CITY OF MOAB
PUBLIC HEARING
WATER CONSERVATION PLAN UPDATE

The City of Moab will hold a Public Hearing on Tuesday, November 9, 2021, at approximately 7:00 p.m. in the Council Chambers of the Moab City Offices at 217 East Center Street, Moab, Utah.

The purpose of this hearing is to solicit public input on the draft Water Conservation Plan Update.

In compliance with the Americans with Disabilities Act, individuals needing special accommodations during this meeting should notify the Recorder's Office at 217 East Center Street, Moab, Utah 84532; or phone (435) 259-5121 at least three (3) working days prior to the meeting.

/s/ Sommar Johnson
City Recorder

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Water Conservation Plan Update 2021

City of Moab

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Acknowledgements

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INTRODUCTION

The City of Moab 2021 Water Conservation Plan has been prepared to comply with the Utah Water Conservation Plan Act of 1998 amended in 2004 with HB71 Section 73-10-32. Statute requires that every Utah water conservancy district and water retailer adopt a Water Conservation Plan every five years and file the plan with the Utah Board of Water Resources. This 2021 Water Conservation Plan Update presents updated data for water supply and demand, trends, future growth and consumption projections, and proposes policies and actions to achieve regional conservation goals.

The Regional Water Conservation Goal for the "Upper Colorado River" area (Carbon, Emery, Grand, and San Juan Counties) is 20% by 2030, from an average of 333 gallons per capita per day (GPCD) to 267 GPCD. Moab is close to this goal and is currently at 278 GPCD according to 2020 population estimates. The 2020 Census data will be available in 2022, at which time, the City will have a more accurate resident number, and it is likely the actual GPCD will be lower.

The City proposes to meet and exceed the Regional Goal by setting a new goal of 230 GPCD by 2030. This represents a 50% decrease in outdoor landscape irrigation and would result in the total volume of residential water use staying the same, while still accounting for the projected increase in population. A goal of 230 GPCD by 2030 is a representation of the water conservation values of the community and an effort to keep water use at a safe level to ensure a sustainable quality of life for the City of Moab and its environs.

To meet this goal, the City plans to implement a suite of water conservation measures including policies, outreach, infrastructure improvements, and water resource management planning. Proposed policies include regulating landscapes and turfgrass for new development, water wise development standards, and re-landscape incentives. Outreach and education for current residents as well as making technical resources and expertise available are a key component of meeting the City's goal. The City has committed to system upgrades which will be completed over the next five years and have the potential to reduce loss and improve efficiency, as well as development of a new source (well). In addition, the City is embarking on a water resource management planning effort in coordination with other water providers who share the groundwater supply, to make smart decisions now and prevent shortages in the future. Underpinning all of these efforts is on-going research by state, local, and federal agencies to improve data accuracy and forecasting.

Data for this plan comes from ongoing studies by the Utah Division of Water Rights (DWR), the United States Geological Survey (USGS) and the Utah Geological Survey (UGS) as well as the City and neighboring water users, Grand Water and Sewer Service Agency (GWSSA), and Moab Irrigation Company (MIC). Population data was derived from the 2010 US Census and Census.gov estimates.

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SECTION 1: SYSTEM PROFILE

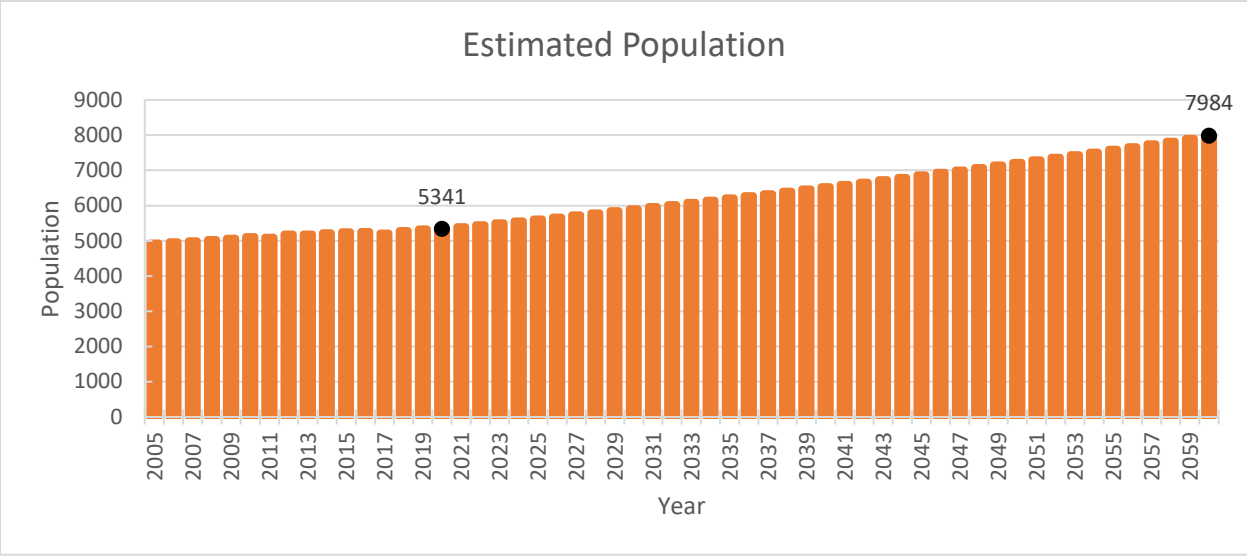
1.1 History, Government and Population

The City of Moab was incorporated in 1902 and is the largest city in Grand County. The City of Moab has a Council-Manager form of government, with five elected Council members, a separately elected Mayor, and an appointed City Manager.

The semi-arid climate of Moab is characterized by hot summers and cold winters, with one inch of precipitation per month evenly spread over the year. Moab has been known for ranching and agriculture, uranium mining, film production and tourism over the decades. The area serves as a gateway to Arches and Canyonlands National Parks, Bears Ears National Monument, the Colorado and Green Rivers and the La Sal Mountains. It is home to world-renowned mountain bike, hiking and 4x4 trails, and the area hosts millions of visitors each year. Dramatic upticks in visitation in the past decade have resulted in explosive development of tourist amenities such as overnight accommodations. This transient population makes water planning more complicated, and can be a point of contention for those concerned that our GCPD does not differentiate between visitors and residents, resulting in each resident being "responsible" for some portion of the tourism impact. Please see Section 6, Water Conservation, for more details.

The resident population of the City has slowly grown over the past ten years, with an average estimated growth rate of 1.01% / year. Current resident population is estimated at 5,341 using this assumed growth rate, and will be updated with the 2020 Census data available in 2022. The greater Spanish Valley area, including northern San Juan County, sits at around 10,000 people, including the City of Moab. This is the most useful population number for long-term water resource management planning, as these are the total users of the water supply. Moab City alone could see an increase of approximately 2,500 people in the next 40 years, if the average growth rate stays the same.

Fig 1. Projected Population Growth



However, build-out projections are complex, and have many different scenarios based on current zoning, potential zone changes, types of uses, and possible future regulations such as water availability. 2020 Census data may be higher than the previous growth rates, and post-covid, Moab seems to have undergone a boom in popularity if the housing market is any indication of current residential demand.

There are currently 240 undeveloped properties within City limits, representing 725 buildable acres (there are 1116 vacant acres, but the remaining 391 acres are unbuildable due to natural hazards). Approximately 30% of these are zoned for commercial uses. The lowest end of the build-out scenario is one single-family dwelling on each residentially zoned property and non-residential uses on the others, which adds only about 223 people (using as average of 3 people / household) to the projected population. The build-out number gets much higher assuming each property uses their total density allowance, and higher still if any are rezoned to zones allowing more density than currently permitted. With a medium scenario, where every vacant residential property is subdivided and developed to the maximum density allowed by current zone (excluding multi-family options), then there are 3,000 new units built, and approximately 9,000 more people.

The City is currently looking into these various scenarios to develop smart land use policy based on limited resources and community desires. The matter is complicated further by the addition of other water users outside City limits who share the aquifer – residents of both Grand County and San Juan County. Acknowledging this reality is the inspiration behind the initiation of the Moab Spanish Valley Water Providers Coalition, a water resource management planning group to be convened later in 2021.

