JOSHUA BASIN WATER DISTRICT
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2005 URBAN WATER MANAGEMENT PLAN

AUGUST 2009

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1. URBAN WATER MANAGEMENT PLAN

1.1. INTRODUCTION

In 1983, the California Legislature passed the California Urban Water Management Planning Act (Act) as defined within the Water Code Sections (Codes) 10610 – 10656 (Appendix A). The purpose of the Act is to require water suppliers to implement water management planning. The Act describes the required contents of an Urban Water Management Plan (UWMP) as well as how urban water suppliers should adopt and implement the UWMP. The plan should address methods to ensure reliable and adequate water service to meet the needs of the various categories of customers during normal, dry, and multiple dry years.

1.2. CODE REQUIREMENTS

This report was prepared to satisfy the Water Code Section 10620 which states every urban water supplier shall prepare and adopt an UWMP. Water Code Section 10617 defines an urban water supplier as any supplier that provides water to 3,000 or more customers, or that provides over 3,000 acre-feet of water annually. The current customer count of over 4,000 qualifies the Joshua Basin Water District. Furthermore the Codes require the UWMP to be updated at least once every 5 years on or before December 31, in years ending in five or zero.

1.3. AGENCY COORDINATION

Coordination with other agencies is essential to formulate a meaningful UWMP. The process provides an avenue for regional wholesale water suppliers, retail water suppliers, public agencies, and private agencies to contribute to the preparation of the UWMP. During the process of preparing the 2005 Joshua Basin Urban Water Management Plan update, the regional water management plan of the Mojave Water Agency (MWA) was consulted.

The District services an unincorporated part of the County of San Bernardino. The County and MWA were notified that the District is updating its UWMP and input was solicited. No comments were received.

The following table lists the names of the agencies/groups that received notification and their general participation in the preparation of this plan.

Table 1 – Agency Coordination

Check at least one box per row	Participated in UWMP Development	Referenced Documents	Commented on the draft	Attended Public Meetings	Contacted for Assistance	Received copy of draft	Sent Notice of intention to adopt
Mojave Water Agency	-	YES	-	-	YES	-	-
County of San Bernardino	-	YES	-	-	-	-	-

1.4. PUBLIC PARTICIPATION

Water Code Section 10620 - "Each Urban Water Supplier shall encourage the active involvement of diverse social, cultural and economic elements of the population within the service area. Prior to adoption, the plan will be made available for public inspection and a public hearing held. The plan shall be adopted as prepared or modified after the hearing."

The Joshua Basin Water District (District) encouraged public participation through the Citizen's Advisory Committee meetings on November 8, 2005, December 6, and a public meeting and presentation with the Board of Directors meeting, November 16, 2005. The general public was given an opportunity to contribute to the UWMP. A draft copy of the UWMP was made available on December 2, 2005. A public meeting was held at the next board meeting (December 7). A public hearing was also held concurrently with the UWMP adoption on December 28, 2005. See Appendix E for documentation of these public hearings.

2. CONTENTS OF PLAN

2.1. LEVEL OF DETAIL

The Urban Water Management Plan is a supply and demand planning document that does not address specific infrastructure requirements. Its' key elements are the available and planned water supply and the predicted water demands. The level of detail for the plan does not address specific infrastructure improvement. The District currently depends only on groundwater as its water supply. The District is currently updating its Groundwater Management Plan. This document may be revised and amended once the new groundwater management plan has been completed and adopted.

2.2. SERVICE AREA

The Joshua Basin Water District service area is located at 34°7'37" North, 116°19'7" West in San Bernardino County, approximately 70 miles east of the City of San

Bernardino. The District is bordered on the west by Yucca Valley and on the east by Twenty-Nine Palms. The southern most part of the District is bounded by the Joshua Tree National Park. The northern most part is bounded by the Marine Corps Air Ground Combat Center at Twenty-Nine Palms. The District consists of approximately 96 square miles.

Figure 1 is a vicinity map taken from the "Joshua Basin Community Plan" by San Bernardino County.

Based on known development plans the potential for accelerated growth has been identified. Reviewing these plans and development potential the following projected connections have been prepared.

Table 2 – Current and Projected Connections

	2005	2010	2015	2020	2025	2030	2035
Water Connections	4,375	6,094	8,594	10,805	11,930	13,172	14,543

Note: 900 additional water commitments have been purchased but are currently inactive. These may request service at any time.

This is much higher than the Mojave Water Agency's (MWA) 1.63% expected growth rate because recent local data has shown more than 5% growth rate in the past few years.

Table 3 – Service Area Population

	2005	2010	2015	2020	2025	2030/opt
Service Area Population	13,107	15,643	18,668	22,280	26,589	31,732

The service area population is expected to increase substantially in the future. The growth rate information was based on a 2002 Water master Plan developed for the District. It cites district staff as the source of historical growth records. Local data has shown more than 5% growth rate in the past few years. This is much higher than the Mojave Water Agency's (MWA) 1.63% expected growth rate.

In addition, the District has 900 additional water commitments that have been purchased but are currently inactive. These may request service at any time. These commitments are included in the District's SOI, which is not anticipated for full build out until after 2050. Therefore, population projections remain in the City's current service area, which is consistent with the water demand through 2030.

Table 3 shows the District's service area population since 2005 and projects the population through the year 2030 in five-year increments based on the information projected in the Water Master Plan.

There are currently no other demographic factors that affect water management.

The environmental climate within the service area is typical of the Mojave Desert. Temperatures can reach as low as 10° F in the winter and in excess of 115° F in

summer months. The average precipitation is 4.6 inches per year and the Evapotranspiration rate (ETo) is quite high during summer months.

