the average demand for water will be approximately 3,683 acre-feet /year in the year 2025. Historically water supply has exceeded the natural replenishment of the groundwater, and water supply wells in Cedar Basin are mining or over-drafting water. This mining is the cause of land cracks or fissures and subsidence in the valley. The future impact of continuation of this over-drafting of groundwater is likely to adversely affect the heath, welfare and economy of District's service area.

3.2.4 Water supply from Lake Powell Pipeline Project: To avoid groundwater over drafting and meeting other water quantity and quality challenges, Washington County is proposing a pipeline to convey water from Lake Powell to Southwestern Utah. The cost of conveying and treating Lake Powell water is estimated to be less than that of reclaimed wastewater or large volume of water from any other sources. Lake Powell represents the last geographic location at which the State of Utah's allocation from the Colorado River Compact may be diverted, and the District wishes to assist in efficiently utilizing that allocation to the fullest extent possible.

Based on projections by Boyle Engineering and the State Engineer, in the year 2025 the population of Iron County will reach over 70,000 and the projected demand for water in the Cedar Valley aquifer will exceed 43,000 acre-feet per year. The District intends to participate in, and contribute financially and technically to the construction of the Lake Powell Pipeline Project in proportion to the water which may be allotted to the District. Based on United States Geological Survey (USGS) estimates of aquifer recharge requirement, the District is considering

acquiring at least **20,000** acre-feet/year water from the proposed Lake Powell Pipeline Project for future needs. In support of this Lake Powell Pipeline Project, the District already passed a Resolution.

3.2.5 Water supply from West Desert Pipeline Project: In the last year a filing for 26,000 AF of water from the Pine and Wah Wah Valleys has gone through the State protest hearings and all associated work to develop water rights in those areas. This is subject to State Engineer approval and could bring a significant amount of water into the Cedar Basin for stabilization of the aquifer.

3.3 Water Storage Demand Forecasting

Based on UAC *R 309-510*, a water storage facility shall meet the following storage demand: indoor, outdoor, fire suppression and emergency storage. The summary of water storage demand forecasting and pertinent requirements is provided in Table 8 below. Figure 6 shows water storage demand for the District. The detail of water storage demand estimates is provided in **Appendix B.**

Table 8. Summary of Water Storage Requirement for Central Iron County Water Conservancy District.

Year	Residential storage (MG)	Non-residential storage (MG)	Total storage (MG)
2010	1.8	1.19	3.01
2015	4.17	2.12	6.29
2020	4.63	2.30	6.94
2025	5.10	2.51	7.60
2030	5.60	2.73	8.33
2040	6.60	3.12	9.72
2050	7.35	3.42	10.77

Explanations and Assumptions

- Water storage is divided into indoor, outdoor, fire suppression and emergency storage.

Indoor storage demand

- 400 gpd/connection for residential based on UAC R 309-510.
- **Assumptions**: 10 gpd/persons/connection with 250 persons for institutional; 17.5 gpd/persons/connection with 30 persons for industrial; 12.5 gpd/persons/connection with 30 persons for commercial; 2.5 gpd/persons/connection with 100 persons for recreational connections. (Indoor water storage demand is estimated as 50% of indoor source demand.

Outdoor storage demand

- 2,528 gpm/irrigated acre/connection based on UAC R 309-510.
- **Assumptions**: 0.2 acres of irrigable area/lot for residential; 6 acres of irrigable area/lot for institutional, 0.4 acres of irrigable area/lot for industrial and commercial; 10 acres of irrigable area/lot for recreational.

Fire suppression demand

- 120,000 gallons (1,000 gpm for 2 hours) for all connections based on UAC R 309-510.