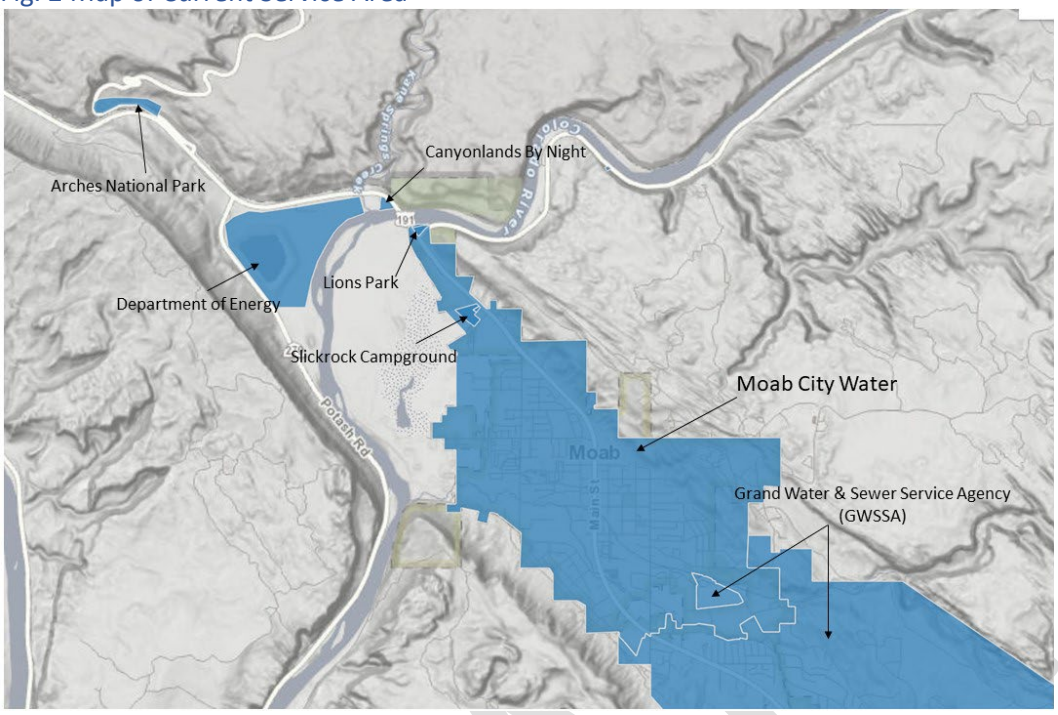
It is impossible to address the population of Moab without representing tourism. Though the City only has around 5,000 permanent residents, the area (including Spanish Valley) sees more than a million visitors per year, many of which stay at least one night in the many overnight accommodations available in both City limits and Grand County.

1.2 Water governance structure

The City of Moab is the sole provider of culinary water to all City residents and businesses. The Moab Irrigation Company provides some irrigation water to its members in town, and Grand Water and Sewer Service Agency serves residents outside of City limits. There are a few exceptions such as the new USU campus which will be within the City but served by GWSSA. City of Moab water is supplied, delivered, and billed by City staff within the Public Works, Engineering, and Treasury departments.

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Fig. 2 Map of Current Service Area



1.3 Water Distribution System

The Moab City culinary water system is fed by six sources: two wells and four springs. One additional well is currently being developed and should be on-line in 2022. Source water is stored in three tanks with a total capacity of 3.0 MG, with one additional tank scheduled for construction in the next several years. Approximately 52 miles of pipes, ranging in size from 4 to 21 inches in diameter, distribute water from the storage tanks throughout the City's service area.

The City's water delivery network comprises three pressure zones. The three zones are referred to as the Lower, Middle, and Upper Zones, with the names corresponding to the relative elevations served by each pressure zone. In general, the topography in Moab slopes toward the Colorado River. Therefore, the Lower Zone is on the northwest side of the City, closest to the Colorado River, with the progressively higher Middle and Upper Zones located to the southeast. These zones are separated with pressure reducing valves (PRVs). Due to PRV interconnections between pressure zones, excess storage located in higher zones can be applied to zones that are low. See Section 2 for volume and supply information.

Table 1. Number and Type of Connections in 2020

Type of Connection	**Number in 2020**
Residential	1,773
Commercial	430
Institutional	60
TOTAL	2,263

The City of Moab's water system operates as an Enterprise Fund in which fees are charged to users of the system to pay for the costs. The Water Fund revenue sources consists of water base and usage fees from residential and commercial customers, bulk water sales, water impact fees, and proceeds from debt service secured by water rates. In April of 2021 the water revenue was used to secure a bond to enable the City to complete a backlog of necessary water related projects in the next five years, including developing a new well, Well #12. These projects also include water line improvements along Mill Creek Drive, a new two million gallon storage tank on Spanish Valley Drive, and various optimization projects on existing facilities. The Water Department keeps up on leak and loss maintenance regularly (see Section 4).

1.4 Water Treatment System

The new Wastewater Reclamation Facility was built and became operational in 2019, saving the City 200,000 gallons of water per month, on average. There is an opportunity to upgrade the treatment system so that water flowing through the plant could be discharged into the Matheson Wetlands and re-used once again before joining the Colorado. As water management between providers in the Valley and ecological concerns are brought to the table, this may become a path the City chooses to take.

SECTION 2: SUPPLY

2.1 Sources – Aquifers, Surface Water, and Water Rights

2.1.1 History

As desert country first settled by Europeans in the mid-19th century, Spanish Valley with the La Sal mountains to the east looked like a water-secure place for the foreseeable future. That changed in the mid-1950s with the uranium boom and a sudden influx of people. Moab and Spanish Valley grew to about 3000 people at that point, and then it changed again for good with the creation of Arches and Canyonlands National Parks, and the outdoor recreation economy. The County has since grown to 10,000 permanent residents and shows no signs of slowing.

Besides Moab City, several water providing entities share one valley, one mountain range and two very complex aquifers, and are facing a finite water supply. Private rights holders, Moab City, Grand County, Moab Irrigation Company (a non-profit irrigation company with senior rights to much of the valley's surface water), and the northern end of San Juan County all share, cooperate and compete for both agricultural irrigation supply and domestic culinary water. There is wide-spread sentiment that the state has over-allocated water rights, particularly in the light of recent research and climate change projections. Recently the focus has changed from "Who has rights?" to "Are we at safe yield?" a relatively recent state prohibition against mining aquifers.

The state's Division of Water Rights is nearly finished conducting a three-year adjudication process, an effort to put unused water rights back in the public domain. After this process is completed, the paper water rights should match wet water a little better, though the over-allocation issues remain.

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The Water Conservation and Drought Management Board was created with the adoption of the previous Water Conservation Plan in 2016, and has worked to address some of the issues facing the Valley in the intervening years. With the emergency drought situation of 2021, water has come more to the forefront of the conversation with citizens and Council people alike stepping up efforts to integrate conservation practices into the community and do longrange water planning as a joint effort with all the water providers in the Valley at the table. It is no longer time to pretend we are separate – the water flows underground and is used by all. Hopefully, with a constructive process and good leadership, there will be an agreement reached regarding a number for "safe yield," whether that is a number codified by the State Engineer or a number that the water providers agree on remains to be seen. With conflicting science and missing data, it seems prudent to wholeheartedly embrace the precautionary principle and make conservative estimates now to preserve water supply for an uncertain future.

2.1.2 Aquifer and surface water descriptions and maps

During the last several years the City, GWSSA and several other concerned entities funded a USGS study to help better understand the aquifers in our area (citations here). The City of Moab also hired a consulting firm, Hydrologic Systems Analysis, LLC, to further understand this very complex system. The study can be found in the appendix.

Due to the complexity of the aquifers fed by snow melt from the La Sal Mountains there is not complete agreement on exactly how the system functions, and there is still a wide range in the estimates of how much water is in the aquifer and what the recharge rate is. This discussion is ongoing in the community and will be a part of groundwater management planning efforts.