Table 4 – Area Climate

		Jan	Feb	Mar	Apr	May	June
Standard Monthly Average Eto		1.59	2.2	3.66	5.08	6.83	7.8
Average Rainfall (inches)		0.57	0.55	0.41	0.17	0.1	0.03
Average Temperature (Fahrenheit)		49.95	54.05	59.2	65.95	74.25	83.1
	July	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Standard Monthly Average Eto	8.67	7.81	5.67	4.03	2.13	1.59	57.06
Average Rainfall (inches)	0.6	0.84	0.5	0.2	0.22	0.42	4.6
Average Temperature (Fahrenheit)	88.2	86.5	80.1	68.9	54.6	49.6	68.1

Note: Average rainfall and temperature data is for the Twenty-nine Palms station.
Period of Record: 1971-2000
Average Monthly ETo data is for Cathedral City station Since DEC 1995

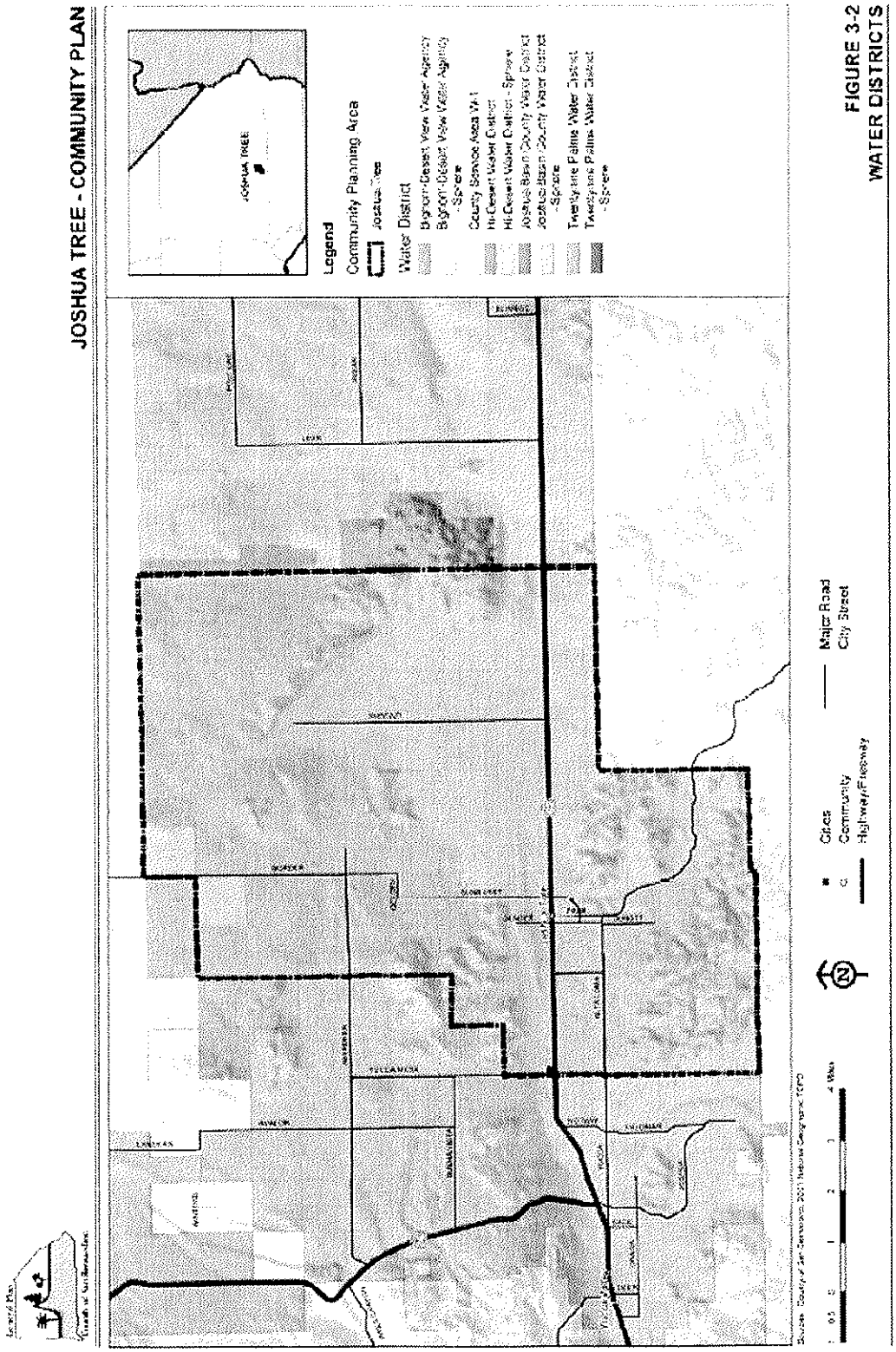

Figure 1 - Joshua Basin Water District Location

2.3. WATER SOURCES

Currently the District relies exclusively on groundwater as its' sole water source.

The groundwater stored in reserves managed by the district is currently estimated (Dudek 2005) at 625,000 Acre-Feet of usable water based on quality. This vast stored quantity of groundwater provides the District with a reliable and safe water supply. While the groundwater may be extracted at a rate greater than recharge (mining or over-drafting), the quantity of withdrawals relative to the stored amounts are small. Significant reductions in groundwater levels would not require significant additional investments in wells until well beyond the 30 year planning horizon of this study. The estimated total water demand for the District for the next 35 years using the aggressive growth strategy will amount to just over 111,000 acre feet. This represents less than 19% of the groundwater in storage.

To provide alternate water supply sources, the District has entitlements to receive surface water from the State Water Project. These entitlements were achieved via funding participation with the Mojave Water Agency which paid a portion of the initial construction cost and continues to pay for the operation and maintenance of the project as noted in the Morongo Basin Pipeline Agreement. These entitlements amount to approximately 1,959 Acre-feet per year. The District also has submitted an application to the State for a grant to assist in funding the infrastructure needed to access its entitlement. In conclusion the District is well positioned to meet the predicted demands with its existing water sources.

Table 5 – Current and Planned Water Supplies - AFY

Water Supply Source	2005	2010	2015	2020	2025	2030	2035
Groundwater supply	1,650	2,285	3,223	4,052	4,474	4,939	5,454
Mojave Water Agency	1,959*	1,959	1,959	1,959	1,959	1,959	1,959
Total	3,609	4,244	5,182	6,011	6,433	6,898	7,413

The Groundwater sources described in Table 5 are described and qualified in section 2.3.2.

*NOTE: This water source is not currently being used.

2.3.1. Wholesale Suppliers

The District has entitlements to the State Water Project through cost participation with the Mojave Water Agency Morongo Basin Pipeline Project.

The above Table 5 shows an available water supply from the MWA beginning in 2010. The surface water may be stored in existing aquifers and later re-pumped to serve customers. This "conjunctive" use of surface and groundwater provides additional management options for the District.

2.3.2. Ground Water

The current water supply is from the Joshua Tree Groundwater Basin and the Copper Mountain Valley Groundwater Basin.

The groundwater basin is comprised of non-water bearing rock forms the boundary of the Joshua and Copper Mountain Subbasins. Alluvial sediments including sand, gravel, silt, and clay fill the basins. The depth to crystalline rock comprising the boundaries is estimated by extrapolating between wells borings that encounter crystalline rock and by geophysical techniques including gravity anomaly surveys. The porosity of the alluvium is the open spaces between individual grains of sand. Porosity can vary from 15 percent of the total volume of sediment in gravel to 55% in clay. Below the water table, the porosity is filled with water.