Emergency storage demand

- **Assumptions**: 25% of indoor plus outdoor consumption**.**

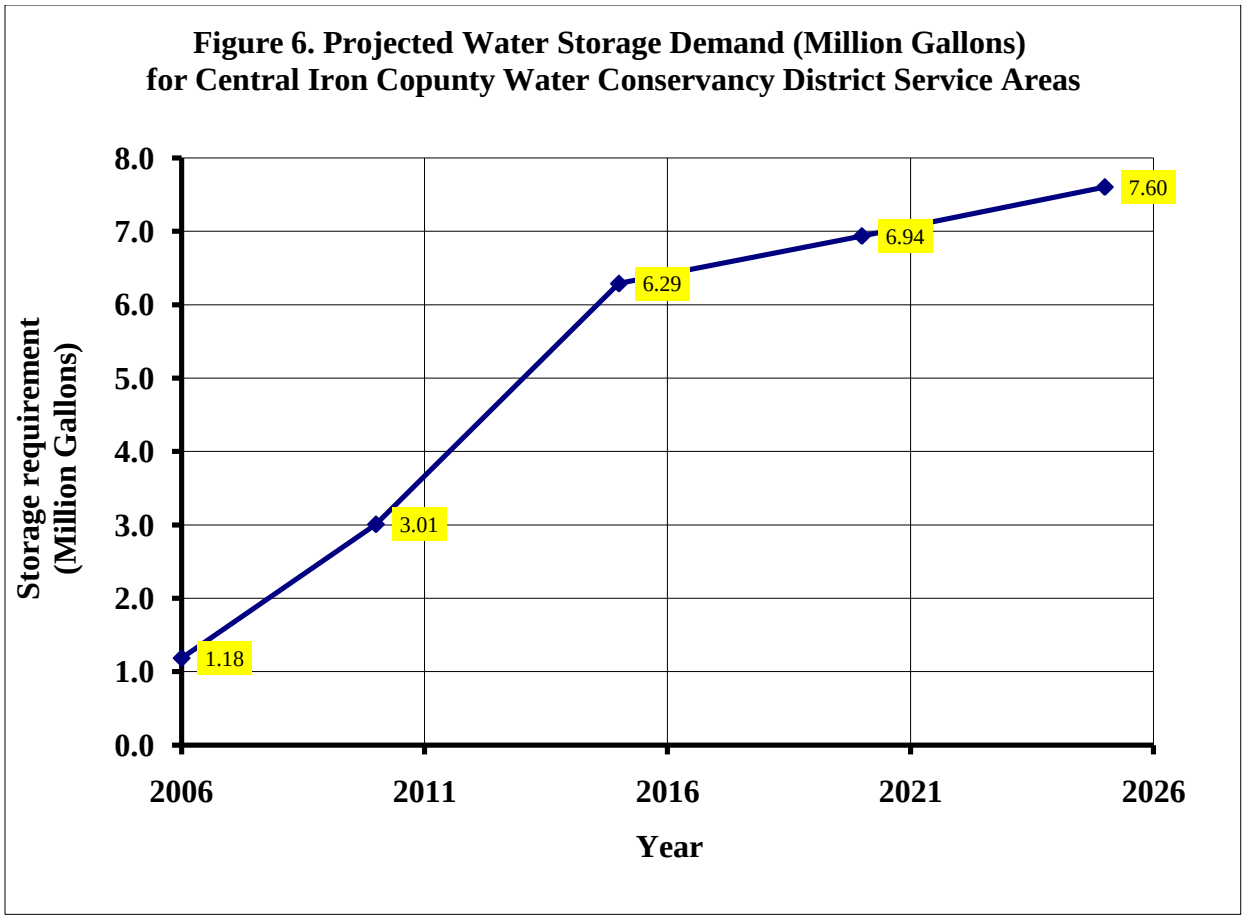


Figure 6 indicates that the proposed water storage system must have a minimum capacity of 7.6 million gallons to meet the demand in 2025.

3.3.1 Water storage facilities: The following water storage facilities are in use by the District.

Water storage facility name	Capacity (million gallons)
Three Peaks	1.0
Cross Hollows	.5
West Slope	.25
Chekshani Cliffs	.25
Total capacity	**2.0**

The above table indicates that total capacity of storage tanks is approximately 2 million gallons. Based on water storage demand presented on Figure 6, the District will need additional storage in order to have adequate water storage in 2025. More storage will continue to be developed to meet future needs after 2025.

3.5 Water Rights

3.5.1 Current status: The District has been in the process of acquiring water rights through purchasing wells and Inter-local agreement with several subdivisions as described in Table 2. The District anticipates acquisition of more rights to support this source development in the near future. A summary of the water rights that various subdivisions currently own and the water rights that are in the process of acquiring by the District is provided in Table 9. Table 9 also indicates that the District already obtained some water rights.

The acquisition of water rights in the Cedar Valley area is divided by State Highway 56 which runs east and west through the valley. This groundwater division is believed to coincide with a groundwater divide. This division separates the allocated water rights for the north and south ends of the valley. Since transfer of water rights typically does not occur across the dividing line and the District spans the length of the valley, this division presents a challenge for the District. Therefore, the District will need to have sources placed at each end of the valley for which adequate water rights will have to be acquired. The acquisition of these water rights will allow the growth of the District in all areas of the Cedar Valley.

3.5.2 Lake Powell Pipeline Project: Investigation of water rights in southern Utah brings into consideration of the Lake Powell Pipeline Project, which is proposed to bring water from Lake Powell to the St. George area and to the Cedar Valley through a pipeline. Water rights associated with Lake Powell Project come from the Colorado River Basin. As described earlier, the District is seeking to acquire approximately 20,000 acre-feet/year of this water for future needs.