In the 1970's the total water budget including the GCGA and the Valley Fill Aquifer was about 20K acre-feet per year, as estimated by the USGS. In 2018 the USGS completed a more extensive set of field measurements and reduced its budget estimate to 11-13K acre-feet. In 2020, a Journal of Hydrology (pre-publication but peer-reviewed) article by one of the previous USGS authors using extensive geo-chemistry tracing and age-dating techniques estimated the annual GCGA recharge (from the "deep" portion of it) that sources culinary springs and wells) at less than 4000 acre-feet. This is an interesting number, since if it holds up to scientific scrutiny and usefully narrow error bounds, it is about what is being withdrawn from the GCGA now. This would be game changer for both the area's residential and commercial growth and its conservation practices.

The complexity of our water source not only makes quantifying it difficult, but it also means our water supply is relatively invisible to residents and visitors alike. Conservation of a resource that may only be understood to be gone when wells run dry creates a challenging conservation planning atmosphere. The City of Moab and others in the community can lead the conversation about understanding our water system, how we are working to ensure the security of our water supply, and how every resident can help through water conservation.

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Table 2. SUPPLY CATEGORIZED BY TYPE of SOURCE**

	5-yr average	2016 (2,388 AF)	2017 (2,540 AF)	2018 (2,478 AF)	2019 (2,264 AF)	2020 (2,218 AF)
Springs	1,444.01	1,386.32	1,506.30	1,439.42	1,265.64	1,321.94
Wells	1,024.47	1,001.18	1,033.48	1,038.74	997.86	896.44

2.2 Secondary Water (Irrigation Sources)

2.2.1 Moab Irrigation Company

Moab Irrigation Company (MIC) is a non-profit organization founded circa 1890 which has senior water rights to almost all of the water in the Mill Creek drainage, including North Fork, which is usually around 6,000 acre-feet per year. Headwaters of both branches of Mill Creek are high on the west side of the La Sal mountains. Mill Creek is the principal drainage supplying water to Spanish Valley.

There are three diversions in the upper reaches of Mill Creek that supply water to three ditches – Wilson Mesa, South Mesa, and Horse Creek – for agricultural and irrigation uses. There is another large diversion, discussed below, supplying water through Sheley Tunnel to Ken's Lake, which is a reservoir supplying irrigation water to upper valley users.

There are three more diversions on Mill Creek below its confluence with North Fork. The two lower dams are near each other and not far from the intersection of Spanish Valley Drive and Powerhouse Lane. The uppermost dam of this group supplies mostly small farms on the southeast edge of the city. The remaining two dams supply two "ditches" (long since replaced by closed plastic piping) that stretch from east to west across Moab City. The users on these ditches are more than a hundred of mostly urban landscapers who enjoy relatively inexpensive irrigation water compared to what it would cost to irrigate with City culinary water. Delivery takes advantage of the steady downhill grade to the west to hydrostatically pressurize the pipelines; no pumps are used. The majority of these users flood irrigate their properties.

Since 1980, all flow (except a BLM required 3 cfs minimum in-stream flow) in Mill Creek is diverted by Grand Water and Sewer Service Agency (GWSSA) into Ken's Lake where it is used for irrigation in the upper valley. *[A hydrologist employed to study the City's culinary water supply asserts that this reduced (since 1980) stream flow has detrimentally reduced the city's production from its springs and wells at the golf course as well as Skakel Springs farther north along a NW trending Kayenta fault line.]* MIC charges GWSSA for this diverted water, and in turn if MIC wishes to augment its city pipelines in late summer (a common occurrence in recent frequent drought years) when Mill Creek flow is low, GWSSA charges MIC for water pumped from Valley Fill Aquifer wells in the same geographic area as MIC diversions. Ken's Lake also owns a large number of MIC shares, for which it pays an assessment fee like any other MIC shareholder.

In summer, MIC frequently takes all Mill Creek flow at its two lower dams to serve its users, leaving Mill Creek almost dry, particularly in the daytime when more people are watering than they do at night. Water does seep back into the creek below the lower dam so that by the time Mill Creek crosses Main Street (Hwy 191) there is some flow back in the creekbed. The

aesthetics and ecological amenity of leaving some modest flow, ideally even in drought years, in the creek all the way through town is desirable, but there's not enough water to serve MIC customers and leave some in the creek unless water distribution can be made more efficient. Doing so is certainly possible, but it requires considerable upgrade to both MIC and user systems with technologies such as pumps, timers, tanks, automated diversion dams and automated valves. Surface water is messy to handle, involving foreign material such as sand, limbs, leaves and beavers, making the situation more complicated.

Similarly, the idea surfaces periodically of using MIC water, its pipelines, or at the least its right-of-way through town to grow a secondary municipal water system. This is possible, but likely means converting MIC from a non-pressurized to a pressurized, metered system, which is not currently in City or MIC budgets.

2.2.2 The Colorado River

Another potential secondary irrigation system is surface water out of the Colorado River. The City of Moab has the opportunity to conserve culinary water and add non-potable supply for outdoor irrigation needs by converting some of the groundwater rights to surface water from the Colorado. Developing this system would cost many millions of dollars and take years of planning and infrastructure installment and is not within the scope of City capital improvement projects at the moment. However, as a means to further conserve culinary water supplies, this development could be well warranted in the future.

2.3 Water Rights

The City of Moab holds 8,795AF in water rights currently.

SECTION 3: WATER MEASUREMENT

3.1 Water Measurement Methods and Practices

Moab city uses Neptune R900i T-10 gal water meters. We read all water source production meters daily for data collection and all customer-based meters at the beginning of each month for billing. We test or replace malfunctioning meters immediately as we discover them. If we suspect a meter is reading inaccurately we will remove the meter, bring it back to the shop and verify its accuracy by installing it on the water meter testing station and measure the gpm's.

Rough estimates on meter size percentages are ⅝- 90%", 1" 2-4%, 2" 2-4%, 3" 1-2%, 4" 1% & 6" less than 1%. We replace as needed. We try to keep enough meters on hand to keep up with replacements and cold winters. Back in 2014-15 we had a really cold winter with average temps below 0 at night and single digits during the day for 3-4 weeks. That year we replaced roughly 175 frozen meters and thawed or repaired 24 frozen service lines. Last year we replaced 2 frozen meters and no frozen service lines.

We have connection and impact fees for each size of connection based on the size of connection and its usage. New developments and meter sizes are engineered according to ERC's (Equivalent Residential Connection).

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SECTION 4: SYSTEM WATER LOSS

4.1 Water Loss

There were approximately 550 acre-feet of water, or about 20%, lost between production and metered connections in 2020, which is typical for recent years. The City engineering and public works team attributes this loss to four possible causes:

1. Dispersed Leaks: individual leaks may be too small to be noticed but taken together could have a significant effect. Water lines are in various types of soils, some of which may be able to absorb a slow leak for a long time without evidence showing.
2. Water Line Breaks: these are repaired quickly, but large amounts of water can be lost during the leaking period.
3. Unmetered Connections: there may be older connections that are as yet unmetered.
4. Fire Hydrant Exercise: Public Works exercises fire hydrants on a schedule, and the water expelled is not metered.

4.2 Leak Detection and Repair

Moab City has four full time Water Department personnel directly supervised by the Public Works Director. They work around the clock to provide safe drinking water for the City of Moab. They monitor and perform regular maintenance on the water production and treatment process daily and always make necessary repairs immediately. They have a SCADA system that is able to monitor and control various parts of the water system remotely from a desktop computer or a phone app with full control of all the pumps in the system. This means they are able to see intrusion alarms and all of the tank levels in real time.

The Water Department takes leaks seriously and responds immediately to all identified issues, making a conscious effort to lose the least amount of water possible during repairs. They are always on high alert and inspecting the water system for leaks and have personnel on-call 24/7 through local dispatch through the Sheriff's office or by the on-call number (435)210-1982. The City Water Department responded to 35 water leaks in 2020 and completed repairs on eight water mains and 22 service lines.