Specific yield is the term for the amount of water that is released from storage per unit area of aquifer per unit decline in the water table. That is, the amount of water will drain from an unconfined aquifer was the water table declines. Not all the water filling the porosity will drain. Water touching the grains of the sediment is held in place by electrostatic forces and will not completely drain. Specific yield can range from 0.01 to 0.30.

The Basin is not an adjudicated basin and, as such, there are no deeded rights to withdraw water. Overall management of water resources is the responsibility of the District. The 2002 Water Master Plan describes the groundwater basin in detail, and estimates existing and future groundwater production rates.

Between July 2003 and June 2004, JBWD produced approximately 1650 AF of groundwater. Based on the USGS estimate of 0 acre feet of natural recharge, the amount withdrawn from the basin exceeded the amount recharging the basin by approximately 1495 AF. This amount was the overdraft of the basin for that year. Even allowing for potential septic recharge of 660 AFY, the amount of overdraft would be 835 AFY.

Both basins are being over drafted but this has little effect on the quantities stored. As stated earlier, the current Groundwater Management Plan Update will address the impacts on total groundwater storage and levels. Preliminary indications are that the overdraft will result in additional groundwater pumping facilities being required in more than thirty years. This report may be revised to reflect the adopted Groundwater Management Plan. There is currently an effort to develop infrastructure to deliver water from an allocated amount from the SWP.

Table 6 – Amount of Groundwater Pumped - AFY

Basin Name (s)	2000	2001	2002	2003	2004
Joshua Tree/ Copper Mountain	1,518	1,604	1,609	1,437	1,534
% of Total Water Supply	42.06%	44.44%	44.59%	39.81%	42.49%

2.4. RELIABILITY OF WATER SUPPLY

Since the District relies on groundwater as its source of supply, it is not subject to short-term shortages caused by periodic drought. The water stored in groundwater is estimated to be well over 625,000 acre feet (Dudek 2005). As a result the groundwater basins are capable of absorbing the effects of multiple dry years without seriously hindering the water supply. The water supply for the District is highly reliable.

Table 7 –Supply Reliability (af/yr)

Normal Water Year	Single Dry Water Year	Year 1	Year 2	Year 3	Year 4
1,604	1,588	1,572	1,556	1,540	1,524
% of Normal	99.00%	98.00%	97.00%	96.00%	95.00%

The 1931-2001 hydrological period was used to determine average normal base year. Multiple dry year estimates represent the average during the period 1988-1990 and are referenced from the Mojave Water Agency Regional Water Management Plan with single dry year taking place in 1988. This is also the driest 3 year period of record.

2.5. TRANSFER AND EXCHANGE

No current opportunities for water transfer and exchanges exist. As the system expands, emergency entities will be planned for where beneficial.

2.6. WATER USE BY CUSTOMER TYPE

Water use by customer type is broken down in the following Table 8. Some water is not or cannot be metered for a variety of reasons. Line leakage, fire flows, and flushing/disinfecting of pipelines cannot be metered. Faulty flow meters and illegal connections can go undetected for a period of time, thereby un-metered as well.

The projected water deliveries are based on the growth rate described in Section 2.2.

Table 8 – Past, Current and Projected Water Demand by Type

Year	Wtr Conn		Water Use Sectors	Single Family	Multi-Family	Com-mercial	Indust-rial	Instit / gov	Land-scape	Agric	Total AF/Y
2000		metered	Deliveries AF/Y	1058	83	172	27	-	66	-	1406
2005	4,375	metered	Deliveries AF/Y	1,150	91	187	29	-	193	-	1,650
			# of Accounts	4,186	54	131			4		
2010	6,094	metered	Deliveries AF/Y	1,819	112	230	36	-	88	-	2,285
			# of Accounts	5,832	73	183			6		
2015	8,594	metered	Deliveries AF/Y	2,670	133	273	42	-	105	-	3,223
			# of Accounts	8,224	103	258			9		
2020	10,805	metered	Deliveries AF/Y	3,394	158	325	50	-	125	-	4,052
			# of Accounts	10,340	130	324			11		
2025	11,930	metered	Deliveries AF/Y	3,688	189	388	60	-	149	-	4,474
			# of Accounts	11,417	143	358			12		
2030	13,172	metered	Deliveries AF/Y	4,045	215	441	68	-	170	-	4,939
			# of Accounts	12,606	158	395			13		

Table 9 – Additional Water Uses and Losses – AF Year

Water Use	2000	2005	2010	2015	2020	2025	2030 - opt
Saline barriers							
Groundwater recharge							
Conjunctive use							
Raw water							
Recycled (Landscape)							
Transfer							
Unaccounted-for system losses	229	266	326	387	462	552	627
Total	**229**	**266**	**326**	**387**	**462**	**552**	**627**

2.7. DEMAND MANAGEMENT

The various measures involved in water management can generally be placed into one of five major categories. Those categories are residential/ commercial interior measures, landscape measures, industrial measures, systems measures, and other measures (such as pricing, incentives, and public information). The measures included in the District's Plan provide reasonable coverage of the five categories, and address agency-implemented measures as well as promote water conservation by the end-user. The District considers environmental, economic, social, and health impacts during implementation of each measure listed.

An essential component of an Urban Water Management Plan is a description of conservation measures required by the Department of Water Resources. These Demand Management Measures (DMM's) will support continuing improvements in water use efficiency.

2.7.1. Water Survey Programs for Residential Customers

The Urban Water Management Planning Act, as revised, includes the requirement that water Districts employ a water survey program for single-family residential and multifamily residential customers. JBWD has implemented this Demand Management Measure through Resolution 00-618 (see Appendix F). This resolution includes a water survey program that includes, but is not limited to, an annual customer survey distributed to 100% of the customer base as a water bill insert. The customer survey obtains current end-user information that facilitates the District's water conservation planning, as well as provides water-saving tips to water customers. The District intends to implement a program in the year 2010 that will provide compliance with the CUWCC requirements for this BMP. The goal of this program will be to receive residential surveys from at least 1.5% of the single-family and 1.5% of the multi-family customers during the first 10 years of the program. After this 10 year period, the District intends to maintain a program at the level of high-bill complaints or not less than 0.75 percent per year of current single and multi-family accounts. This program meets the requirements of DMM #1.

