WATER
CONSERVATION PLAN UPDATE 2011

City of Moab
Grand County, Utah

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INTRODUCTION AND EXECUTIVE SUMMARY

Because of unprecedented growth in many Utah communities, along with the relative scarcity of adequate water supplies in the west, the State of Utah mandates that each Utah community adopt and then update every five years a Water Conservation Plan. **The Water Conservation Plan is meant to address how a given community will meet its future water demand needs through water conservation programs and practices.**

The City of Moab, motivated by severe water shortages during the uranium boom of the early 1950s, acquired rights to underground water that exceed culinary demand at the City's build-out. Water rights have also been purchased subsequent to the boom, further augmenting supplies beyond anticipated demand. The City's build-out is based on the City's full growth potential, which is based on existing zoning. The City of Moab can also meet additional culinary water demand created by limited annexations and/or higher density rezoning that might occur in the future. **Despite adequate water supply to meet build-out projections, it is important that the City anticipate drought conditions and development patterns that are different from those contemplated in the build-out analysis, as well as other unknown factors that may affect water supply and distribution.**

The City of Moab first completed a Water Conservation Plan in 1996. Because billing categories and population estimate methodology have changed since the 1996-2000 reporting period, data from that timeframe is not included in the current analysis. Moreover, data from the 2000-2006 timeframe was re-analyzed due to discrepancies in population estimates used to calculate the per capita residential water usage rates**. Because of these discrepancies, the Per Capita Average for residential water use for 2001-2005 was inaccurately calculated at 162 gallons per day (gpd), while more up-to-date population estimates reveal that the Per Capita Average for 2001-2005 was actually 190 gpd.**

The 2011 Water Conservation Plan Update reveals a considerable conservation trend from the 1996-2000 timeframe to the 2001-2005 timeframe, given the total gallons per day (gpd) delivered in that period. The current plan specifically deals with an analysis of the period of 2006-2010. Average per capita consumption for 2010 was 169 gallons per person per day. Overall, from 2006-2010 the total water delivered by the City of Moab culinary system has decreased by 17.2% relative to the average for 2001-2005. The Per Capita Average comparing the same period shows a 7.8% decrease. Because previous water conservation plans have indicated relatively low per capita water usage rates for 2000-2006, the City of Moab has not been aggressive in pursuing water conservation measures. **With a current per capita consumption of 169 gallons per person per day, the City of Moab is well below the state**

average of 182 gallons per person per day for residential use, but above the American Water Works Association's culinary use conservation target of 150 gallons per day per capita. It is recommended that the City progressively implement the water conservation measures outlined in this plan, concentrating on reduction in outdoor water use.

This plan recommends that the City aim toward a 5% reduction in per capita water consumption over the next five years, and that the City reduce outdoor usage of culinary water by 10% in the same time period. Recommended water conservation measures include public education, adoption of a water conservation rate structure that focuses on reducing outdoor water use and other efforts. Water conservation measures are addressed in pages 18-20 of this plan.

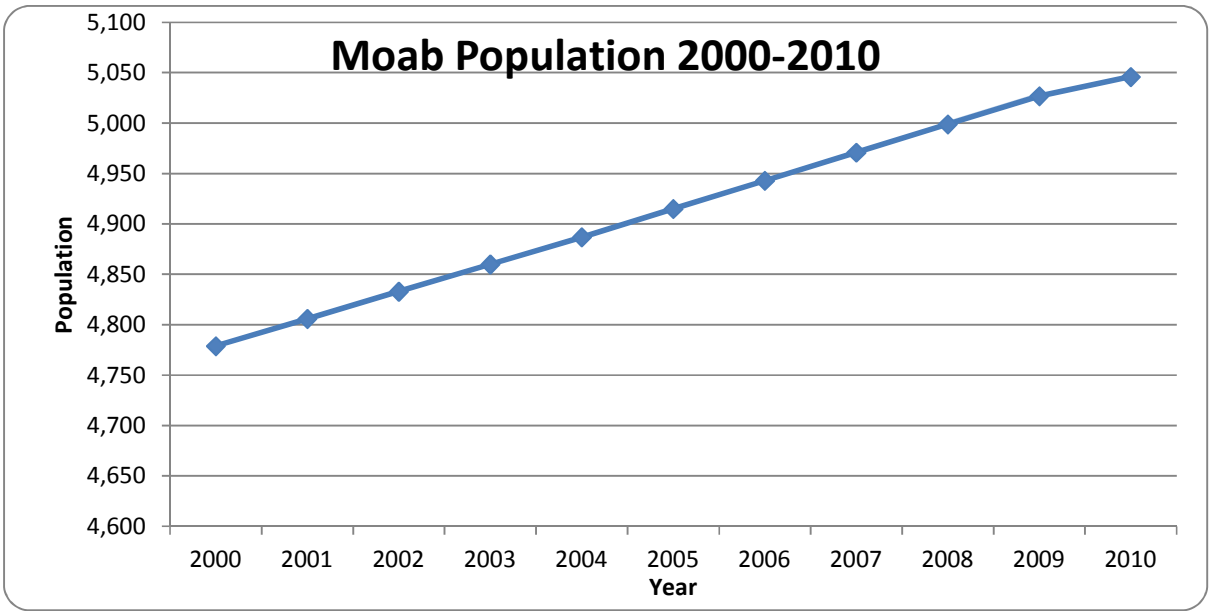
THE CITY OF MOAB AND ITS WATER SYSTEM

History, Government and Population

The City of Moab was incorporated in 1902. The 2010 Census showed the City's population at 5,046. The City of Moab has a Council-Manager form of government, with five elected Council members serving at large and a separately elected Mayor.