The Treasury and Water Departments work closely together on water conservation. The Water Department reads all water meters, most of which are digitally broadcast, and reports those readings to the Treasury Department monthly. The Treasury Department is able to identify high usages through their billing software which creates a re-read list. The Water Department will then verify the unusually high readings on the ground and report the conditions back to the Treasury Department. If there is evidence of a water leak the homeowner is notified immediately and work begins on a solution. When the leak is properly fixed, the homeowner can request a rebate on the amount of their water bill caused by the leak. This is intended as an incentive to fix leaks and not simply let them run, although, that has happened in the past, and it may be time to add a penalty for those who do not choose to fix their leaks.

In addition, the Water Department works to educate customers on ways to conserve water. From irrigation watering schedules to overflowing swamp coolers and leaking faucets, they help customers identify high usage areas and come up with solutions.

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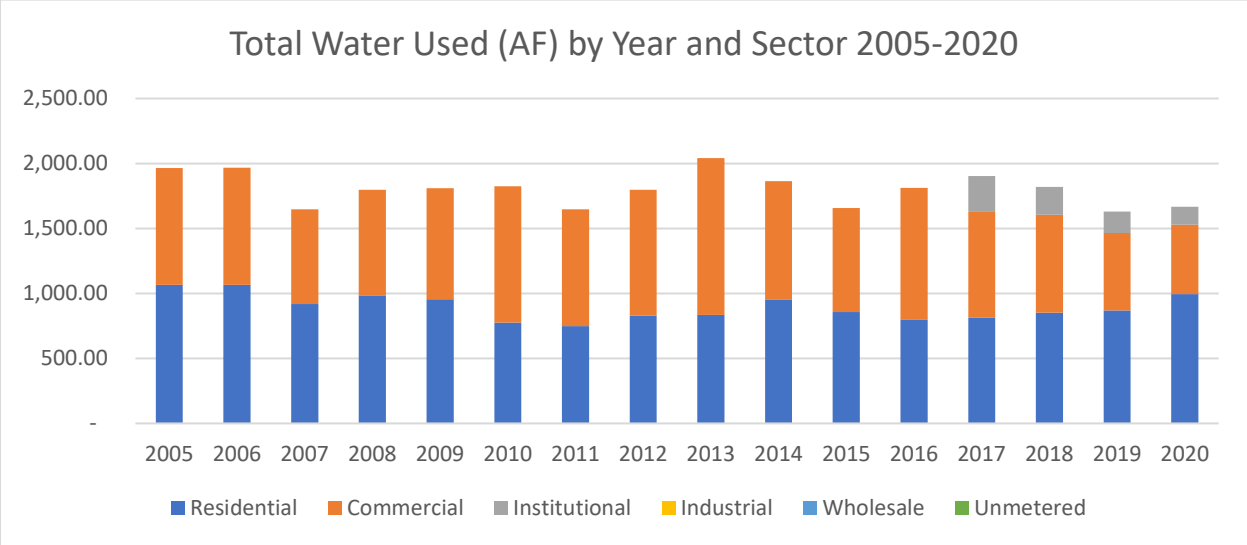
In an effort to maintain water quality the Water Department cleans and inspects water storage facilities every five years. They flush low flow and dead-end lines on a regular basis and upon restoring water after an outage, they flush water mains until free of sand. There is sediment that flows naturally from the springs and settles in main lines due to aging infrastructure. New infrastructure additions strictly follow AWWA water standards. From installation and pressure testing to treatment and sampling all applicable standards are followed every time to maintain water quality.

SECTION 5: WATER USE

5.1 Water Use

Total water used from 2005 – 2020 has decreased. In recent years, the proportion of water going to commercial uses has begun to decrease in comparison to residential use as well, as the City becomes more built-out and residentially focused, and commercial and agricultural uses move out into Spanish Valley. The City has set the goal of a 50% reduction in outdoor landscape irrigation by 2030 to effectively keep residential draw the same as it is today, regardless of the projected increase in population.

Fig. 3 Water Use by Sector and Year



The City of Moab only began keeping records on non-potable water production and use in 2017. There are only three connections that are considered non-potable water used for irrigation. Well #7 is used exclusively by the Golf Course for spring irrigation to make up for shortfalls when their usual water source (GWSSA) does not have enough supply. They use varying levels per year depending on available surface water. The City Center well is exclusively used for irrigation of City facilities near City Hall, and McConkie spring is a diversion near Old City Park used for irrigation there.

Table 3. Potable vs. Non-Potable Water Use

SOURCE	2020	2019	2018	2017
City Center Well	**1.35**	N/A	N/A	N/A
McConkie Spring (Irrigation)	**120.00**	**120.00**	**120.00**	**152.03**
Well #7 Golf Course (Irrigation)	**8.43**	**18.00**	**182.70**	**41.06**
Total Per Year	**129.78**	**138.00**	**302.70**	**193.09**

5.1.1 Water Use – Permanent Residents

Total water use has been trending downwards in the past 15 years, even as population has risen. This is due to shifting uses from commercial and mining towards residential, conversion of agricultural land to residential use, replacement of an old sewage treatment facility, and likely some water conservation awareness as well. In 2005 the total water used was 1,965 acre-feet and in 2020 the total was 1,667 acre-feet. *The City of Moab aims to keep total water use at or around the current level into 2030, regardless of population growth.*