2.7.2. Residential Plumbing Retrofit

These programs include two general components, 1) working with the land use jurisdiction to assure use of complying plumbing devices and, 2) distributing and/or installing retrofit kits including high quality low flow showerheads, toilet displacement devices, faucet aerators and toilet flappers to pre 1992 housing. Few agencies find it cost effective to fund or monitor land use jurisdiction enforcement of plumbing standards. Given that the current standards require manufacture and use of low flow devices, and that is all that is available on the legitimate retail market, such activity is deemed unnecessary. However, many agencies with conservation programs have initiated plumbing retrofit programs, either through providing retrofit kits to pre-1992 housing or offering direct installation.

Offering or installing retrofit kits to pre-1992 homes is a common program among water agencies with active conservation programs. Issues that must be considered are relatively high natural replacement levels for such fixtures as showerheads and recognition that replacement heads already meet the federal 2.5 gpm standard. Direct installation programs have a higher implementation rate than drop off distribution methods. However, direct installation programs are more costly and bring insurance and liability issues. It is estimated that the "drop off" types of retrofit programs provide average savings of 5.65 gpd per installation with a life expectancy of 10 years even assuming that just over 50 percent of the kits become installed. Costs are relatively low at approximately $13 per kit distributed. All other factors being equal, retrofit programs which reduce demand are environmentally preferable over development of additional supplies or delivery of more water.

Given the low costs of administering these projects, the "drop off" retrofit programs result in a net present value of approximately $170 for every installation.

A simplified retrofit program offering leak detection dye tablets, a high quality low-flow showerhead, toilet flappers and faucet aerators was implemented, for pre-1992 housing only, in 2006. There are 3,742 residential customers within the district with pre-1992 homes eligible for the program. The District does not currently have a method to evaluate or estimate the effectiveness of this program, but is looking at possible methods (from other agencies, CUWCC, etc.) for possible implementation in the 2010 UWMP. This program, combined with the District's ULFT program, satisfy the requirements of DMM #2.

2.7.3. System Water Audits

The District conducts water loss analyses describing what's being produced vs. what's being sold, calling the difference the water "loss." The District conducts a visual leak detection survey of the distribution system to locate and detect leaks. The pipeline replacement program and the Supervisory Control and Data Acquisition (SCADA) system provide more information related to water use and loss. As a result of these programs, areas that are identified as high water use are targeted for high priority replacement programs.

Performance of prescreening audits comparing gross system production vs. sales is an accepted industry practice generally done on an annual basis. If results from this prescreening note excessive unaccounted water then a more detailed audit focusing on loss possibilities (system leakage, under-metering, illegal connections, fire flow water and system flushing etc.) are made. No significant social, environmental or technological factors are found to be relevant for this activity.

The ability of the District to combine the parcel Geographic Information System (GIS) with the billing data provides further tools and information for identifying abnormally high water usage. Grant funding opportunities are pursued to assist in funding leaky pipe replacement when possible. This program was implemented in the year 1994, and the last audit was completed in the year 2009. This program meets the requirements for DMM #3.

2.7.4. Metering with commodity rates new and existing connections

The District is fully metered for all customers, and customers pay the sector rate for each billing unit consumed. Since 1995, More than 3,800 new meters have been installed to replace older, less efficient meters within the service area. The new water meter retrofits have the capability to detect low-flow leaks and in turn reduce water losses. The District has also installed radio read meters for more accurate meter reading operations. The commodity rates or "bill by volume" structure can by found in Appendix C. The District does not currently have a method to evaluate or estimate the effectiveness of this program, but is looking at possible methods (from other agencies, CUWCC, etc.) for possible implementation in the 2010 UWMP. This program meets the requirements for DMM #4.

2.7.5. Large Landscape Conservation

These programs identify large landscapes offering surveys and development of evapotranspiration (ETo) - based water budgets. There are currently no large landscape facilities (>2 acres) within the sphere of influence for the District. Financial incentives are offered through usage based rate structures to encourage efficient use.

Large landscapes are often viewed as water conservation targets by the general public. Generally, however, and especially where dedicated meters exist, large landscapes are more efficiently managed than landscapes which are part of a mixed use setting. This is due to professional management and a direct correlation between the water bill and irrigation practices, where dedicated meters exist. This creates a financial incentive for conservation. Regardless, opportunity exists to improve irrigation efficiency. The California Irrigation Management Information System (CIMIS) operated by the Department of Water Resources provides real-time evapo-transpiration and other climatic data available on the Internet to help manage irrigation demands.

The District is working with the Building Industry Association (BIA) and other agencies for a Model Landscape Ordinance. In addition to this effort, the District works with the Association for Water Awareness and Conservation to provide pamphlets and information related to low water use plants for landscaping. These are made available to the public at the District office. Because of the desert landscaping and limited amount of landscaped areas in the District's sphere of influence, all accounts are charged based by consumption.

Given the small positive net present value for a large landscape audit programs and the fact that the District does not have any large landscaped areas, it is recommended the District do pre-screening of new large landscape customers of two acres and above. In this pre-screening, the general efficiency and sophistication of an irrigation system can be assessed and the operators can be queried regarding their interest in a systematic survey and their interest and likelihood of being able to invest in efficiency improvements. If sufficient interest exists, a pilot program targeting the largest and likely least efficient users could be initiated.

While large landscape surveys are often not the most cost-effective conservation technique, they are generally cost-effective if survey recommendation results are implemented. Additionally, with their high public visibility, having a large landscape audit program can be helpful public relations. Given their relatively high rate of consumption, owner and operators of large landscapes are generally cooperative with such surveys as the money savings potential creates and economic incentive for participation. However, as noted above, the cost of implementing survey recommendations can be an impediment to achieving actual savings. The District's lack of large landscape installations, proposed pre-screening of new large landscaping installations, and general preference for desert landscaping techniques satisfies the requirements of DMM #5.

2.7.6. High Efficiency Washing Machines

The Mojave Water Agency implemented a Washing Machine rebate program in the District's service area. It began in February of 2008 and is available on a first come, first serve basis while funding is available. The program allows District customers to submit to the Mojave Water Agency for the rebate. The value of the High Efficiency Clothes Washer rebate is $175. Further information, including a report on the regional effectiveness and savings is available at MWA or at http://www.hdawac.org/MWA/#mwa_top

The District reserves the right to inspect and verify the installation of the new clothes washer model submitted for this rebate program, and if contacted, customers must agree to allow for a post-installation inspection. This program meets the requirement of DMM #6.

2.7.7. Public Information Programs

The District recognizes the continued need for a public information program to maintain and increase the public's awareness of water and the need to use it wisely. The District promotes water conservation.

Beginning in the year 2005, the District distributes public information through billing inserts, brochures, and community events. The District also has the opportunity to provide public information on conservation measures through televised board meetings on a public access channel. The District is also developing a web page (http://www.joshuatreevillage.com/552/552.htm) on the Internet, which provides water conservation information, ideas, and frequently asked questions.