Table 9. History and Current Status of Water Rights for Proposed Source Development and Infrastructure Improvement Program in Central Iron County Water Conservancy District (subject to revision).

Water Right Number	Current owner	Source	Flow	Status	Use	Comment
A34654	CICWCD	Wells	1127.118 AF	Approved	Municipal	Main application for the District all other rights are in the process of being changed to municipal rights

3.6 Water Quality

The water quality in the Cedar Valley basin is generally considered to be good. Ground water is generally classified as either a calcium-bicarbonate type or a magnesium-sulfate type, and is suitable for most uses. The principal ground-water contaminant identified in the Cedar Valley basin-fill aquifer is nitrate. Concentrations of nitrate in water wells in 1979 ranged from less than 0.06 mg/L to 57.4 mg/L (0.06 - 57.4 parts per million). Nitrate concentrations in water from 19 of these wells exceeded 10 mg/L, the current Utah ground water quality maximum standards. These high-nitrate wells are distributed throughout Cedar Valley, rather than concentrated in a single area of high-nitrate concentration. High-nitrate wells are more common near the Hurricane fault on the east side of the valley (Eisinger, 1998).

3.7 Water Pricing

There are three common pricing methods used in most communities today. These are (i) level rates for all users, (ii) declining block rates as water use increases, and (iii) increasing block rates as water use increases. Neither of the first two methods provides an incentive to conserve water, primarily because there is no financial savings to most of the users. To encourage water conservation, it is recommended that water purveyors establish base rates to cover fixed costs and set increasing block rates for use above the minimum.

The District has adopted a water service rate through resolution on July 2005. Based on this resolution, the District will charge a minimum monthly fee of **$25.00** per month (regardless of water usage) and a rate depending on water usage to its customers. The water service fee is presented in Table 10. The increasing rate will provide incentives for water conservation.

Table 10. Water user Rates for Customers in Central Iron County Water Conservancy District.

Residential/Recreational	Cost	Includes
Level #0 - Minimum Monthly Fee	$25.00	No Water, Minimum Monthly Fee
Level #1 - Plus $0.60 per 1,000 gallons	$0.60	0-12,000 gallons per month
Level #2 - Plus $0.75 per 1,000 gallons	$0.75	12,001-20,000 gallons per month
Level #3 - Plus $1.00 per 1,000 gallons	$1.00	20,001-30,000 gallons per month
Level #4 - Plus $1.50 per 1,000 gallons	$1.50	30,001 and above gallons per month

These rates may be adjusted periodically as the Districts needs arise.

5.0 Water Conservation Update

5.1 General Benefits of Water Conservation

Quantifiable benefits to the District by reducing water demand include the following:

5.1.1 Cost reduction: Reduction of operation and maintenance (O & M) expenses results from lower pumping energy.

5.1.2 Downsizing of capital facilities: Lowering the rate of increase of demand can postpone facility construction and, in cases where growth is slowing, avoid the next water supply or treatment increment.

5.1.3 Reduced wastewater flow: Reduced indoor water use translates into reduced wastewater flow which reduces O & M costs of existing facilities.

It is important to mention here that conservation can suppress water sales, lowering water revenues. If reduction occurs slowly (i.e., less than 1% per year), then the revenue loss impacts can be mitigated by periodic rate adjustments. These adjustments would be handled similarly to operating cost increase due to inflation and can be integrated into financial planning.

5.2 Water Conservation Goals

The State of Utah has developed a goal to reduce the 1995 per capita water demand from public community systems by at least 25% before 2050. To concur with the State water conservation goals, the District adopted the following conservation goals.

5.2.1 Goal 1: Reduce the District's per capita water use rate by 25% by 2025

5.2.2 Goal 2: Maintain a financially viable water system: To encourage customers to reduce water use without creating a revenue shortfall, the District will develop plans to initiate conservation-oriented rate structure.

5.2.3 Goal 3. Maintain or improve the appearance of landscapes, open spaces and yards: Improved irrigation practices and water efficient landscaping can enhance the beauty of the entities in the District. The annual surveys of citizen attitudes will measure satisfaction, or lack thereof, for landscapes on city-owned properties and rights-of-way.

5.2.4 Goal 4. Consolidate management: The consolidation of existing water companies' management into the District will provide opportunity to strengthen water conservation program.