Fig. 4 Population vs Water Use

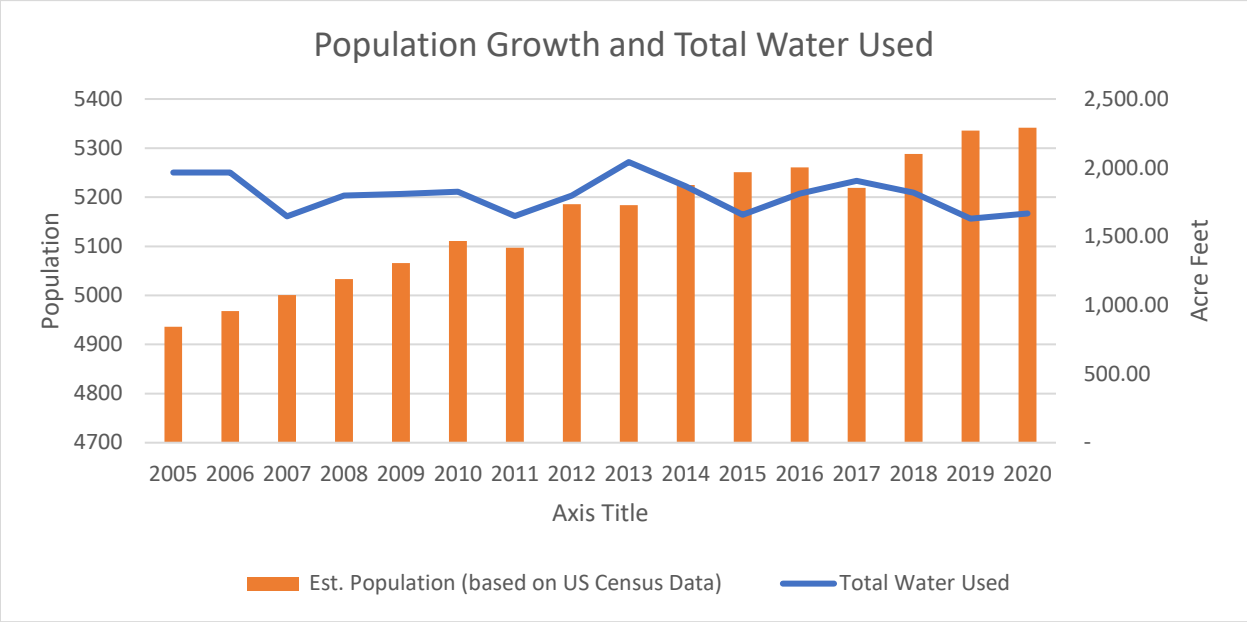


Fig. 5 Gallons per Capita per Day by Type

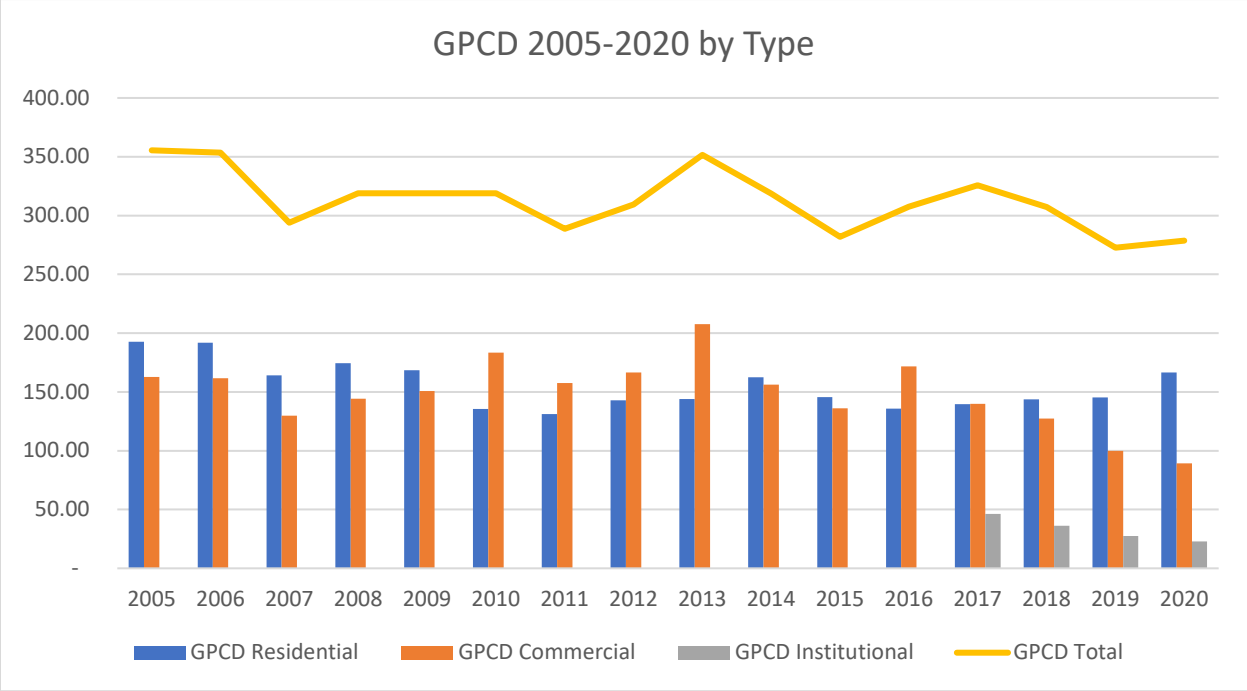


Table 4. Gallons per Capita per Day 2005 - 2020

Year	Population	GPCD Residential	GPCD Commercial	GPCD Institutional	GPCD Total
2005	4936	192.76	162.72	-	355.48
2006	4968	191.78	161.60	-	353.38
2007	5001	164.18	129.78	-	293.96
2008	5,033	174.56	144.34	-	318.89
2009	5,066	168.42	150.65	-	319.06
2010	5,111	135.46	183.40	-	318.87
2011	5,097	131.05	157.60	-	288.64
2012	5,186	142.79	166.56	-	309.35
2013	5,184	143.89	207.67	-	351.56
2014	5,225	162.38	156.24	-	318.62
2015	5,251	145.69	136.18	-	281.88
2016	5,261	135.68	171.73	-	307.41
2017	5,219	139.50	139.97	46.21	325.69
2018	5,288	143.66	127.38	36.12	307.17
2019	5,336	145.33	99.91	27.43	272.67
2020	5,341	166.47	89.23	22.97	278.67

5.1.2 Water Use – Visitors

No discussion of water use in Moab would be complete without addressing the impact of our many visitors. Currently, overnight accommodations account for approximately 16% of the commercial water used. In 2019 (a more typical year than 2020), this was a total of 95AF. Of course, this does not include the proportional use of visitors at businesses which serve mostly tourists such as restaurants and the car wash. This proportional use would be difficult to accurately account for unless individual surveys were taken at each establishment – an effort no one is currently undertaking. Regardless, as visitors increase, we can expect their water usage to increase concurrently unless more conservation measures are implemented at overnight accommodations. Outreach efforts are part of the five year conservation plan.

5.2 Water Production and Projections

Table 5 Water Produced by Source / Year

Water Source Data (AF)						
	5-yr average	**2016 (2,388 AF)**	**2017 (2,540 AF)**	**2018 (2,478 AF)**	**2019 (2,264 AF)**	**2020 (2,218 AF)**
Birch Springs 1,2,3 (WS003)	535.82	515.78	551.85	539.83	503.63	468.42
Sommerville Springs Nos. 1 & 2 (WS001,2)	535.79	518.19	572.11	517.06	472.09	469.22
Well No. 10 (WS010)	529.13	533.68	565.79	487.91	521.26	409.36
Well No. 6 (WS007)	415.20	450.83	426.63	368.13	458.60	478.65
Skakel Springs (WS012)	241.73	232.35	230.31	262.53	169.92	264.30
McConkie Spring (Irrigation, estimated)	130.68	120.00	152.03	120.00	120.00	120.00
Well #7 Golf Course (Irrigation)	80.14	16.67	41.06	182.70	18.00	8.43
Total Per Year	**2,468.48**	**2,387.50**	**2,539.78**	**2,478.16**	**2,263.50**	**2,218.38**

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Fig. 6 Water Production Trends by Source

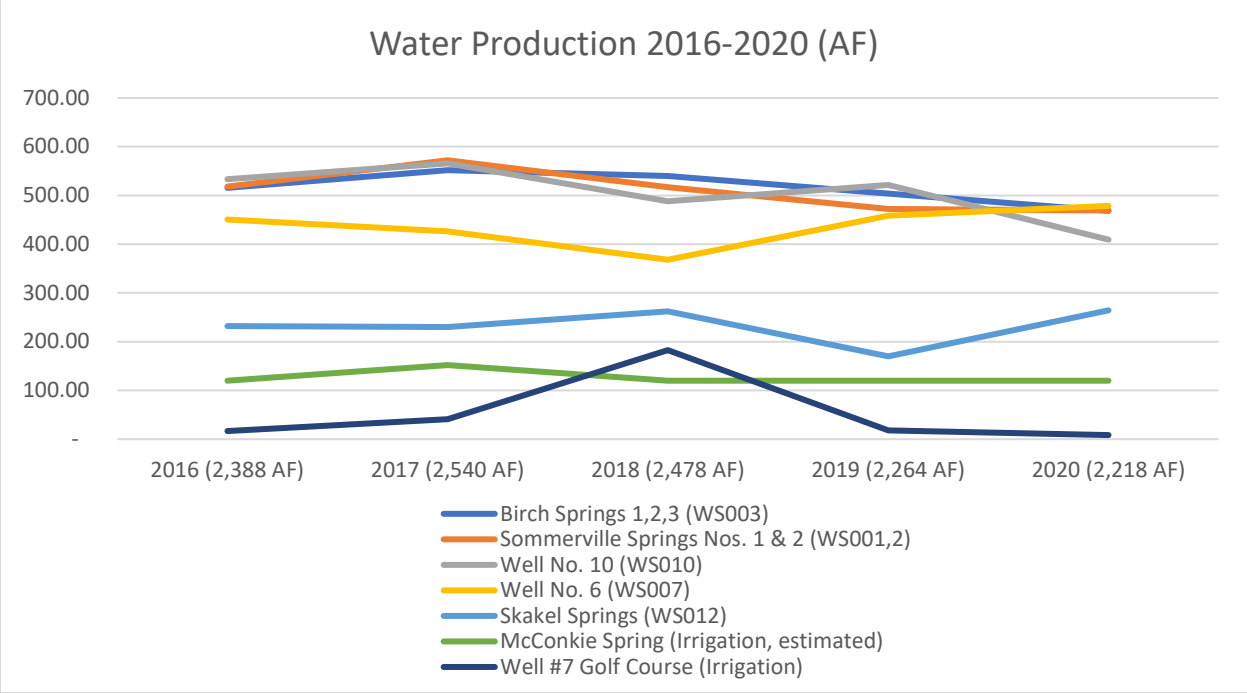


Table 6 – Source Capacity & Future Projections

Future Projections (AF)	
Existing Source Capacity	5,387.00
Estimated Water Use 2060	3,801.00
Efficient Use (2060 Water Use reduced 25%)	2,850.75