Public outreach is administered by staff by presenting educational displays at community events, televised board meetings, and newsletters. The District directs the following programs to promote water conservation:

- **Televised Board Meetings**: Water conservation is a frequent topic of discussion. The board meetings a twice a month.
- **"A Guide to High Desert Landscaping":** The District distributes a booklet on landscapes that are suitable for desert climates. An effort is made to educate the public on appropriate landscaping and irrigation issues. These are available at the District office.
- **Several Small Brochures**: on leak detection, component familiarization and household repairs are available in the District office.
- **Water Bill Historical Use Data**: is printed on each water bill and a space for additional information has been provided in the billing format.

The District does not currently have a method to evaluate or estimate the effectiveness of this program, but is looking at possible methods (from other

agencies, CUWCC, etc.) for possible implementation in the 2010 UWMP. This program meets the requirements for DMM #7.

2.7.8. School Education Programs

These programs generally consist of provision of teacher training materials and teacher training to elementary students and above. Materials consist of general information regarding the water cycle, information on California's water system, groundwater resources, drinking water quality and the role of individuals in water conservation and water quality protection. The intent of the materials and in-service training is to educate educators about California's water system, a conservation ethic and to have those teachers incorporate this information into the curriculum for their classrooms. A populace with basic education on water issues assists in resolving water supply and quality problems. Some districts develop their own materials and provide in-classroom instruction. Others utilize materials from the nonprofit Water Education Foundation and their in-service teacher training programs, whose materials are consistent with the standards of California's Framework for Science and History/Social Science Education. A variety of programs are available from the Foundation along with in-service training for those programs.

Beginning a school education program requires nominal investment from the District. This investment, however, provides dividends in terms of a more educated customer base and improves community relations. Water savings data do not exist for education programs in the area. Consequently, no cost benefit analysis was conducted. However, education programs complement other conservation activities and are believed to lower overall consumption.

In 2008, the District implemented a Water Wise program dedicating $2,200 to the elementary school program, grades 4-8. The District also plans to initiate information in the school newsletter to school teachers with advice on how to incorporate water education into everyday lessons. Utilizing program materials from the Water Education Foundation, these funds allow the provision of materials and in-service training for teachers within the District. The Water Wise program provides annual, year-end audits of the program that assists in determining the effectiveness of the program. A curriculum summary and 2009 year end audit have been included in Appendix G. Due to the long-term nature of this program the District does not have a method to evaluate potential water savings. This program meets the requirements for DMM #8.

2.7.9. Conservation Programs for Commercial, Industrial and Institutional Accounts

These programs typically consist of identifying commercial and industrial accounts and offering surveys and/or incentives for conservation where the surveys indicate an opportunity for conservation.

The District service area historically is a residential community with very few commercial and institutional customers. The District currently serves 230 commercial and/or industrial customers, which comprises approximately 10% of the customer base. Recent residential and supporting commercial growth is very slowly changing the customer makeup. However, since this commercial growth is occurring subsequent to the 1992 Plumbing Code amendments, it is deemed to be relatively efficient. Commercial and industrial audits in other regions have found most of the savings opportunity in the replacement of high flow toilets, as these toilets receive relatively high usage rates. The literature reveals that surveys have resulted in about 1.2 AF of savings per year against an average cost of $1,200 per survey. Industrial surveys are more complicated than commercial surveys and thus survey costs for the District are estimated to be about $400. Incentive costs (mostly ULFT rebates) are estimated at $500 per survey at an average of approximately $75 per toilet for the District.

Given the lack of significant commercial and industrial uses prior to 1992, no analysis was performed.

As the District develops, new development will both be subject to landscaping water use standards of the land use jurisdictions and the 1992 plumbing code. The District has retained the services of a water efficiency consultant, The Bollinger Consulting Group, to assist in the development and implementation of these programs as they become economically feasible. Currently, commercial/industrial retrofit opportunities are largely absent and a program is not recommended. This evaluation will however be reviewed for the 2010 UWMP. This analysis satisfies the requirements of DMM #9.

2.7.10. Wholesale Agency Programs

These programs involve reviews of potential water consumption and conservation potential during the development review process.

Given the specialized nature of industrial water use and a high cost to assess process water use, and gains made by the 1992 Plumbing code amendments which cover conventional uses, few water agencies invest in such programs.

This action has been dropped from the California Urban Water Conservation Council's list of Best Management Practices.

No data exists for water savings for this demand management measure; consequently no cost benefit analysis was performed.

Joshua Basin Water District supplies groundwater to 95% residential customer's only, wholesale agency programs do not apply.

The District will continue to work cooperatively with Mojave Water Agency to participate in regional DMM programs, informational groups and projects,

determination of the most cost-effective DMMs, and tailoring programs specific to the District.

2.7.11. Conservation Pricing

The District has meters for each customer and charges a volumetric rate for water use. In 2004, the District implemented a tiered rate structure that would charge customers an increased price for each cubic foot of water used above a set amount. This resolution is attached as Appendix C. By charging each customer a tiered rate for the volume of water used, the District encourages customers to reduce water use and therefore the amount paid for water. This rate system meets the requirements of DMM #11. The District does not provide sewer service; the service area relies exclusively on septic tanks for sewage disposal.

2.7.12. Water Conservation Coordinator

This demand management measure consists of designating a water conservation coordinator among the staff of the District or hiring a new person or consultant to serve in that capacity. In general, it is felt that having a designated coordinator helps improve the effectiveness of a water agency's conservation efforts. Depending upon the scope of the program and size of the District, along with other staffing demands, these duties can be a part- or full-time responsibility.

In 2007, the District obtained the services of a water conservation consultant, Bollinger Consulting Group, to serve as an as-needed role for water conservation issues. Together with the General Manager and his staff, they work together to coordinate conservation programs and implementation, as well as communicate and promote water conservation issues to the District Board, local developers, and the community at large. The District's current sharing of these duties meets the requirements of DMM #12.

2.7.13. Water Waste Prohibition

In 2004, the District implemented a Resolution that provides for special water conservation provisions. Resolution 04-665 limits the use of water and includes penalties for excessive use (see attached Appendix C.) It also has several provisions for conservation ethics for all district customers. The District further intends to implement a resolution for the 2010 UWMP that includes the following language, *"Joshua Basin Water District shall prevent water waste resulting from inefficient landscape irrigation by prohibiting runoff from leaving the target landscape due to low head drainage, overspray, or other similar conditions where water flows onto adjacent property, non-irrigated areas, walks, roadways, parking lots, or other impervious structure."* The District does not currently have a method to evaluate or estimate the effectiveness of this program, but is looking at possible methods (from other agencies, CUWCC, etc.) for possible implementation in the 2010 UWMP. This resolution meets the requirements of DMM #13.