5.3 Water Conservation Efforts for 2000-2010

During past five years, the District has conducted various activities to promote water conservation. Included in these are: (i) a video demonstration to promote awareness and the proper mindset for water conservation, (ii) a pamphlet distribution to schools to encourage

wise water usage and (iii) the establishment of water related facility design and construction standards. Since the first water conservation and management plan in 1999, the District has made the following conservation efforts:

- **Public education**: The District initiated public education program as part of its water conservation campaign. As part of this campaign, the District has given presentations on water conservation at a Water Fair held in Cross Hollows Middle School. The school has adopted topics on water conservation as part of its curriculum. Additionally, a video tape titled "Its Easy to Save Water" was shown to encourage water conservation.

- **Water wise landscaping**: The District has initiated a public education program pertaining water wise landscaping. This involves a part time employee in conjunction with USU Extension services that is working towards building a water wise demonstration garden as well as performing water audits for existing homeowners within the District

- **Water Incentive Water Right requirement:** The District has developed and adopted a water conservation type water acquisition ordinance that encourages water wise landscaping to be included in CC&R's and enforced by home owners associations. This ordinance allows developers to bring less water if the landscaping around future homes will be minimized by covenant and recorded with the plat.

- **Conservation oriented zoning ordinances**: The District has discussed a revised zoning ordinance with Iron County Planning Commission, which encourages water conservation.

5.4 Water Conservation Efforts in Other Entities in the Vicinity of the District

5.4.1 Cedar City: As water conservation measures, the city enforces a 10 a.m. to 6 p.m. watering restriction (outside irrigation with culinary water) during the summer and has a tiered rate structure for billing. The city is considering a more aggressive rate structure to better encourage conservation, as the current rate structure provides only a marginal incentive to conserve. Education of customers has also been used to encourage water conservation. Water bill inserts and reminders in the City's monthly newsletters have also been used to transmit information to customers.

5.4.2 Enoch City: For water conservation, Cedar City's goal is to reduce per capita water use by at least 15% in five years (2004-2009). As water conservation goal, Enoch City has introduced a new water pricing structure, watering restriction schedule, secondary water source and installed demonstration garden for efficient water use.

Enoch City estimated that the 2004 water consumption was near 60 million gallons, or a 20% reduction since 2002. The reductions are likely due to a combination of drought response and the new pricing structure. The city also has a time of day watering restriction.

Enoch City has approved a secondary system that will service 100 homes in a new subdivision. Another subdivision of 50 homes will soon follow and will use the same secondary water.

Additionally, Enoch City installed a demonstration garden in 2002 with the assistance from Utah State University extension agents. This 1.5-acre landscape features 8 different low-water use hybrid turf grasses (3 for hot season and 5 for cool season) distributed in 24 garden spots. The city has ordered over 500 pounds of "Discovery" hard fescue grass along with various smaller amounts of other grasses for local citizens' landscapes. These grasses need about half the water that Kentucky Blue grass requires.

Enoch City also initiated water education program. As part of this program, information on efficient water use is sent to residents by newsletter, radio and television from city, county and state agencies.

5.4.3 Paragonah: Paragonah City has a summertime watering restriction that limits landscape watering to the hours between 6 pm and 10 am.

5.4.4 Parowan: The city's water conservation ordinance restricts summer irrigation to between 6 pm and 10 am. During the 2004 summer, irrigators were also restricted to irrigating on two days per week. Because of the growth and limited system capacity, irrigation restrictions will likely remain permanent.

5.4.5 Kanarraville: Based on Division of Water Resources, Kanarraville is not required to submit water conservation plan since it has less than 500 water connections.

6.0 Recommended Water Conservation Measures for the Future

Water conservation measures are known as "Best Management Practices (BMPs)" (primarily in the state of California), "Reasonable Conservation Measures (RCMs)" (primarily in the state of Arizona) and, "Recommended Measures" (primarily in the state of Washington). Regardless of the nomenclature, the intent of the measures is the same: states encourage utilities to use these measures as the cornerstone of their water conservation program.

6.1 Public Information Program

Public information addresses specific measures and establishes or enhances a water conservation ethic among District's customers**.** Programs will include one or more of the following program:

- Poster contests.
- T-shirt design contests.
- Presentations and tours with hands-on demonstrations.

- Advertisement on the radio or television.
- Printed educational material such as bill inserts (providing information on the customer's bills showing water usage in gallons per day for the last billing period compared to the same period the year before), and
- Coordinating with other government agencies, industry groups, public interest groups, and the media.

The following steps could be used to design new public information program:

- Develop a clean and persuasive statement of purpose.
- Choose an appropriate theme.
- Identify key target group.
- Select members for a water conservation committee.
- Identify communication paths, resource materials, and volunteers.
- Design and implement specific campaigns.
- Ensure effective coordination and follow-through.