The City's population has grown slowly over the past 10 years, with an average growth rate of 0.56% over the past 10 years. The chart on the following page shows the City of Moab's slow and steady population growth trend.

Figure 1. Moab Population



Moab Area Geology and Origin of Water Sources

The City of Moab is located at the north end of Spanish Valley to the south of the Colorado River. Spanish Valley is a salt collapse graben, formed when a dome of Paradox Formation slats bulged up, fracturing the overlying sedimentary formations. The fractured formations and part of the salt dome eroded away, largely from runoff from the La Sal Mountains through the Pack Creek drainage. The La Sal Mountains compose a small mountain range southeast of Moab that rises approximately 12,000 feet above sea level. The Glen Canyon Group (Navajo, Kayenta and Wingate) of sandstones conducts water downward from the mountains, which then surfaces in springs at various points along the Eastern Moab Fault complex on the edge of Spanish Valley. The City's water source, consisting of wells and springs, is a large aquifer contained in the highly porous Wingate sandstone to the east of the city. This aquifer is fed by the snowmelt from the La Sal Mountains. This water is classified as Pristine Ground Water by the Utah DEQ Division of Drinking Water.

Moab Water Rights/Water Source Capacity

Through its history, the City of Moab has acquired enough water rights and water source capacity to meet build-out projections.

Shortly after its incorporation in 1902, the City of Moab acquired an approximate half-interest in Skakel Spring, located behind the Grand Old Ranch House about a mile south of the Colorado River. The amount of the acquisition was 0.625 cfs. Skakel Spring was used as the culinary source for the City's drinking water system installed in the original platted town blocks to the south. Outlying farmhouses utilized wells for water.

Contemporary with formation of the City, the Moab Irrigation Company built a diversion dam on Mill Creek where the creek enters the east side of Spanish Valley, and currently provides irrigation water throughout the City and to unincorporated areas north and west of Moab City. Many residential lots in the original Moab City town blocks still have irrigation shares with which outside watering is done, with the water being delivered down the gutters of the town streets to inlets into yards.

When the uranium boom occurred in Southeast Utah after World War II, Moab's population suddenly jumped from about 1,500 to 8,000, resulting in a severe shortage of culinary water. In 1955, the City purchased the 1,600-acre Lloyd Sommerville Ranch, which contained Sommerville #1, #2, #3, McKonkie, and Birch springs. The City sold most of the ranch lying west of the spring area to George White, and located the Moab City Cemetery, Old City Park (which contains McConkie and Birch springs) and the Moab Golf Course (which contains the Sommerville #2 and #3 springs) on part of the remainder. The City drilled six wells adjacent to the Sommerville #2 and #3 springs; from 1998 through 2005 only wells #6 and #10 have been pumped into the culinary system. The springs (including Skakel) and the wells are the City of Moab water supply source today. Water from the Sommerville Ranch springs can fill the City water storage tanks (three, having 3,500,000 gallons total capacity) by gravity flow. In 1999 the City acquired the remaining interest of 0.626 cfs in Skakel Spring, and afterward rebuilt the Skakel Spring diversion structure to secure it from accidental or deliberate contamination. Full rights to Skakel were acquired by the City in order to supply future demand anticipated from annexation of commercial properties in the north US 191 corridor.

With the loss of cultivated farmland to residential development, 308.79 of the 1,086.897 shares of the Moab Irrigation Company stock were acquired in 1979 by the Grand County Water Conservancy District, which diverts Mill Creek upstream into Ken's Lake for irrigation delivery above Moab in Spanish Valley. Since then, 66.5 shares of Moab Irrigation Company stock have been leased or purchased and transferred by private owners upstream to the Mill Creek Diversion for Ken's Lake. Seventeen years ago the Moab Irrigation Company put in pressurized irrigation pipelines to replace their original open ditch system within Moab.

The City of Moab's total water rights (not including any Moab Irrigation Company water) total 14.137 cfs, which is 6,345.11 gallons per minute or 9,137,009 gallons per day. The following provides a summary of Moab's acquired water rights, for both springs and wells:

Figure 2. Municipal Springs

Municipal Springs (water rights perfected)

cfs	Name of Spring	Water Right #	Priority Date
2.252	Skakel Spring	05-2105	1880
0.21	McConkie Spring	05-2007	1903
0.2	Sommerville Spring #1	05-2008	6-12-1951
0.207	Sommerville Springs #2, 3	05-2511	10-20-1958

Springs subtotal: 2.869 cfs = 1,287.69 gallons per minute

Figure 3. Municipal Wells

Municipal Wells (perfected and proving)

cfs	Name of Well	Water Right #	Priority Date
3.0	Wells 4a, 5, 6, 7, 9, 11	05-169	9-15-1955
1.63	Same	05-206	10-07-1964
2.256	Same	05-716	10-24-1968
1.0	Same	05-101	1-27-1954
1.114	Same	05-183	2-21-1956
1.0	Same	05-336	4-14-1961
1.0	Well #10	05-429	7-23-1962
0.150	West Park Well	05-1540	10-12-1978
0.118	West Park Well	05-1744	04-24-1980