Under existing conditions, the City has an estimated surplus capacity of 19 gpm during peak day conditions with all sources in operation. However, in order for the City to have source redundancy such that no single drinking water source is indispensable, about 1,500 gpm of additional source capacity is needed. One potential option for the City to make up a portion of that deficit would be to use Well 7, or another City owned well that is not currently in service within the drinking water system. In order for one of these wells to be a viable drinking water source, Moab will need to ensure that the well meets all state requirements. In addition, as water from Well 7 is currently sold to the Moab Golf Club, the City should verify that any agreements with the Golf Club would allow the City to divert the water into the drinking water system under an emergency scenario. With a capacity of 350 gpm, Well 7 is not sufficient to provide full redundancy in the event of a loss of operation at Well 6.

As an additional option, the City could consider working with Grand Water and Sewer Service Agency (GWSSA) to explore the feasibility of adding an interagency connection between the Moab and GWSSA drinking water systems. Depending on the capacity of the connection, it could potentially serve all or part of the needed redundancy. An interagency connection has the potential to aid both parties in supplying quality water to their respective customers. As

another option, the City could also develop an additional water source. For planning purposes, it has been assumed that the City will construct a new well for source redundancy.

Under 2060 conditions, a source deficiency of 1,930 gpm is projected if no new sources are developed. In order to address this projected deficiency, it is recommended that the City develop an additional 1,930 gpm of source capacity. This is in addition to the capacity needed for existing system redundancy. It is not expected that the City will need to add all of this capacity in the immediate future. Instead, the City should periodically evaluate their source capacity and system demand and add capacity as needed. The City's Water Master Plan (Appendix B) assumed that this future deficiency will be met through the construction of two new wells, one of which is being constructed before the end of 2021. Developing the new Well #12 will cost approximately $2.39 million dollars, which has been bonded for by the City. The other well should be constructed in the future once it is needed to support growth.

5.3 Billing

The City recently updated water rates to adopt a stronger tiered rate structure to encourage conservation, particularly for commercial properties. These new rates were only recently adopted in the winter of 2020 / 2021 and have yet to see a full summer season. We are hoping that it will encourage adoption of conservation behaviors and more awareness of water use. See below for the current rates.

Residential, within the City	$13.00 minimum charge (includes the first 3,000 gal.)
	$1.13/thousand for 3,001 to 10,000 gal.
	$1.50/thousand for 10,001 to 60,000 gal.
	$1.88/thousand for 60,001 or more gal.
Residential, outside the City	$18.85 minimum charge (includes the first 3,000 gal.)
	$1.50/thousand for 3,001 to 10,000 gal.
	$2.25/thousand for 10,001 to 60,000 gal.
	$2.63/thousand for 60,001 or more gal.
Commercial, within the City	$37.50 minimum charge (includes the first 2,000 gal.)
	$1.50/thousand for 2,001 to 5,000 gal.
	$2.25/thousand for 5,001 to 10,000 gal.
	$3.40/thousand for 10,001 to 50,000 gal.
	$4.25/thousand for 50,001 or more gal.
Commercial, outside the City	$44.25 minimum charge (includes the first 2,000 gal.)
	$3.00/thousand for 2,001 to 5,000 gal.
	$3.38/thousand for 5,001 to 10,000 gal.
	$4.25/thousand for 10,001 to 50,000 gal.
	$4.68/thousand for 50,001 or more gal.
Shop Water Retail Fee (City Public Works Yard)	$32.50 for first 2,000 gallons, $12.75/1,000 gal.
Shop Water Government Fee (City Public Works Yard)	$26.00 for first 2,000 gallons, $9.38/1,000 gal.

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Construction Fire Hydrant Fee	$32.50 for first 2,000 gallons, $12.75/1,000 gal.
Construction Fire Hydrant Rental Fee	$15 per day
City Parks & Cemeteries	$0.81/1,000 gal.
Moab Golf Course Well #7	Current Commercial Rate
Water turn-on fee, after failure to pay City water/sewer charges	$25.00 during normal working hours; $50.00 after normal working hours
Water meter re-read charges	
The City crew will re-read the customer's meter.	$10.00
The City crew will test a customer's meter.	$20.00
The City crew will change a tested customer's meter, at the customer's request.	Actual labor costs with a one hour minimum
The costs incurred for these requests will be paid within thirty days. If that bill is not paid, the water will be turned off until the debt is satisfied, and a reconnect charge (1/2 hour minimum) during regular hours or reconnect charge (2 hour minimum) after hours, will be applicable.	During regular working hours, actual labor costs with a ½ hour minimum
	after hours, actual labor costs with a 2-hour minimum
If the problem proves to be the city's responsibility, there will be no charge to the customer.	

There is a space on mailed paper City bills for a small message, which can be anything from information about the new rates to conservation messages. Currently, the City is sending out the Sustainability website address as a place for water conservation tips and resources. There is current information maintained on that site as well as links to other water conservation resources and programs. Integrating these conservation messages onto e-bills will also be explored. In the future, the City is contemplating bill restructuring to include conservation goals and measurements aimed at such.

SECTION 6: WATER CONSERVATION

6.1 Introduction

The City of Moab is interested in a nuanced approach to conservation that does not simply focus on up-and-coming technologies and strategies alone (which are often the rediscovered practices of yesteryear's farmers anyway). The multi-pronged approach described in this Water Conservation Plan is comprised of policies, infrastructure improvements,

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investment in technologies and incentive programs, outreach and education, coordinated resource management, and on-going research and data refinement.

The ultimate goal is to better define and achieve conservation as a term and set of practices which become embedded in the community ethos and carry forward to a sustainable future.

6.2 Water Use Reduction Goal

In 2000, Governor Levitt proclaimed a conservation goal of 25% in GPCD by 2050 using 2000 water use as the indexing year. The conservation proclamation was aimed at municipal and industrial (M&I) users, agriculture was intentionally omitted from the goal. A few years later Governor Herbert decreased the timeline and proclaimed a conservation goal of 25% by 2025 using the same year, 2000, as the indexing year. The goals were not intended to reduce the total demand for M&I water, they were established to make room for new growth because a fair number of regions were reaching the limit of their water resources.

Since then, the Utah Legislature began getting involved which led to a 2015 Legislative Audit, followed by a 2017 Follow-up Audit, then a Third-Party Review, and finally a 2017 Recommended State Water Strategy. Those efforts recommended the State develop regional water conservation goals. The Utah Division of Water Resources (UDWR) was tasked with the project and developed the latest goals in their document Utah's Regional M&I Water Conservation Goals. Grand County was put in the "Upper Colorado Region" which also includes Carbon, Emery and San Juan County.

The draft recommendations were for the Upper Colorado Region to reduce their per-capita water consumption by another 17% and the final recommendations were for 20% reduction from average regional 2015 usage (333GPCD) by 2030. The 20% reduction for the region resulted in a recommended goal of 267GPCD. *Moab is currently at 278 GPCD (depending on accurate population data) and has set a new goal of 230 GPCD by 2030*. The table below shows the percent reduction from the year 2000 as per the original call from Governor Levitt, which Moab would meet with the 267 GPCD regional goal, and exceed with a new goal of 230 GPCD. The City will assess progress towards this goal annually when data is reported to the Division of Water Rights, and publish results on the City of Moab's website.