The aforementioned information program will target all customers within the District's service area. Once the purpose of the public information program is prepared, a water conservation theme will be decided upon. Examples of possible themes include the following:

- Save Water.
- Use Water Wisely.
- Save Water, Save Money, Save Energy.
- Save Water, It's Your Future.
- Save Water Today for Tomorrow.
- Water is Life, Don't Waste It.

A program logo reflecting the aforementioned theme (or state's existing logo) then can be selected. The image could be realistic, stylized, or a friendly caricature with a suitable name. This theme can be retained or modified as needed in the future.

6.2 Public/Consumer Education Program

One of the best ways to implement long-term water conservation is through public education. Through education, people become more aware of the hydrologic cycle, including the limitations nature places on water availability, and by providing practical ways for more efficient use. This can result in public realization of the value of water, reasons to conserve water and the benefits of implementing long term water conservation efforts. Consequently,

significant water use reductions can be achieved and more public support for the conservation program can be obtained.

The District will develop plans for a consumer education program focusing on the need for water conservation, community water problems, and alternative which are feasible. The potential for water conservation programs will be discussed, including the rationale behind proposed actions and monetary benefits to the customers.

The free distribution of water conservation kits consisting of a shower flow restrictor, a faucet aerator, and a faucet flow restrictor will assist in reducing indoor domestic water use.

A water conservation program will be initiated in public utilities (such as schools, hospitals, prisons and municipal buildings) including a leak detection program, full metering and refitting of public facilities with water saving devices, and seminars for public employees.

Public education programs on water conservation prove to be the best way of bringing about substantial water savings. Long term, on-going programs will promote a conservation ethic, making people more receptive to the idea of reducing water use to conserve limited water resources.

6.3 School Education Program

Long term results to eliminate wasteful water-use habits are best achieved by educating young people. As water users, school children can exert a great impact on their family's water conservation. Teaching children to respect the value of water will help them grow into responsible adults with conservation ethic. As part of school educational program, teaching material must meet state education frameworks and grade; appropriate materials should be distributed to grade levels K-3, 4-6, 7-8, and high school.

New school programs could be organized as follows:

- Obtain approval for the new water education programs from the superintendent of schools.
- Organize water utility efforts to obtain relevant materials.
- Estimate the number of participants, including teachers, in the water education program.
- Organize distribution of curriculum materials to teachers.
- Monitor and follow the success of the program making adjustments as necessary to maximize student contact.

A school education coordinator could serve to administer and follow-through with the program.

Water conservation programs in the classrooms may be facilitated by the following media sources geared specifically toward children:

- **"Story of Drinking Water"**: This is a picture presentation designed to acquaint the elementary or mid school student with the history, accomplishments, and workings of public water supply systems. (source: www.conservewater.utah.gov /agency/resources/communitywater.pdf, accessed on September 13, 2005)

- **"Water Conservation: It's Up to You!"** Cartoon color slide show (13 minutes). This features Beauregard Beaver with water saving tips for children. Recommended for grades 1 through 4. These programs are available from American Water Works Association (6666 W. Quincy Avenue, Denver. Colorado 80235). (source: www.conservewater.utah.gov /agency/resources/communitywater.pdf, accessed on September 13, 2005)

- **"Instructor's Guide to Water Education Activities.**" This is a public school education program. Pennsylvania Water Conservation Technical Assistance Section. Department of Environmental Resources, P.O. Box 1467, Room 212, Harrisburg, PA 17120. 1982. (source: www.conservewater.utah.gov /agency/resources /communitywater.pdf, accessed on September 13, 2005)

- **"How to do an In-School Education Program".** California Office of Water Conservation, Office of Water Conservation, 1416 Ninth St., P.O. Box 942836, Sacramento, CA 94236-0001 (source: www.conservewater.utah.gov/agency /resources/communitywater.pdf, accessed on September 13, 2005)

6.4 Usage of Secondary Water Systems

The usage of secondary water systems can reduce the demand on high quality culinary water. The District will consider delivering low quality water for certain uses, particularly for landscape irrigation. A large portion of municipal supplies are typically used for landscape irrigation where there is no need for this water meeting culinary standards. The District is in the process and currently undertaking studies to determine the feasibility of constructing secondary water systems.

Based on information obtained from Utah Division of Water Resources internet website (http://www.water.utah.gov/droughtconditions/BasinDroughtReports /CedarBeaver/default.asp, accessed on September 28, 2005), the following entities in the vicinity of the District are utilizing secondary water system.

6.4.1 Cedar City: Cedar City is currently considering providing water with high nitrate in a secondary system. This would keep the poorer quality water from migrating into areas of the aquifer from where drinking water is drawn. The high nitrate water is suitable for sprinkler irrigation and could be used on large landscapes.