Wells subtotal: 11.268 cfs = 5,057.90 gallons per minute

Current City of Moab Water Distribution System Configuration

The City of Moab supplies drinking water to almost all of the residents and businesses within the City. Not all of the above named water rights currently provide water into the Moab water distribution system. Moab's primary water rights are surface rights to three springs producing approximately 2,260 acre feet per year that flow out of the aquifer. These rights are fully utilized

in the summer, but not in the winter. As indicated above, Moab also holds groundwater rights to six major wells that penetrate the aquifer. Only two of these wells are currently on line, and are only utilized during peak irrigation season. Water sources in the distribution system for the City of Moab vary seasonally. Moab obtains water from three wells and three springs during the summer months. From the north end of town, water from Skakel Spring is pumped through a chlorination station and into a one-million-gallon tank, which then feeds the Northwest Low pressure zone of the city. Moab City Springs One, Two and Three plus Moab City Wells Six and Ten south of Moab are channeled into pipes and flow into two gas chlorination stations. From each of these chlorination stations, water flows downhill to the city grid. Two one-million-gallon storage tanks are not in line with the main transmission lines, but branch off at the south end of the system.

The City of Moab contracted with the University of Utah Department of Civil and Environmental Engineering in 2010 to produce a report entitled Moab Culinary Water Distribution System Model Description and Analysis: Recommendations for Current and Future Improvements (herein after "The 2010 Moab Water Distribution System Report"). Among other things, this report looked at the utilization of water sources in the Moab water distribution system. According to the report, Moab currently uses less than half of the water sources that have been allotted and developed for the City. The following table, taken from this report, shows the water production of each of the in-service water sources for the City:

Figure 4. 2010 Annual Water Production and Utilization by Source

2010 Annual Water Production and Utilization by Source
(in millions of gallons)

Source	Volume Used	Potential Production	Utilization	Unused Water Immediately Available
Springs 1 and 2	244	244	100%	0
Spring 3	220	220	100%	0
Skakel Spring	114	232	44%	148
Well 6	97	788	12%	691
Well 10	94	367	26%	273
TOTAL	**769**	**1851**	**40%**	**1112**

Drought conditions beginning in 1998 with a shift in the Northern Pacific Decadal Oscillation system in ocean currents caused a shift from water production from gravity sources to pumped sources. While the amount of water pumped as a percentage of total water diverted changed dramatically in 2000, the percentage of water pumped has remained fairly steady since that time. Note that diminished pressure due to reduced infiltration due to drought conditions takes two years to reach the point of discharge. Spring flow has remained fairly constant over the past five

years. The chart on the following page shows the City's total water production over time, along with the percentage breakdown of pumped versus gravity sources and a comparison to pre-drought conditions:

Figure 5. Total Water Production from Gravity and Pumped Sources

Total Water Production from Gravity and Pumped Sources, 1998-2010 – in millions of gallons

Year	Total Gravity	% of 1998 flow	Total Pumped	Total Diversion	% Pumped	% of 1998
1998	517.90	-	96.21	614.11	16	-
1999	504.20	97.4	93.97	598.17	16	97.4
2000	510.80	98.6	280.62	791.42	35	128.9
2001	463.51	89.5	342.49	806.00	42	131.2
2002	425.87	82.2	239.50	665.37	36	108.3
2003	398.75	77.0	280.72	679.47	41	110.6
2004	421.21	81.3	275.66	696.87	40	113.5
2005	422.01	81.5	282.15	704.16	40	114.7
2006	451.62	87.2	354.16	805.78	44	131.2
2007	448.62	86.6	285.98	734.60	39	119.6
2008	494.76	95.5	345.64	840.40	41	136.9
2009	464.12	89.6	304.61	768.73	40	125.2
2010	467.41	90.3	293.49	760.90	39	123.9

Water Use Trends, Current Water Use, per Capita Consumption and Number of Water Connections

Current water use reflects an ongoing trend of reduced water consumption for both residential and commercial water consumers. In addition, previous Water Conservation Plans indicate that delivery of water through residential meters has decreased from a 1996-2000 average of 1,353,960 gallons per day to a 2006-2010 average of 876,616 gallons per day, a 35% decrease over a 15 year period. Overall, for 2006-2010 the total water delivered by the City of Moab culinary system has decreased by 17.2% relative to the average for 2001-2005. The per capita

average comparing the same period shows a 7.8% decrease. Of note, Commercial usage has decreased 18.2% from the 2001-2005 period, while the total amount delivered has decreased 17.2%. There is evidence of achievement of water conservation over the last 15 years, as well as during the term of the 2006 City of Moab Water Conservation Plan.

Figure 6. Average Water Consumption Residential versus Commercial 2006-2010

Average Water Consumption Residential versus Commercial 2006-2010

Year	Popu-lation	Per Capita Avg	Average gpd Dwellings	Average gpd Commercial and Other	Total gpd Delivered
2006	4943	171	847,049	848,659	1,695,709
2007	4971	178	885,789	714,010	1,599,799
2008	4999	173	868,410	698,772	1,567,182
2009	5027	184	926,682	706,887	1,633,568
2010	5046	169	855,150	596,666	1,451,816

Figure 7. Water Consumption Trends 2001-2010

Water Consumption Trends 2001-2010

Avg Years	Per Capita Avg	Average gpd Dwellings	Average gpd Commercial	Average Total gpd Delivered
2001-2005	190	926,962	998,357	1,925,320
2006-2010	175	876,616	816,388	1,593,714
Change	-15	-50,346	-181,969	-331,606
% Change	-7.8%	-5.4%	-18.2%	-17.2%

The number of water connections in the City of Moab system as of July 2010 is 1,910. It appears as though this is an approximate 4.3% increase from 2006. For 2010, there were 1446 Residential connections and 464 Commercial connections. Since the method for categorizing what constitutes a residential connection versus a commercial connection has changed with

changes in accounting systems, it is difficult to provide an "apple-to-apple" comparison for changes in residential and commercial connections since the last report. It is safe to say that the total number of connections has increased at a higher rate than population growth, which would lead one to believe that growth in the number of second homes and commercial establishments have been the main contributors to the increase in number of connections. Population growth since 2006 has been approximately 0.42% per year.