Table 7 Percent Change in GPCD from 2000

Year	Population	Total AF	gallons per capita day	% change from 2000
2000	4779	1926.63	359.9	0.0%
2015	5251	1657.96	281.9	21.7%
2020	5341	1667.31	278.7	22.6%
2030	N/A	N/A	267	25.6%
2030*	5906*	1667*	230*	36%

6.3 Water Conservation Metric

The State has determined the metric for conservation goals at GPCD, or gallons per capita per day. The metric is a reasonable measure if only measuring municipal use. However, adding commercial, industrial, and institutional uses into the metric is problematic because the people who are using that water may not be living in the area where the water is being used – namely, tourists. Trying to determine whether metrics represent conservation or a change in economy are not represented using the current measurements.

The City of Moab has a tourism economy. There are between 1.6 and 2.6 million visitors per year. As such, the per capita metric does not include the numbers of visitors who use at least 16% of all commercial water, or 95AF, just on overnight accommodations. This does not include the amount of water used in other businesses catering to visitors such as restaurants and washing off highway vehicles. The City of Moab is interested in considering other metrics to determine their conservation goals. One which has potential is an Equivalent Residential Unit (ERU). It is already used for a variety of requirements associated with water supply and could be a metric which allows a comparison between economies and water conservation strategies.

6.4 Current Conservation Measures

Leak protection program / rebates

The leak protection program provides a rebate for the amount assumed to be lost due to a leak after the customer has fixed it. This is intended to provide an incentive for fixing leaks.

New Water Treatment Facility

The new Wastewater Treatment Facility uses only 20,000 gallons of water per month whereas the old one used two million gallons per month. This new facility saves the City over 23.5 million gallons of water per year since it came online in 2017.

Outreach, Education

The City of Moab maintains a column in the *Moab Happenings* monthly newspaper and the monthly City Newsletter, e-mailed to those interested and those receiving e-bills for water service, devoted to issues of Sustainability. Water conservation is an important and frequent topic in these articles. In the past several years, the City has placed box ads in the two local weekly newspapers several times per year to educate readers about appropriate watering for outdoor landscaping and low-flow fixtures.

6.5 Current Conservation Ordinances and Standards

The City of Moab does not currently have any ordinances or standards addressing water conservation directly. However, the WaterNOW Alliance just awarded the City a grant for technical assistance to develop three things: 1) a greywater ordinance, 2) a landscaping ordinance, and 3) new development standards, which will be completed in early 2022. The City is looking forward to working with WaterNOW Alliance as well as Utah State University Extension experts to get smart, relevant, and up-to-date ordinances adopted as soon as possible. The City is also working on an Emergency Drought Management Plan.

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6.6 New Conservation Measures for the Next Five Years

6.6.1 Planning Efforts

The City of Moab is spearheading an effort to bring all the water providers in the valley together to create a consensus-based Water Resource Management Plan. This group will be called the Moab Spanish Valley Water Providers Coalition and consists of the City of Moab, Grand Water and Sewer Service Agency, San Juan Special Service District, and the Moab Irrigation Company. Grand County administration may or may not be part of this group. The state engineer's office has indicated that they do not believe a state-sanctioned Groundwater Management Plan is in order at this time, and that the valley aquifers have a few thousand acre feet yet to be developed. However, the water providers in the valley disagree, and are interested in avoiding a crisis situation by undergoing a planning process prior to potential shortages. Undertaken now, this process will allow for community voices to be heard, experts to be consulted, and the best available science to be included – underpinned by the precautionary principle and a desire to create a sustainable water supply for all current and future residents.

The first meeting of this new coalition is taking place at the end of July, 2021, with the intention to meet at least monthly until the process is complete. At this point, the group will evaluate their options and intentions moving forward and develop policies in accordance with the recommendations.

6.6.2 Ordinances and Policies

A. Landscape Ordinance

The City's Water Conservation and Drought Management Advisory Board, which was formed as a result of the 2016 Water Conservation Plan, recommends developing a landscape ordinance which would have three main components. 1) Requiring new development to use waterwise landscaping principles, limit or omit turfgrass, and design in conjunction with greywater systems (see below), 2) Instituting outdoor landscape watering rules for all residents during times of drought (see Drought Management Plan), and 3) Developing a recommended/required species list for any new development in Moab. This effort will be particularly helpful in conserving culinary water supply, which is currently being used as irrigation water on most properties in the City for lack of a secondary irrigation system.

A key component to the success of the landscaping ordinance is outreach to current residents and businesses to encourage adoption of waterwise landscaping and abandonment of unused turfgrass. City staff is working on opportunities to improve existing demonstration landscaping around City Hall, as well as removing turfgrass and installing waterwise landscaping in prominent location. These demonstration areas will serve to encourage current residents to do the same in their own homes and will provide inspiration and education to current and future residents.

This ordinance is planned for development in 2021 and adoption by 2022.

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B. Grey Water Ordinance

Residents of the City of Moab (City) began installing grey water systems a couple of years ago as pilot projects with the Southeast Utah Health Department (SEUHD). The projects were successful and with the new information SEUHD collaborated with the Utah Division of Water Quality to re-write the rules associated with permitting grey water reuse in Utah. Since then, the SEUHD has permitted several residential homes including affordable housing projects. The systems are relatively easy to install compared to most landscaping irrigation systems and inexpensive if installed during the building of a new home.

The City plans to take advantage of the local expertise and the willingness of new homeowners to embrace these systems. This effort will make the City more resilient to drought and conserve water by reusing grey water to irrigate landscapes instead of sending it to the Wastewater Reclamation Facility and discharging it out of the area. It is estimated that new residences with lots less than .25 acres could save 50% of the water they would have used for outdoor irrigation.

The City is developing ordinances that would require the indoor plumbing associated with grey water systems be installed during the construction or remodel of new single family and multi-resident housing. The City also intends to encourage the use of these systems by refunding some of the impact fees associated with new construction to home and multi-housing units if they complete the installation with outdoor grey water irrigation.

The City is also looking to make the City's water portfolio more resilient by developing grey water ordinances for new commercial developments. The ordinance would require new commercial buildings to install either grey water or rainwater catchment systems that would provide all the water required for the landscaping associated with the new development.

C. *New Development Standards*

In conjunction with the landscaping and greywater ordinances, the City will implement standards for new development that incorporate waterwise landscaping principles and water saving construction features. Landscaping will be required to be waterwise, using a recommended list of plants and features, as well as a limitation on turfgrass area. New construction will be required to use WaterSense labeled fixtures and appliances, and stub for greywater.

D. Emergency Drought Management Plan

The City intends to develop and adopt an Emergency Drought Management Plan to prepare for a situation of actual shortfall in water production. With thoughtful pre-planning, the City will be able to take the time needed for calculations, engage the public, and decide what measures make the most sense to conserve water when a drastic situation arrives. This may involve recommendations to install infrastructure for emergency shut-offs or secondary lines in all new construction so irrigation may be divorced from culinary uses. The City aims to adopt this plan within the next five years.

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6.6.3 City Facilities Improvements

There are opportunities to improve municipal water efficiency which the City intends to complete as funds become available, beyond the infrastructure improvements bonded for and contained within the Capital Improvements Plan (mentioned in Section 1). There are three main City parks that use water for irrigating turfgrass – Rotary Park, Swanny Park, and Old City Park. In addition, the City maintains the ballfields outside City Hall and various other smaller areas. Improvements to the system involve four things:

1) installing smart timers and moisture meters for more efficient watering
2) removing grass where it is not needed
3) evaluating and fixing old systems to water where needed and not where it's not
4) replacing plants which have died and are still being irrigated, allow them to establish, and re-evaluate and reduce irrigation appropriately

In addition, there are opportunities to install green infrastructure and improve stormwater management to facilitate more infiltration and less runoff, as well as contribute to a greener streetscape. As City drainage features are renewed or repaired, green infrastructure can be incorporated into new designs and implemented where possible. If funding becomes available, the City will be able to develop a green infrastructure plan for areas where projects would be possible. The proposed greywater ordinance could work in concert with green infrastructure between residential property and City streets.

6.6.4 Outreach and Education

Successful water conservation in Moab will depend on both tangible and intangible elements. Efforts like replacing old fixtures and repairing leaks are opportunities to passively conserve water by updating systems. Behavior change is the intangible piece of the puzzle which will require a different approach. The City of Moab values the impact of education and outreach on water conservation and will be continuously working to develop a community spirit of water conservation without sacrificing quality of life or economic opportunities.