6.4.2 Enoch City: Recently, Enoch City's water board has approved the first secondary system that will service 100 homes in a new subdivision with water pumped from the high nitrate farm wells to the west of the city center. Enoch City is currently servicing much of their city with secondary water and have included a study of how to implement a secondary water system in their last water master plan.

6.4.3 Paragonah: The Red Creek Reservoir supplies the secondary water and some agricultural water to this city.

6.5 Reclaim Treated Wastewater

For water conservation, treated wastewater can be reclaimed for beneficial purposes such as agricultural and landscape irrigation, industrial processes, toilet flushing, and replenishing a ground water basin (referred to as ground water recharge). Preliminary studies have shown that this is a high cost alternative and it falls into one that will need to be implemented prior to Lake Powell Water being utilized.

6.6 Identify High Water Users

The high water users in the commercial and industrial sectors such as office buildings, hotels, motels, gas stations, restaurants, and individual industrial plants should be identified. The high water users should be approached with specific water conservation plans for their facilities.

6.7 Refitting Program with Water Saving Devices

A refitting program using water saving devices such as toilet displacement bottles, flow control-aerators and shower flow control should be planned. A pilot test program should be started before a large-scale program is begun.

6.8 Water Survey Programs for Single and Multifamily Residential Customers

The District could offer an indoor and outdoor water survey of single and multifamily residential customers. Specific activities for each indoor and outdoor survey should include the following:

6.8.1 Indoor activities

- Check for leaks including toilets, faucets, and meter check.
- Check flow rates for showerheads and faucets, and offer to replace or recommend replacement with low flow models as appropriate.
- Check toilet flow rates and offer to install or recommend installation of displacement devices or direct customer to Ultra Low Flush Toilet (ULTF) replacement program, as appropriate; replace leaking toilet flapper, as necessary.

6.8.2 Outdoor activities

- Check irrigation system and timer
- Review or develop customer irrigation schedule in minutes of watering time per week for spring, summer, and fall.
- Provide a rain shut-off device (optional)
- Measure currently landscaped area (optional).
- Measure total irrigation area (optional).

6.9 Conservation-Oriented Billing Rate Structures

The District currently has a minimum rate of **$25.00** regardless of usage and a increasing rates ranging from **$0.60** to **$1.50** per 1,000 gallons per month (for the entire year) for various base volumes as listed in Table 9. According to Table 10, as more water is consumed, rate increases which will provide incentive for water conservation.

Since the rate does not change with seasons, the District charges the same amount for the first gallon of a winter month as the last gallon of a summer month. In the most typical scenario, the users would be willing to pay more for summer water demanded than for winter water. Based on this principle the District should promote and implement two different conservation oriented rate structures for winter and summer usage.

6.10 Landscaping Schemes with Low Water Consumption Rates

Since landscaping creates challenging demands on current water supplies, the District chould promote water conservation through landscape planning by education and through the use of xeriscaping. Xeriscaping has the greatest potential for water saving, especially where new construction is involved. Public education is critical to the success of any conservation plan.

6. 11 High Efficiency Washing Machine Rebate

The District could start this rebate program to encourage residents using a more conservation oriented washing machine than their existing one. Front loading washing machines typically use half as much water as a top loading washing machine. The District could sets goals, objectives, and a timetable for implementation of the program.

6.12 Linking With Internet Site

Once the proposed water system is constructed, the District will launch an Internet website for posting water conservation related information. The following Internet will be linked to the District's website so that District residents could visit these sites and learn about different strategies for water conservation.

1. (http://www.conservewater.utah.gov, www.water.utah.gov): Utah Division of Water Resources site.
2. (http://www.wasatch.com/~urc/conservation.html): Utah River Council site. The site includes information on strategy to reduce water use, Xeriscaping, other water conservation links and books on water conservation.
3. (www.watereducation.utah.gov/conservation/default.asp): Sits for Water Conservation for Kids
4. (http://www.awra.org): The American Public Works Association" an excellent source of water related information and literature.
5. (http://www.waterlink.co.uk): Site for scrutinizing every detail of water consumption, and water auditing.
6. (http://www.IRWD.org); Site for Irvine Ranch Water District that presents an excellent article on water conservation.

6.13 The Water Conservation Checklist

The following checklist or "water conservation tips" could be posted to District's internet web site to educate its residents about water conservation.

- **Check your toilet for leaks:** A leak in your toilet may be wasting more than 100 gallons of water a day. To check, put a little food coloring in your toilet tank. If, without flushing, the coloring begins to appear in the bowl, you have a leak. Adjust or replace the flush valve or call a plumber.