Demand Projections to 2050

It is important that a water conservation plan not only consider the five-year time frame called for by the plan, but a longer time horizon. This plan looks to 2050 and beyond.

The 1996 Public Facilities Analysis, Grand County/City of Moab addressed the water demand from development of land already within the City of Moab, or contained in "islands" of unincorporated county within City boundaries, to the density limit of current zoning. Existing city residential zoning permits 4,298 additional units to be added to the 2,051 currently existing. Annexation of unincorporated "islands" would add 288 additional ERUs to the 32 existing in these islands in 1995. At build-out, total residential units equal 6,669, housing a projected population of 18,473.

Using the 2010 population figures, along with the total amount of water delivered in 2010, we can derive a total per capita average water consumption of 278 gpd per resident. This 278 gpd number considers total water consumption and not just residential water consumption. The 1996 build-out analysis did not project a particular population growth rate. However, at a rate of 1% per year (higher than the current rate of approximately 0.56% annually for the last ten years), the City would meet build-out in approximately 130 years. Water demand would be 5,135,494 gallons per day at the build-out population potential of 18,473. With a source capacity of 9,136,958 gallons per day in hand, the City has 44% more in water rights and source capacity over what it needs at build-out.

At 1% growth per year, about twice the current rate, the City's population would reach approximately 7,438, by 2050. This is only 40% of the City's build-out potential. A population of 7,438 would put water demand at 2,067,764 gallons per day in 2050. Given that the City has water rights of 9,157,009 gallons per day, the City will not need to acquire more water rights any time before build-out potential is reached.

City commercial zoning would allow an expansion from approximately 1,521,000 square feet (2005 estimate) to 4,489,066 square feet, an increase of three times, if current lot coverage rates continue in new construction. Industrial zoning permits an increase from the 2005 estimate 97,400 square feet to 281,289 square feet, a 65% increase.

However, the Public Facilities Analysis did not assume any annexation of lands outside the current City of Moab perimeter boundary. This is a sound assumption for Grand County

residential-zoned lands to the south of Moab on the floor of Spanish Valley. These rural residential areas are uphill from the Moab water system, already served by Spanish Valley Water and Sewer Improvement District (now part of the Grand Water and Sewer Service Agency), and typically consist of half acre or acre minimum lot sizes (larger minimums in most subdivisions by covenant) with farm animals and horses allowed on lots one acre or greater in size. The vast majority of these county property owners are as resistant to annexation into Moab as the City is rationally resistant to acquiring areas already receiving utility services which would bring no new tax revenues with them if annexed.

Commercial areas are a different matter. The City of Moab recently annexed a new commercial area along Hwy 191 to the Colorado River Bridge. Many of these properties are already serviced by the city water system. Acquisition of the other half interest in Skakel Spring, which is located in the center of the north US 191 unincorporated commercial corridor, permits the City to anticipate providing culinary water to additional commercial properties without reducing its surplus source capacity from the golf course area springs and wells. Costs for extending services would be recovered from property owners as extraordinary costs upon annexation or development of the properties.

Another city expansion involves lands currently owned by the Utah School and Institutional Trust Lands Administration (SITLA) on the "sand flats" benchlands between the Slickrock Bike Trail and eastern Moab City limits, north of Sand Flats Road. This property has recently been annexed into the City. A development group proposes to site a 460-unit residential planned unit development on these lands, entitled the Lionsback development. The City of Moab will be providing both water and sewer services to this new development, which is expected to be phased in over a 15-year timeframe.

Moab City might modestly expand its municipal border southwards on US 191 in the Highway Commercial zoning district. However, annexation of this area will not impact city water supplies, as water and sewer services to these areas will be provided by the Grand Water and Sewer Service Agency and not the City. Grand County has anticipated commercial and other growth in these areas as part of the county's Public Facilities Analysis, and the Grand Water and Sewer Service Agency has incorporated these lands into their build-out analysis for the provision of water and sewer services. The Grand Water and Sewer Service Agency will need to pursue additional water sources to fully provide for the build-out potential of lands within Agency boundaries.

The 2010 Moab Water Distribution System Report reviewed future development scenarios and provided recommendations regarding the City system's ability to accommodate the anticipated developments. Regarding the Lionsback development, the report recommends that the city allow development itself but recommends against utilizing the water storage tank contemplated for the project for city storage. The report also examined potential commercial and residential development as described above, and indicated that water sources are more than adequate to meet the demands of the planned developments. The 2010 Moab Water Distribution System Report maintains that the "data indicate that the City of Moab can double its current population

before new sources need to be developed or administrative constraints need to be placed on water use" and that "currently the greatest motivation for water conservation is energy conservation". Further the report maintains that "total water availability, however, is not a limiting factor for growth in the foreseeable future."