2.7.14. Residential Ultra-Low Flush Toilet Replacement Programs

The District requires compliance with state regulations for water efficient devices in new construction, per the Uniform Building code. Retailers in California are generally required to provide only high water efficiency toilets and appliances.

In 2006, the Mojave Water Agency also implemented a High Efficiency Toilet Voucher program in the area. The program allows District customers to submit an application to the Mojave Water Agency to receive a voucher that can be used at local retailers. The Voucher is to be used the same as cash at a participating point-of-sales. Each pre-approved customer is provided with a voucher that is accepted towards the purchase of a qualifying WaterSense® high efficiency toilet. The voucher value is up to $165, or the retail cost of the toilet, whichever is less. Further information is available at WMA or at http://www.hdawac.org/MWA/#mwa_top. The voucher program is not limited to pre-1992 constructed homes, and retrofit to ULF toilets is not currently required for re-sale of a residence.

Currently, the District does not maintain a separate voucher program or have a ordinance that requires retrofit on resale. Information specific to the estimate of water savings through this program is unavailable through the Mojave Water Agency at this time, but the District is looking at possible methods for implementation in the 2010 UWMP.

This program meets the requirements of DMM #14.

2.8. EVALUATION OF DMM'S NOT IMPLEMENTED

Many of the demand management measures are being implemented and others are managed through the escalating rates for increasing water use. As further growth demands, future plans will be considered.

The Urban Water Management Planning Act under California Water Code Section 10631 (g) requires an evaluation of water demand management measures specified in the Act which are not currently being implemented or scheduled for implementation. As noted above, preference is given to implementing measures that offer lower incremental costs than expanded or additional water supplies. The evaluation must do all of the following:

Take into account economic and non-economic factors, including: 1) environmental, social, health, customer impact and technological factors. 2) Include a cost benefit analysis, identifying total benefits and costs. 3) Include a description of funding available to implement any planned water supply project that would provide water at a higher unit cost. 4) Include a description of the water supplier's legal authority to implement the measure and efforts to work with other relevant agencies to ensure the implementation of the measure and to share the cost of implementation. JBWD has worked to implement each of the DMMS or BMPs.

2.9. PLANNED WATER SUPPLY PROJECTS AND PROGRAMS

Based on the water demand and supply in the 2 sub basins the District will not need to import water from the Mojave Water Agency. The District is however entitled to 1,959 AFY per year but must build the infrastructure to bring the water in. A currently in-progress Ground Water Availability study will determine the timeframe in which the infrastructure is needed. As an option the District is considering banking its entitlement through conjunctive use for future demands.

2.10. DESALINATED WATER

There are currently no opportunities to develop desalinated water.

2.11. CURRENT AND PROJECTED WHOLESALE WATER SUPPLIES

The water supply from the District does not currently rely on wholesale water supplies. 1959 AFY of water has been allocated for the District. Based on projections, the District will not reach those limits in the next 20+ years

Table 10 – Agency Demand Projections Provided to Wholesale Suppliers - AFY

Wholesaler	2010	2015	2020	2025	2030 - opt
Mojave Water Agency	326	387	462	552	627

Table 11 – Wholesaler Identified & Quantified the Existing and Planned Sources of Water - AFY

Wholesaler sources	2010	2015	2020	2025	2030 - opt
Mojave Water Agency	1959	1959	1959	1959	1959

3. DETERMINATION OF DMM IMPLEMENTATION

The implementation of the Demand Management Measures has been described in above sections (2.7.1 – 2.7.14).

4. WATER SHORTAGE CONTINGENCY PLAN

The District has a civic and legal responsibility to provide for the water-related health and safety needs of the community. In response, a four-stage plan was developed for reacting to a water shortage as defined in Section 4.1.

To minimize the social and economic impact of water shortages, the District consistently manages water supplies. In correlation with the Urban Water Management Planning Act 1999 amendment, the District provides a 3-year estimate of minimum water supply as shown in Section 4.3. The contingency plan is designed to provide a minimum of 60 percent of normal water supply during a severe or extended water shortage.

The District's priorities for use of available water during a water shortage are:

A. Fire protection, health, and welfare emergency uses.

B. Domestic-interior uses only (residential).

C. Public buildings, school-interior uses only.

D. Commercial and Industrial-interior use only.

E. Commercial and Industrial-other uses (not including landscape watering or other nonessential uses).

F. Domestic-other uses.

The Stage 3 and Stage 4 health and safety allotments are roughly 68 gallons per capita per day (gpcd). These health and safety levels are used as a basis for water allocations using the priorities listed above. This provides sufficient water for essential interior use with no change in either water use habits or plumbing fixtures.

As mentioned, the District currently relies solely on groundwater. Rationing stages may be triggered by a shortage in aquifer supply, equipment failure, or catastrophe. Shortages may trigger staged allocation limits at any time.

The District has rights to surface water through the State Water Project. This water is available for access at the western boundary of the District, although there are currently no facilities in place to provide transport, such as line extensions, percolation ponds, or treatments plants. If the District decides to access this surface water in the future, existing Water Shortage Contingencies will be modified. Also, the District has a temporary tie-in to the Hi-Desert Water District for emergency situations.

Individual customer allotments are based on a five-year base period. This gives the District an accurate view of the typical water needs of each customer and provides additional flexibility for determining allotments and reviewing appeals. However, no allotment is greater than the amount used in the most recent year of the five-year base period.

The District's General Manager classifies each customer and calculates each customer's allotment according to the methods described in Appendix D. The allotments reflect seasonal patterns. Customers are notified of their classification and allotment by mail before the effective date of the Water Shortage Emergency. New customers and connections are notified at the time service commences. In a disaster, prior notice of allotment may not be possible. In such cases, notice may be provided by other means, such as telephone, radio, television, or newspaper. Customers may appeal the General Manager's classification on the basis of use or the allotment on the basis of incorrect calculation. The appeals process is set forth in Appendix D.

4.1. STAGES OF ACTION

The District's plan includes mandatory and voluntary stages; triggering levels and allotments for each stage are described in the following Table 12. A Stage 1 shortage involves a 25 to 40 percent shortage in available supply. A Stage 2 shortage is 40 to 50

percent shortage in available supply. A Stage 3 shortage involves a 50 to 60 percent shortage in supply. A Stage 4 shortage involves a 60 percent or greater shortage in supply.