- **Stop using your toilet as an ashtray or wastebasket**: Every time you flush a cigarette butt, facial tissue or other small bit of trash down the toilet, you waste five to seven gallons of water.

- **Put two plastic bottles in your toilet tank**: Your toilet can flush just as efficiently with less water than it now uses. To cut down water waste, put an inch or two of sand or pebbles in each of two plastic quart bottles to weigh them down. Fill them with water, replace the lid and put them in your toilet tank, safely away from the operating mechanisms. Better yet, replace your old toilet with a new low-flow toilet. They are readily available in a variety of styles and colors.

- **Take shorter showers:** Long hot showers waste five to ten gallons of water every unneeded minute. Limit your showers to the time it takes to soap up, wash down and rinse off.

- **Install water-saving shower heads or flow restrictors**: Most shower heads put out five to ten gallons of water a minute, while three gallons is actually enough for a refreshing cleansing shower. Your local hardware or plumbing supply store stocks inexpensive water-saving shower heads that you can install yourself. For even less money, you can purchase a small plastic insert that will limit flow through your present shower head.

- **Turn off the water after you wet your toothbrush**: After you have wet your toothbrush and filled a glass for rinsing your mouth, there is no need to keep water pouring down the drain.

- **Rinse your razor in the sink: Before shaving, partially fill your sink with a few inches of warm water.** This will rinse your blade just as efficiently as running water, and far less wastefully.

- **Check faucets and pipes for leaks:** Even the smallest drip from a worn washer can waste 50 or more gallons of water a day. Larger leaks can waste hundreds.

- **Use your automatic dishwasher only for full loads:** Every time you run your dishwasher, you use about 25 gallons of water.

- **If you wash dishes by hand, don't leave the water running for rinsing**: If you have two sinks, fill one with soapy water and one with rinse water. If you have but one sink, gather all the washed dishes in the dish rack and rinse them with an inexpensive spray device.

- **Don't let the faucet run while you clean vegetables.** You can serve the same purpose by putting a stopper in the sink and filling the sink with clean water.

- **Keep a bottle of drinking water in the refrigerator.** This ends the wasteful practice of running tap water to cool it off for drinking.

- **Use your automatic washing machine only for full loads**. Your automatic washer uses 30 to 35 gallons of water in a cycle. That's a lot of water for three T-shirts.

- **Plant drought-resistant trees and plants.** There are many beautiful trees and plants that thrive in Utah with far less watering than other species.

- **Put a layer of mulch around trees and plants**. A layer of mulch will slow the evaporation of moisture.

- **Use a broom to clean driveways, sidewalks and steps**. Using a hose to push around a few leaves and scraps of paper can waste hundreds and hundreds of gallons of water.

- **Don't run the hose while washing your car**. Soap down your car with a pail of soapy water. Then use a hose just to rinse it off.

- **Teach your children that your hose and sprinklers are not toys.** There are a few things more cheerful than the sound of happy children playing under a hose or sprinkler on a hot day. Unfortunately, there are also few things more wasteful of precious water.

- **Water your lawn only when it needs it.** Watering frequently can be very wasteful as it doesn't allow for cool spells or rainfall that can reduce the need for watering. A good way to see if your lawn needs watering is to step on some grass. If the grass springs back up when you move, it doesn't need water.

- **Deep-soak your lawn.** When you do water your lawn, do it just long enough for water to seep down to the roots where it won't evaporate quickly and where it will do the most good. A light sprinkling which sits on the surface, will simply evaporate and be wasted. A slow steady fall of water is the best way to irrigate your lawn.

- **Water during the cool parts of the day.** Early morning is better than dusk since it helps preventing the growth of fungus.

- **Don't water the gutter.** Position your sprinklers in such a way that water lands on your lawn or garden, not on concrete, where it does no good. Avoid watering on windy days when much of your water may be carried off before it ever hits the ground.

- **Check for leaks in pipes, hoses, faucets and couplings**. Leaks outside the house may not seem as unbearable since they don't mess up the floor or drive you crazy at night. But they can be just as wasteful as leaks in the line from the water meter, even more wasteful.

6.14 Additional Best Management Practices (BMPs) as Conservation Measures

In addition to the water conservation measure that the District currently has, the following best management practices (BMPs) are recommended (Utah' M & I Water Conservation Plan, July 2003).

- **BMP 1 – Universal Metering**

– Install meters on all residential, commercial, institutional and industrial water connections. Meters should be read on a regular basis.
– Establish a maintenance and replacement program for existing meters.