In summary, the City of Moab has sufficient pristine groundwater source and distribution capacity at projected levels of per capita or ERU use to meet reasonable future demands from growth within current city limits, recently annexed areas, from future annexation of commercial properties outside the city limits, and from limited rezoning of city parcels to higher density/granting density bonuses. Given the growth potential through 2050, the City would not have to seek additional water sources or institute administrative control measures until well after the 2050 time horizon.

System Deficiencies

The 2010 Water Distribution System Report identifies deficiencies in the existing City of Moab water system. Contrary to the 1996 Public Facilities Analysis, the 2010 report does not recommend construction of new water storage facilities. It does recommend improvements to the Supervisory Control and Data Acquisition (SCADA) system, replacement of fire hydrants, and the upgrade of several water mains. It does not recommend that the City secure any additional water rights or water sources at this time.

Future Supply Sources

As discussed above, the 1996 Public Facilities Plan, the 2010 Water Distribution System Report and reasonable estimates of city population and commercial growth indicate that the City will probably have sufficient water for at least the next 100 years. Although this is the case, it is important for the City to anticipate future drought conditions and to acknowledge uncertainty inherent in fully understanding the viability of the City's water sources by contemplating the acquisition or use of additional or alternative water sources.

One possibility in this regard is to acquire from the Moab Irrigation Company water shares that could be used for outdoor watering. Most of the remaining Moab Irrigation Company water shares that are delivered in Moab, north and west of Moab, and on Wilson and South Mesas above Mill Creek to the east of Spanish Valley could be bought and transferred to the Ken's Lake diversion on Mill Creek. Inside the City limits and in the north US 191 corridor, a number of orchards, hay fields, pastures and gardens are currently irrigated with these shares. Recharge from this irrigation may be largely responsible for inflow to the Matheson Wetlands Preserve operated by the Nature Conservancy at the north end of Spanish Valley. When some of these parcels have been converted to residential or commercial development in recent years, the predominant pattern has been to cluster buildings, leaving landscaped open areas. The City needs to explore and define ways in which parcels developed with large open spaces can obtain and/or retain Moab Irrigation Company irrigation water shares for outside landscaping irrigation.

Acquisition of water shares by the Nature Conservancy to maintain recharge of the Matheson Preserve should be considered in this planning.

Although studies have indicated that the City of Moab has adequate water rights and production capacity to meet build-out demand for culinary water without having to install a secondary irrigation system, it might be to the City's benefit to implement such a secondary system and enjoy this pristine groundwater demand savings if: (1) growth patterns depart from plan assumptions so that the total culinary demand on the City's water system is greater than anticipated in the current plans, or (2) the City finds it profitable to "swap" conserved pristine groundwater for irrigation water from the Grand Water and Sewer Service Agency because the Agency is unable to divert enough pristine groundwater out of the same aquifer the city is using to meet growth demands in the Agency's service area. In 2005, it appeared that 180,641,000 gallons of pristine groundwater were consumed by 31 city customers for irrigation; another 185,075,000 gallons were apparently used by 2,121 residential customers for outdoor watering. This provides an idea of the total amount of pristine groundwater that could be conserved by the city if it was replaced by water from a secondary irrigation water system. Options for a secondary water system constitute the greatest potential for future water sources.

Intersystem Agreements

There are currently no significant intersystem agreements for culinary water. The Grand Water and Sewer Service Agency, which serves Spanish Valley and is uphill and to the south of the City, does not have sufficient water sources in hand to meet its service area's build-out demand. The Agency undertook a $4.7 million project in 2000 to improve storage and distribution to resolve system deficiencies, and collects impact fees for the purpose of expanding the system to meet growth demands in the future per its Capital Infrastructure Plan. Geography and gravity allow the Agency to supply the City with culinary water, but the Agency doesn't have culinary water to spare and the City doesn't need it. The Grand Water Service Agency and City of Moab collaborate on matters affecting both entitites such as source protection plans, financing of expansion of the sewage treatment plant, and regional drinking water facility planning. They may choose to collaborate on development of a valley-wide secondary irrigation water system for the reasons discussed above, although these options do not need to be immediately pursued.

Water Quality

Water quality in the Moab water system is excellent. All drinking water supply for the City of Moab is Pristine Ground Water from wells and springs discharging from a sandstone aquifer. This aquifer enjoys the protections of U.S. Environmental Protection Agency designation as a Sole Source Aquifer. [Sole Source Aquifer Determination for Glen Canyon Aquifer System, Moab, Utah, published in the January 7, 2002 *Federal Register*, volume 67 #4, pp. 736-738.]

Distribution System

The City of Moab water distribution system is in good condition and is sized to meet current and projected demand, with the exception of new service lines needed for new development. In addition, the 2010 Water Distribution System Report outlines water line improvements that should be made in order to provide for the efficient distribution of water throughout the City. Each water connection is serviced by a meter. The City has an ongoing meter replacement program, moving toward a system-wide radio-read meter system.

Treatment System

Treatment for the City of Moab water system consists of minimal chlorination. USGS water sampling in 1997 found the drinking water of the City of Moab, before treatment, equals or exceeds the quality of 80 percent of brands of bottled drinking water from springs sold in stores (comparison data is from the published Natural Resources Defense Council study of bottled water quality).