Table 12 – Water Supply Shortage Stages and Conditions

Stage No.	Water Use Reduction	Type of Program
1	A reduction goal of 10% is triggered	Voluntary
2	A reduction goal of 15% is triggered	Mandatory
3	A reduction goal of 20% is triggered	Mandatory
4	A reduction goal of 25% is triggered	Mandatory

4.2. THREE-YEAR MINIMUM SUPPLY

Because there is minimal correlation between hydrology and available water, the supply availability is not immediately impacted by annual variations in conditions. The groundwater supply is available to meet water needs for the next three-year period.

Table 13 – Three-Year Estimated Minimum Water Supply – AF/Year

Source	Year 1	Year 2	Year 3	Normal
Groundwater	1782	1746	1694	1800

The District is currently allotted water from the SWP through the Mojave Water Agency (MWA) but does not have the infrastructure for delivery at this time. It has been estimated that based on the reductions that MWA would face that these would be passed on the JBWD as well. The estimates of wholesale supply are found in the following Table 14.

Table 14 – Wholesale Supply Reliability - % of normal AFY

	Multiple Dry Water Years				
Wholesaler sources	Single Dry	Year 1	Year 2	Year 3	Year 4
SWP via MWA	1450 (74%)	768 (39%)	768 (39%)	768 (39%)	768 (39%)

4.3. CATASTROPHIC SUPPLY INTERRUPTION PLAN

The groundwater subbasins in the District area are the limiting factor in groundwater production, but are expected to continue to produce reliable supplies even in a catastrophe (power outage, earthquake, other).

Water stored in the District's distribution system storage tanks are monitored and proactively managed to not allow the volumes of the reservoirs to drop to very low levels. Standard practice is to maintain at a minimum the required emergency and fire flow storage within all tanks at all times. In am emergency, these stored water volumes are available for distribution or truck delivery as necessary.

The District has an emergency plan and will update it in the coming year to detail operational procedures in the event of catastrophic interruptions that might result from earthquakes, power outages, pipeline ruptures, terrorism threats, and water quality limitations/contamination. Currently the plan includes alerting procedures, provisions for backup power provided by stand-by generators at critical well and pump station sites, emergency supplies trucked in from system storage or neighboring water agencies, and temporary connection to Hi-Desert Water Agency supplies at the shared District boundary. When updated, the plan will include an outline of the responsibilities of the District's designated emergency response personnel, alternate headquarters, communications, transportation and relationships with regional and state emergency response personnel. Supply reporting procedures are outlined in Section 4.6.

4.4. PROHIBITIONS, PENALTIES AND CONSUMPTION REDUCTION METHODS

The District's current rate structure is provided in Resolutions 04-665 (see Appendix C) and the District's water shortage contingency plan is attached as Appendix D. During any declared water shortage emergency, a customer who exceeds the established allotment will pay a surcharge of two times the highest rate tier per hundred cubic feet (hcf) of water for excess water delivered during the first or second billing period, and a surcharge of four times the highest rate tier per hcf for excess water delivered during the third and subsequent consecutive billing periods.

As used herein, "excess water" means the amount of water delivered in excess of the specific customer's established allotment during any billing period; however, if a customer's total annual usage is equal to or less than the annual allotment, any surcharge payments will be refunded to the customer. A similar adjustment will be made for each successive twelve-month period during the term of the rationing program; if the program is terminated prior to a full twelve-month term, the adjustment will be pro-rated.

If a customer exceeds the allotment usage for three consecutive billing periods, the District will install a flow restrictor at the service meter with a capacity of two gallons per minute (gpm) for meters up to one and one-half inch sizes (and comparatively sized restrictors for larger meters) for a period of seven days. The customer must pay a flow restrictor installation and removal charge of $100 before the normal service will be restored.

Specific use restrictions and prohibitions for each supply shortage stage are as follows:

Stage I:

Prohibitions

- Elimination of hosing of hardscape surfaces, except where health and safety needs dictate

- Usage of buckets and automatic hose shut off devices for car washing and outside cleaning activities
- Repair water leaks and adjust sprinklers to eliminate over-spray

Other Activities

- The District shall notify customers of the shortage and indicate requested curtailments of use. Such notification shall provide avenues of additional information assisting customers in achieving requested conservation.

Stage II:

Prohibitions

- Extend the voluntary requests from Stage I
- No landscape watering between 0800 and 1700 hours
- New meters for land development restricted only to property owners of presently existing parcels

Other Activities

- Initiate media campaign to educate the District customers of conservation needs

Stage III:

Prohibitions

- Voluntary requests from Stage I & II become mandatory
- Issuance of construction water meters would cease and meters would only be installed for new accounts where the building permit was issued prior to the declaration of the water shortage

Other Activities

- Mandatory use prohibitions will be enforced through water patrol personnel

Stage IV:

Prohibitions

- All prohibited actions in Stage III would be in force
- No meters will be installed for new accounts

Specific consumption reduction methods and anticipated reduction for each supply shortage stage are as follows:

Table 15.1 – Consumption Reduction Methods

Consumption Reduction Method	Projected Reduction	Implementation Stage
Irrigate lawns and landscape only between midnight and 6:00 am (unless hand watering)	5% of external use	Voluntary Stage 1 Mandatory Stage 2
Adjust and operate all landscape irrigation systems in a manner that will maximize efficiency and avoid watering hardscape	10% of external use	Voluntary Stage 1 Mandatory Stage 2
Reference evapotranspiration (ET) factors for individual metered landscape projects will be reduced from 1.0 to 0.8	20% of external use	Voluntary Stage 1 Mandatory Stage 2
Landscape meters to 75% of ET	25% of external use	Mandatory Stage 3
Landscape meters to 60% of ET	40% of external use	Mandatory Stage 4
Water used on a one-time basis for construction and dust control shall be limited to the quantity identified in a plan prepared (and submitted to the District for approval) by the user describing water use requirements.	Varies	Mandatory Stage 3
The use of water from fire hydrants shall be limited to fire fighting and related activities	Varies	Mandatory Stage 3
Water for municipal purposes shall be limited to activities necessary to maintain public health, safety, and welfare.	Varies	Mandatory Stage 3
Outdoor irrigation by sprinklers will only be allowed every other day	50% of external use	Mandatory Stage 3
Irrigation of landscaping is only allowed twice per week by hand-held hose only.	70% of external use	Mandatory Stage 4
All new landscaping shall be limited to drought tolerant plantings as determined by the District	30% of external use for all new homes	Mandatory Stage 4

Service may be terminated to any customer who knowingly and willfully violates any of the provisions included in this chapter of the Plan. The District intends to adopt an

additional ordinance for the 2010 UWMP that will prescribe specific allotments based on supply shortage stage and the type of customer.