- **BMP 2 – Water Conservation Ordinances**

– Adopt an ordinance requiring water-efficient landscaping which include irrigation system efficiency standards and an acceptable plant materials lists.
– Adopt an ordinance prohibiting the general waste of water.

- **BMP 3 – Water Conservation Coordinator**

– Designate a water conservation coordinator to facilitate water conservation programs.

- **BMP 4 – System Water Audits, Leak Detection and Repair**

– Set specific goals to reduce unaccounted for water to an acceptable level.
– Set standards for annual water system accounting that will quantify system losses and trigger repair and replacement programs, using methods consistent with American Water Works Association's Water Audit and Leak Detection Guidebook.

- **BMP 5 – Large Landscape Conservation Programs and Incentives**

– Encourage all large landscape facility managers and workers to attend specialized training in water conservation.
– Provide outdoor water audits to customers with large amenity landscapes.

- **BMP 6 – Water Survey Programs for Residential Customers**

– Implement residential indoor and outdoor water audits to educate residents on how to save water.

- **BMP 7 – Plumbing Standards**

– Review existing plumbing codes and revise them as necessary to ensure water-conserving measures in all new construction.
– Identify homes, office building and other structures built prior to **1992** and develop a strategy to distribute or install high-efficiency plumbing fixtures such as ultra low-flow toilets, showerheads, faucet aerators, etc.

- **BMP 8 – Conservation Programs for Commercial, Industrial and Institutional Customers**

– Change business license requirements to require water reuse and recycling in new commercial and industrial facilities where feasible.
– Provide comprehensive site water audits to those customers known to be large water users. Identify obstacles and benefits of installing separate meters for landscapes.

- **BMP 9– Reclaimed Water Use**

– Use reclaimed or recycled water where feasible.
– Water wise landscaping.

7.0 Evaluation of Water Conservation Measures

This section describes how water savings and cost-effectiveness of BMPs were evaluated. The water savings estimate is useful to help utility planners forecast how future demands may be impacted by water conservation. Savings are usually minimal in the first year of implementation. The methodology to estimate water savings can be implemented by the following steps:

- Develop baseline, detailed water use projections without water conservation. Projections should cover each key customer category and be broken down into indoor and outdoor use.
- For each conservation measure, estimate the affected population or number of accounts by multiplying total service area population (accounts) by the market penetration or installation rate for the measure. The market penetration rate is the likely percentage of the population that will implement the measure.

- Determine total annual water savings for a measure by multiplying affected population or accounts by a measure's unit water savings.

Data necessary to forecast water savings include base water use, demographics, market penetration expectations, unit water savings, and measure interaction factors.

8.0 Water Conservation Program To Meet Goals

To insure the water conservation goals outlined in this report are achieved, the District plans to participate in the following programs in the future.

- Public Information and Education Campaign
- Water Conservation Demonstration Garden
- Model Water-Efficient Residential and Commercial Landscape Ordinances
- Ultra Low Flush Toilet Replacement Program
- Residential, Commercial and Industrial Water Audits
- Water-Wise Landscaping Classes
- Large Water User Workshops
- Water Quest: Saving Water by the Yard
- District Facilities Re-Landscaping
- Water-Wise Landscape Awards
- Member Agency Assistance Program
- Water Conservation Plan Update
- Efficient use of surface water to reduce pumping groundwater.

9.0 Water Conservation Plan Implementation Considerations

Water conservation planning would be a good investment for the District. The cost to develop an equivalent amount of water, treat it, and deliver it to the District residents is likely to be much higher.

9.1 Staffing

It appears that a part-time and/or full time person would be needed to conduct the following tasks:

- Implement public information program as described above.
- Conduct leak detection and repair.
- Coordinate water conservation program.

9.2 Method to Track Water Conservation Progress

The District will implement the following procedure to track water conservation progress:

- After first year of water conservation campaign, the District will compare monthly water supply data for each category of usage.
- The water supplied data and metered data will be compared to identify any leaks in the system. The detection and repair of the leaks will assist in estimating actual volume of water conservation.
- Add more when and if necessary.

9.3 Water Conservation Technical Analysis

The District in conjunction with the Lake Powell Pipeline consulted with Maddaus Water Management to do a conservation technical analysis. The results were provided in the form of a Technical Memorandum which is attached to this document. This analysis shows the interest levels and the projected results of water conservation in this area.

References

1. ***Utah's M & I Water Conservation Plan: Investing in the Future*** (July 2003), Division of Water Resource, The State of Utah.

2. Eisinger, C. (1998). ***A Summary of the Geology and Hydrology of the Cedar Valley Drainage Basin, Iron County***, Utah, Utah Geological Survey.