Reuse Potential

Reuse potential for the Moab water system is not feasible for a city-only secondary water system because the City of Moab Wastewater Treatment Plant is located next to the Colorado River on the edge of the Matheson Wetlands Preserve at the far, low, north end of Spanish Valley and discharges directly into the Colorado River, and the City does not have the water right to use this discharge for a secondary irrigation system. The Grand County Water Conservancy District has filed on and holds irrigation water rights to the discharge from the City Wastewater Treatment Plant, but the point of diversion for this water right is the Colorado River.

Institutional and Political Factors

There are several institutional and political factors relevant to the City of Moab Water Conservation Plan. It will be important to monitor water rights applications submitted by adjacent water agencies such as the Grand Water and Sewer Service Agency and other water providers to ensure that applications that involve such things as a change in points of diversion do not negatively affect the quantity or quality of Moab's water sources. In addition, the ability of the City to work with the Moab Irrigation Company and its shareholders to keep surface-diverted irrigation water flowing to areas within the City, rather than being moved away from these lands for application elsewhere is key. A large part of the Moab Irrigation Company's water shares are currently used by homeowners for yard irrigation, so it functions as a de facto secondary irrigation water system for residences in older portions of town.

Environmental Concerns

Environmental concerns for the culinary system are minimal, since the City of Moab will not develop new water supply sources or water rights, does not have a water treatment facility and will presumably never have one, and will not expand the existing production, storage and distribution system except for that needed to service new development. The City will need to continue to monitor water quality to ensure the long term sustainability of Moab's abundant water sources.

Fiscal Structure and Financial Resources

Since the City will not need to aggressively pursue the acquisition of additional water rights, financial resources will only be needed to make modest system improvements. The 1993 transmission line bond will be paid off in 2013. The $1.3 million Main Street water main upgrade 2005-2006 was paid for in cash that the City had saved from revenues. Connection and user fees fully support the costs of operating the system and retiring the modest bonded debt, although the city should provide for inflationary increases in its rate structure. The City's current water rate structure reflects the City's intent to keep water rates low for its residents. The following is the City's current water rate structure:

Figure 8. Current Water Rate Structure for the City of Moab (per month)

	Within the City	Outside the City	
RESIDENTIAL	$5.81	$11.63	• minimum charge (includes the first 2,000 gallons)
	.46	.92	• per thousand for 3,000 to 10,000 gallons
	.63	1.26	• per thousand for 11,000 or more gallons
COMMERCIAL	Within the City	Outside the City	
	$9.92	$19.84	• minimum charge (includes the first 2,000 gallons)
	2.20	4.41	• per thousand for 3,000 to 5,000 gallons
	.56	1.13	• per thousand for 6,000 to 10,000 gallons
	.65	1.30	• per thousand for 11,000 to 50,000 gallons
	.77	1.55	• per thousand for 51,000 or more gallons

CURRENT WATER CONSERVATION PRACTICES AND CHALLENGES

Current Water Conservation Challenges

The City of Moab has a number of challenges with respect to water conservation. Past water conservation efforts, a relatively dry climate, public perception, a high percentage of outdoor water usage, impacts on the City Waste Water Treatment Plant, and uncertainty with respect to the long term availability of current water sources are just a few of the challenges to be addressed. Many of these challenges are inter-related.

One issue currently facing the City of Moab with respect to water conservation is that previous water conservation plans have overestimated the level of water conservation that has occurred over the last 15 years. While the current report does show a reduction in per capita water consumption from the previous period, there have been minimal deliberate water conservation efforts over the past five years that would have led to this result. There are a few reasons why this situation presents a unique challenge. The idea of water conservation has not been thoroughly institutionalized and culturally accepted within the community. People are under the impression that water is a readily available resource with no need for conservation efforts, and adjusting this perception will be difficult. Implementing new conservation measures at this point in time will present new challenges.

A second issue, related to the above, is the public perception about the need for water conservation in general. Studies looking at growth potential both within city limits and due to annexation indicate that the city has sufficient water sources to provide for growth at build-out, a scenario that may not occur for another 130 years. It is difficult to provide a convincing case to the public for the urgency of implementing water conservation measures. Because of this, it will be important to emphasis the uncertainty of future conditions and the availability of water, as well as the cost-saving and energy saving aspects of water conservation.

Another challenge, faced by communities throughout the west, is that Moab is a relatively arid community. Average rainfall is less than nine inches per year, while the national average for 2010 was about 33 inches. The amount of rainfall is directly related to the percentage of culinary water used for irrigation as compared to indoor uses. Previous water conservation plans indicate that from November through April water consumption per capita by residents is typically below 150 gallons per day. In the hottest month, water use per day per resident is 5.4 times the lowest, coldest month. Commercial water use is 6.5 times higher per day in the hottest than the coldest month annually. Most of this difference is due to outdoor water use from April through October, peaking in July or August. The 2005 Water Conservation Plan showed that approximately 60% of the water that is delivered to customers from city sources is used for outdoor irrigation. This means that the major conservation efforts need to be aimed toward outdoor use. Water conservation measures such as water conservation rate structures are difficult when trying to address outdoor use only.

Yet another challenge that the City of Moab water system faces with respect to water conservation is the impact that a reduction in water flow through the sewer system has on the Wastewater Treatment Plant. According to the City Moab Wastewater Facilities Master Plan, a reduction in per capita water use has caused an increase in BOD and TSS concentrations of the influent coming into the Wastewater Treatment Plant, leading to difficulties in efficient treatment and the resulting costly upgrades needed to maintain effluent at acceptable levels. The reduction in water usage over the past 10 years has led to increases in the strength of the wastewater. This is a dilemma that must be balanced when looking at both upgrades to the treatment plant and implementation of water conservation efforts. This dilemma makes it all the more important that any water conservation measures deal with outdoor use rather than indoor use as the focus, so that we can reduce water usage but not negatively impact the Wastewater Treatment Plant.