4.5. ANALYSIS OF REVENUE IMPACTS OF REDUCED SALE DURING SHORTAGES

The District's average water revenues are slightly greater than 2 million dollars, approximately half of which the meter charges provide. All surplus revenues are currently placed in the District's reserve, which is used to fund emergency repairs, the steel line replacement program, and other water system capital improvements.

Table 16 – Actions and Conditions that Impact Expenditures

Condition	Estimated Revenue	% Reduction	Revenue reduction
Normal	$2,311,816	0%	$0
Stage 1	$2,242,461	3%	$69,354
Stage 2	$2,196,225	5%	$115,591
Stage 3	$2,149,989	7%	$161,827
Stage 4	$2,103,752	9%	$208,063

The above table contains predictions of the District's revenues with reduced sales. The table indicates the changes in revenues for a year-long shortage. It should be noted that, with the District's production capability margins and the current condition of the aquifer, any financial strain would only be for a period of time sufficient to affect repairs for a multiple pumping plant failure. The District maintains a financial reserve that is adequate to address the costs of multiple plant repairs, and has experienced such failures in the past. The District is adequately funded to respond to emergencies. (Table 9 data based on 2000 Joshua Basin Water District UWMP revenue reduction estimates)

4.6. DRAFT ORDINANCE AND USE MONITORING PROCEDURE

Normal Monitoring Procedures - Under normal water supply conditions, production figures are recorded daily in the District's computerized database. Total production measurements are taken in the field and the data is totaled. High demand days are determined at the end of each month, as well as at the end of the year. Water storage reservoirs and well and booster pumping plants are monitored on a continuous basis by telemetry at the District's headquarters, with alarms for abnormal conditions.

Stage 1 and 2 Water Shortages - During Stage 1 or 2 water shortages, daily production figures will be reported to the Chief of Operations, who will compare the weekly production to the target weekly production to verify that the reduction goal is being met. Weekly reports will be forwarded to the General Manager.

Monthly reports will be provided to the Board of Directors and to the Customer Service Department; the latter will serve as the District's Water Shortage Response Team. If

reduction goals are not met, the Water Shortage Response Team will examine individual customer usage and corrective action will be taken.

Stage 3 and 4 Water Shortages - During a Stage 3 or 4 water shortage, the procedure listed above will be followed, with the addition of a daily production report to the General Manager.

Disaster Shortage - During a disaster shortage, production figures will be reported to the Chief of Operations hourly and to the General Manager and the Water Shortage Response Team daily.

5. Recycled Water Plan

The District currently does not have an independent recycled water plan. The size of the District, the extent of facilities needed to be effective, and the economic impacts of implementing a recycled water distribution system present a compelling reason for not pursuing recycled water at this time. A study is underway to determine if a wastewater collection is feasible and desirable. An outcome of the creation of a collection system would be the opportunity to treat to tertiary standard for recycled water use. Connections serviced by the District currently have septic systems.

6. Water Quality Impact on Reliability

Groundwater produced by the Joshua Tree Sub Basin and the Copper Mountain Sub Basin is of high quality, and meets all federal and state standards for drinking water. The size of the groundwater source provides many options for alternate well sites and recharge facilities.

A groundwater study is currently in process. This study should provide information regarding the effect of the overdraft on the quality of the water.

7. Water Service Reliability

Although the District currently has five active pumping plants, entitlement to the water from Mojave Water Agency provides an alternate source of supply, improving the District's ability to maintain continuous potable water service. As of June 2009, construction of the infrastructure required to access this supply is in the planning and design stages.

The groundwater basins of the District act as long-term storage for the region. As previously referenced, water demands in the area are met from these groundwater supplies. While increased groundwater pumping in excess of natural recharge over the last few years has resulted in a decline in groundwater elevations, the groundwater basins remain capable of meeting annual water demands through dry years and consecutive multiple dry years.

Table 17 –Supply Reliability (af/yr)

Normal Water Year	Single Dry Water Year	Year 1	Year 2	Year 3	Year 4
1,604	1,588	1,572	1,556	1,540	1,524
% of Normal	99.00%	98.00%	97.00%	96.00%	95.00%

Table 18 – Projected Supply / Demand for Multiple Dry Year Periods through 2025 (af/yr)

		2006	***2007***	***2008***	***2009***	***2010***
Supply		3829	3966	4102	4238	4244
Demand		3829	3966	4102	4238	4244
	Surplus/Deficit	**0**	**0**	**0**	**0**	**0**
		2011	***2012***	***2013***	***2014***	***2015***
Supply		4511	4647	4783	4919	5182
Demand		4511	4647	4783	4919	5182
	Surplus/Deficit	**0**	**0**	**0**	**0**	**0**
		2016	***2017***	***2018***	***2019***	***2020***
Supply		5192	5328	5464	5601	6011
Demand		5192	5328	5464	5601	6011
	Surplus/Deficit	**0**	**0**	**0**	**0**	**0**
		2021	***2022***	***2023***	***2024***	***2025***
Supply		5873	6009	6145	6282	6433
Demand		5873	6009	6145	6282	6433
	Surplus/Deficit	**0**	**0**	**0**	**0**	**0**

Table 16 identifies the supply reliability for a single dry year, with subsequent dry year reliability data for the following 3 years. Records from the Mojave Water Agency indicate that the single dry year occurred in 1988, which also coincides with the driest 3 year period of record. Table 17 provides the data for multiple dry year scenarios.

8. ADOPTION AND IMPLEMENTATION OF 200 AND 2005 UWMP

The District's previous UWMP was adopted on December 2nd, 2000 and fully implemented with the schedule set forth in that plan.

The District's Board of Directors adopted the updated Plan in December of 2005 with Resolution #05-783 (Appendix B). The District will submit the updated Plan to the Department of Water Resources within 30 days after its adoption, as required by Section 10644 of the Act. This updated Plan contains information required by the Act, which is necessary to plan for the efficient use of urban water supplies within the District's service area. Prior to its adoption, the District's board of directors and the public reviewed the Plan.

The water supply situation is frequently dependent upon forces beyond the local control of the District. The environment and the actions of other agencies can have significant impacts on local water supplies; the recent seven-year drought is an example of the environment's actions, while declines in water tables following excess pumping are an example of other agencies' actions. This Plan, while not enabling the District to control the environment, or the actions of other agencies, does allow the District to plan to mitigate the impacts of these forces through implementation of conservation measures. The plan allows the District to budget the staff and resources necessary to ensure that it continues to meet the water demands of its customers in a fair and equitable manner.

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