Planned outreach efforts include articles in the local newspaper, the City Newsletter, and Moab Happenings, changing the design of the water bill to include conservation-oriented metrics, creating and distributing door hangers at properties with inefficient watering systems to offer consultation and resources, educational mailings with best practices and goals, and providing resources from local landscape designers, USU extension, and other knowledge holders to assist residents and businesses in their water conservation efforts. Keeping the community informed about progress towards our conservation goals is a key component of the outreach and education effort, and an essential piece of meeting our water conservation goals.

6.6.5 Programs

If funding becomes available, the City can invest in programs to accelerate landscaping conversion and outdoor irrigation water savings. These may include the following:

- Turfgrass buy-back / rebate: providing cash payments or rebates for property owners to replace lawn with water wise landscaping (this is a common program to encourage lawn conversion)
- Conservation rebates: direct water-bill rebate rewards for meeting conservation goals on top of the tiered rates

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- Free smart timers and moisture meters: providing smart technologies to assist property owners with efficient watering
- Penalty for failing to fix leaks: adopting a penalty in addition to the rebate for failing to fix a leak in a timely manner

6.7 Responsibility for Meeting Conservation Goals

Chuck Williams, City Engineer: cwilliams@moabcity.org
Levi Jones, Public Works Director: ljones@moabcity.org
Mila Dunbar-Irwin, Sustainability Director: sustainability@moabcity.org
Carly Castle, Assistant City Manager: ccastle@moabcity.org

6.8 Action and Implementation Timeline

Year	Action
2021	• Water-wise landscaping guide sent to all addresses in Moab City including information on watering turfgrass, resources for xeriscaping, and other ways to reduce use of water outdoors • Establish Moab/Spanish Valley Water Providers Coalition
2022	• Adopt Landscaping Ordinance and Greywater Ordinance • Adopt new development standards including water wise elements • Adopt Moab/Spanish Valley Water Providers Coalition Water Resource Management Plan • Inform community of the newly adopted Water Conservation Plan Update
2023	Implement incentive programs (when / if financially feasible): ○ promote fixture replacement and inventory old fixtures where possible; ○ campaign to reduce water waste in the home and improve efficiency; ○ offer smart timers; ○ implement turfgrass buyback program
2024	Update landscaping guide and outreach regarding landscaping and greywater ordinances and new development standards
2025	Work with USU Extension to develop demonstration xeriscape garden in Moab

*progress on GPCD goal will be calculated annually after data is reported to the Division of Water Rights and published on the City of Moab's website

SECTION 7: ECOLOGICAL CONCERNS

7.1 Introduction

The Mill Creek Watershed, its creeks and the wetlands they are connected to at the Colorado River's edge, are critical components of not only a functional watershed and sustainable aquifer, but also have importance to community residents. It is critical to include functional riparian corridors and wetlands while exploring ways to ensure sustainable water for the Moab and Spanish Valley communities. Not only are the riparian corridors important for wildlife, but they also are important transportation and natural corridors through the town. Springs and

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smaller wetlands within the system arguably act as indicators of overall water quantity in the system in a qualitative way.

Water Conservation and Drought Management in the Moab Valley needs to include maintenance and enhancement of the ecological components as well as water delivery to residents and businesses.

7.2 Matheson Wetlands

The Matheson Wetland is a unique and rare wetland in the American Southwest along the Colorado River. The wetlands are not incorporated into the City of Moab's town limits, but they are sandwiched between the City of Moab and the Colorado River. They are affected by the City of Moab and the entire Mill/Pack Creek hydrobasins surface and groundwater practices. The wetlands are owned by the State of Utah Department of Natural Resources and The Nature Conservancy in approximately 50/50 split. The Wetlands are co-managed by the same two agencies.

The wetlands have had difficulty maintaining hydric vegetation during the previous two decades due to several anthropogenic and natural impacts. Climate change and drought have reduced the regularity of high seasonal flows in the Colorado that would flood the wetlands. Mill Creek historically provided some surface water and maintained the groundwater table but currently it is entrenched and several feet below the surface area of the wetlands. Increased domestic use of springs on the Northwest portion of the valley has also altered the water budget. There is also some concern that decreases in the freshwater layer by any of the previously stated means could affect the level of the brine layer under the freshwater layer and allow it to reach the surface or leach to the Colorado River.

This conservation plan suggests that the City of Moab support the wetland monitoring plan being developed by the State of Utah Division of Water Rights and management agencies of the wetlands. It is further suggested that the City of Moab and other Spanish Valley institutions pursue stormwater management plans the slow water down as opposed to diverting directly to Mill and Pack Creek.

7.3 Mill Creek

See Section 2.2.1 on Moab Irrigation Company.

7.4 Pack Creek

Pack Creek is a small stream that runs through Moab and Spanish Valley. Although Pack Creek is not a source of culinary water the aquifer below it is used for culinary and irrigation purposes. The aquifer has relatively high total dissolved solids (TDS) and the creek is not meeting the beneficial use standards for TDS, temperature and E. coli. However, the creek and the aquifer still provide irreplaceable environmental goods and services to Spanish Valley and its residents.

The water quality in Pack Creek is very good above its diversions near the USFS boundary. The water is used to irrigate a small community there. The creek is generally dry from the USFS boundary until ½ mile above Spanish Trail Road where the groundwater table becomes shallow and recharges the creek. The valley is somewhat pinched there, and several springs of varying water quality add volume to the creek. From there till the confluence with Mill Creek, Pack

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Creek and the underlying aquifer are responsible for a verdant riparian area that has several human benefits. During the irrigation season Pack Creek is responsible for most of the water in Mill Creek below their confluence due to withdrawals on Mill Creek. In the Mill Creek the Pack Creek water and the underlying valley fill aquifer also provide water to the Matheson Wetlands. The environmental concerns with the wetlands were discussed earlier in this document.

The growing population, development plans and long-term drought have made the valley fill aquifer a target for new water development. The aquifer itself has a relatively small amount of annual recharge. There are concerns that continued development of the valley fill aquifer will result in lower water tables, reduced or ceased recharge to Pack Creek and deterioration of water quality.

SECTION 8: OTHER CONSIDERATIONS

8.1 Colorado River

Moab City has water rights out of the Colorado River, and could potentially change some of their unusable groundwater rights to increase the rights out of the Colorado. This water has been contemplated for use as an eventual secondary irrigation system, relieving some of the pressure of the culinary water drawn from the aquifer and allowing for a more ready method of regulation should the need for outdoor watering restrictions arise. Developing this system would require a large amount of funding and infrastructure, however, and is not currently feasible.

In the more immediate future, it would be possible to shift non-potable water, such as that used for construction sites, to surface water from the Colorado rather than culinary groundwater. Setting up a metered pump station would not be exceedingly onerous, and the City just needs to identify a suitable location. There is already a construction water pump station at the boat ramp at the 191 bridge, which is owned by Le Grand Johnson, a construction and paving company.

8.2 Water Banking

Water banking is adding water to an aquifer for later use, putting it “in the bank” so to speak, either literally or figuratively through water rights. The banked water is allowed to percolate down into the aquifer where it then disperses and is available for later use. In concept, this can either be done at the surface level, and recharge goes to shallow aquifers, or via deep injection wells to access deeper aquifers.

In Moab, water for recharge could come from the Colorado River, storm water, or future flash floods generated by increasing monsoonal storms predicted by climate change models. Untreated Colorado River water could be pumped up the valley, used for purposes mentioned above, and eventually be emptied into designated recharge areas such as Kens Lake, flood irrigated fields, or purpose-built shallow ponds or wells. This could be a way for the City to “use” water that is currently considered lost from the system due to variations in seasonal needs and continuously flowing springs. There are potentially 300-400 AF of water the City does not actively put to use each year from Skakel springs in the winter that instead of running off to the river, could conceivably be banked for future withdrawals.

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Developing a water bank is not currently on the City's priority list, however, it is something to keep in mind for the future.

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