Another challenge related to implementation of water conservation measures is that the City of Moab has a very small Water Department staff. The City does not have a Water Conservation Coordinator and we do not see in the foreseeable future that we will have one. This will make it important that the measures implemented are cost effective and not staff intensive, and that the effectiveness of water conservation efforts be simple to measure.

A final challenge to be considered is the long-term viability of the Moab Irrigation Company. It has been mentioned several times that the ability of city residents to use Moab Irrigation water is important for preservation of culinary water for indoor use. It is important to maintain a positive relationship with Moab Irrigation to ensure continued operation of the irrigation system within city limits. It is also important to recognize that the Moab Irrigation Company system, while recently upgraded to a pressurized system, is an old system with constant maintenance challenges.

PAST WATER CONSERVATION EFFORTS

Although the City of Moab has not engaged in aggressive water conservation efforts in the last five years, previous plans have identified, and the City has implemented to some degree, water conservation efforts. The following provides a summary of identified water conservation measures, along with the implementation status of the measures.

Emergency Action Plan

The City's emergency plan can be considered a water conservation plan for circumstances in which pumped culinary water from city wells is not available. In event of emergency, such as the main well pump failure that occured in 1998 at the Moab Golf Course, citizens are asked through the media to discontinue all outside watering until adequate water flow is restored. City Public Works staff go in the field to identify customers who haven't gotten the message. If citizens refuse to stop outside watering when asked, their water meter is turned off and locked. Gravity flow from the Sommerville springs to the City storage tanks is sufficient to keep the

storage tanks full while meeting inside culinary water needs; during the winter months, spring flow normally exceeds water usage in the system and the well pumps are not operated. Under emergency conditions, the City's concern is to maintain the storage tanks full so that water is available for firefighting

Public Education on Wise Water Use

In response to the 1996 Water Conservation Plan, the City of Moab implemented educational programs to encourage outdoor water conservation. These programs included pamphlets, newspaper articles, and reminders on the City utility bill.

The 2006 plan called for continuation of these efforts, specifically, the following: (1) Renewal of City public education through the media and bill enclosures, reminding people to not water in the heat of the day; to water for a long period of time at intervals to get deep penetration of water and encourage deep rooting of landscaping, rather than for brief periods often; and to encourage low-water-demand plant selection for landscaping (xeriscaping). (2) Sponsoring of public workshops on water-efficient irrigation and landscaping as a public service. (3) Revision of landscaping standards in residential and commercial site development zoning regulations to require water-efficient landscaping cultivar selection and irrigation systems. (4) Development and placement of attractive placards in guest facility bathrooms reminding visitors that they are visiting a beautiful desert in which water is limited, and spelling out ways they can conserve water during their stay.

Some of these efforts were implemented. The public workshops and placard placement were not. Given the level of conservation that the 2006 plan purported to have been achieved in the previous period, these more intensive efforts were not deemed urgent or warranted. The City has not monitored or determined to what extent any of these efforts contributed to water conservation, especially since most of the efforts were not implemented in a systematic fashion, and the City was not aiming for specific numerical conservation goals.

Study and Adoption of Incremental Water Rates Keyed to Excessive, Wasteful Use

The 2006 plan called for the development of a water conservation rate structure. The City has completed an analysis of options with respect to developing a water conservation rate structure. The proposed structure would entail a graduated billing system that charges progressively more per gallon for water as usage increases. The new structure has not been adopted for several reasons. The first reason is that the proposed structure does not deal with commercial water conservation, and this is a complex issue that needs to be addressed. The second reason is that the proposed structure does not differentiate between indoor and outdoor use. The differentiation is important, given the challenges outlined in this Plan. The last reason is that the City has not

been aggressive in dealing with water conservation measures, given the assumption that previous and current water conservation had produced desired results.

Expansion of the Secondary Water System to Replace Culinary Water with Irrigation-grade Water

This item has not been pursued, since overall demand on the City's culinary water system has declined slightly during the term of this plan, and because of the complexity of the endeavor. See the above section for a discussion of the possibility of linking a City of Moab and Spanish Valley secondary water system that would substitute surface-diverted for pristine culinary water for irrigation throughout Spanish Valley, conserving pristine groundwater from the sandstone aquifer for culinary use. If the systems were so combined, it is logical that the point of diversion for those of the 711,609 Moab Irrigation Company water shares representing South Fork of Mill Creek flow would be moved upstream to the Sheley Diversion on Mill Creek which feeds the Ken's Lake irrigation reservoir, from which water would then gravity-feed the pressurized secondary water system throughout the valley. The effects of this arrangement on the recharge of the Matheson Wetlands Preserve requires study so that appropriate mitigation measures can be taken.

WATER CONSERVATION GOALS

Considerations in the Development of Appropriate and Realistic Goals

The City of Moab's Conservation Goals for the next five years need to take into account past conservation outcomes, challenges and constraints, and long-term prognosis for the viability of water resources.

The City of Moab has seen a fairly steady decline in total water consumption and per capita water consumption over the past 15 years. Delivery of water through residential meters has decreased from a 1996-2000 average of 1,353,960 gallons per day to a 2006-2010 average of 876,616 gallons per day, a 35% decrease over a 15 year period. Per capita water consumption has decreased 7.9% from the 2001-2005 time period to the 2006-2010 time period. This decline was seen despite only moderate conservation efforts. While it appears that there is room for further conservation, especially with respect to outdoor usage, it may not be reasonable to expect continued large reductions in water consumption. Goals must be realistic in this respect.

It is also important to address the challenges and constraints in the development of short and long term water conservation goals. The fact that the City of Moab has not implemented intensive conservation efforts in the past, the overall public perception about the availability of water, the fact that Moab's outdoor water use is relatively high, the need to maintain water flow into the

wastewater treatment plant to ensure its efficient operation, and the issues related to preserving and promoting the secondary water system all must be taken into consideration.

Lastly, it is important to recognize that there is uncertainty associated with understanding the City's water sources. While it appears in looking at spring flows and water rights that the City has plenty of water for the foreseeable future, there are issues such as water quality, drought conditions and unknown factors that may affect our water sources. These issues point to the need for conservatism.

Numerical Goals for Water Conservation

The average per capita residential water consumption for 2006-2010 was 175 gallons per day per capita. This is a 7.9% reduction from the previous five year period. The average total water delivered for the 2006-2010 was 1,593,714, a 17.2% reduction from the previous five year period. These numbers constitute the benchmarks by which future conservation should be measured.

Given the challenges and constraints addressed above, the City can reasonably aim toward **reducing residential per capita water consumption by an average of 5% over the next five years. This means that the City would aim toward an average for the period of 2011-2016 of 166 gallons per day per capita.**

Given the need to address the consumption of culinary water for outdoor uses, **the City should aim to reduce its consumption of residential water during the months of May-September by 10%.** The City will need to establish a 2011 benchmark in order to measure this usage. This benchmark should be established by February, 2012.

Given the City's use of culinary water for use on city park areas, **the City should aim to reduce its per acre use of culinary water for park use by 10% over the next five years.** The City will need to establish a 2011 benchmark in order to measure this usage. This benchmark should be established by February, 2012.

RECOMMENDATIONS FOR IMPLEMENTATION OF ADDITIONAL WATER CONSERVATION MEASURES

The following measures should be implemented in an attempt to meet the City's Numerical Goals for Water Conservation:

Public Education on Wise Water Use

The city has not engaged in public education on the wise use of water for several years. It is recommended that these efforts be reinvigorated, with an emphasis on the need for water conservation in the use of culinary water for outdoor usage. The following measures should be implemented:

(1) Publishing of news releases about the City's water sources, the city's water conservation plan, and the emphasis on the reduction in the use of culinary water for outdoor purposes.
(2) Renewal of City public education through the media and bill enclosures, reminding people to not water in the heat of the day; to water for a long period of time at intervals to get deep penetration of water and encourage deep rooting of landscaping, rather than for brief periods often; and to encourage low-water-demand plant selection for landscaping (xeriscaping).
(3) Sponsoring of public workshops on water-efficient irrigation and landscaping.
(4) Publishing of information on water use audits for residential uses.

Adoption of a Water Conservation Rate Structure that Encourages Conservation of Water for Outdoor Purposes

Pursuant to the 2006 plan, the city studied and developed a water conservation rate structure keyed at reducing wasteful use. Unfortunately, the proposed structure, which was never implemented, did not adequately provide for commercial use, and did not differentiate between indoor and outdoor use. As discussed in this plan, the issue of the conservation of water used outdoors is extremely important for the Moab water system.

The City should re-examine this study and move toward implementing a water conservation rate structure that specifically addresses outdoor use for both residential and commercial use. This rate structure should be implemented in 2012.

Implementation of Measures to Reduce City and other Governmental Users' Use of Water on Lawn Areas

The City should work with other governmental users in taking measures to reduce application of culinary water to large lawn and other planted areas. The City should conduct water usage audits of city and other facilities to determine more efficient water application and lawn maintenance practices. These efforts should begin in 2012. In addition, the City should continue to consider alternatives to grass and other high water plants when developing new parks and park areas. In addition, the City should work with Moab Irrigation to determine if it is feasible for the City to acquire water shares. This could potentially reduce the City's reliance on culinary water for city use, and add more city control over the use of runoff water for irrigation purposes.

Addition of Water Conservation Efforts to the City's Sustainability Plan

Although the City will not be able to hire a Water Conservation Coordinator, it is recommended that the City incorporate water conservation into the City's Sustainability Plan. This plan outlines yearly action steps for obtaining specific sustainability goals.

APPENDIX 1

Resolution # 23-2011

A RESOLUTION ADOPTING THE WATER CONSERVATION PLAN UPDATE 2011 FOR THE CITY OF MOAB

WHEREAS, Utah water providers are required to update their water conservation plans every five years; and

WHEREAS, the City of Moab's last update was adopted in 2006; and

WHEREAS, the Water Conservation Plan Update 2011 for the City of Moab is attached to this resolution; and

NOW THEREFORE, we, the Governing Body of the City of Moab do hereby resolve to adopt the Water Conservation Plan Update 2011 for the City of Moab in substantially the form attached to this resolution and to direct the appropriate parties to submit said plan to the State of Utah.

Passed and adopted by action of the Governing Body of the City of Moab in open session this 13th day of December, 2011

SIGNED:

David L. Sakrison, Mayor

ATTEST:

Rachel E. Stenta, City Recorder