

# DROUGHT CONTINGENCY PLAN

Prepared by J-U-B Engineers, Inc.



GRANGER-HUNTER  
IMPROVEMENT DISTRICT

Improving Quality of Life  
Today, Creating a Better  
Tomorrow

June 2022

# Contents

EXECUTIVE SUMMARY .....	ii
1. INTRODUCTION.....	0
2. DROUGHT HISTORY.....	1
3. PURPOSE OF DROUGHT PLANNING .....	2
4. DISTRICT WATER CONSERVATION AND SUPPLY .....	3
4.1 Water Tiered Rates .....	4
4.2 Salt Lake Valley Aquifer Safe Yield .....	5
4.3 Salt Lake Valley Aquifer Water Quality .....	7
5. Operational and Administrative Framework .....	9
5.1 Drought Monitoring.....	9
5.2 Drought Response Implementation.....	10
6. VULNERABILITY ASSESSMENT.....	10
6.1 Key Drought Risks and Impacts by Sector.....	11
6.2 High Water Users.....	12
6.3 Possible Future Climate Change Scenarios .....	12
7. MITIGATION ACTIONS.....	12
7.1 Identification of Mitigation Actions .....	13
8. DROUGHT RESPONSE ACTIONS AND LEVELS .....	13
Level 0 – Normal Water Supply .....	13
Level 1 – Voluntary Water Conservation .....	14
Level 2 – Voluntary Water Restrictions .....	15
Level 3 – Mandatory Water Restrictions .....	15
Level 4 – Emergency Water Restrictions .....	16
9. PRIORITY PROJECTS FOR DROUGHT RESILIENCY .....	17

# EXECUTIVE SUMMARY

This Drought Contingency Plan prepared for Granger-Hunter Improvement District (District) will assist in recognizing the early stages of drought, understanding drought impacts and developing plans to hedge against reduced water supplies. The District has developed this plan to foster long-term resilience to drought by analyzing potential water supply reductions, better understanding customer reactions to drought levels, and to plan for and develop projects to protect against long-term drought.

The District provides water and wastewater service to 130,000 residents of West Valley City, Utah. The District currently utilizes a water wholesaler, Jordan Valley Water Conservancy District (JVWCD), for approximately 75 percent of its water supply. The remaining 25 percent comes from its own wells in the Salt Lake Valley aquifer. During times of drought, JVWCD may request reductions or reduce the contract by up to 30 percent or more depending on the severity of the drought. In 2022, JVWCD declared a Level 1 Drought.

Drought Level	Targeted % Reduction in JVWCD Contract	Targeted Annual Volume from JVWCD (Acre-ft)	Max Delivered % of JVWCD Contract	Max Delivered Annual Volume from JVWCD (Acre-ft)
0	0%	18,500	-	-
1	5%	17,575	120%	22,200
2	10%	16,650	110%	20,350
3	20%	14,800	100%	18,500
4	30%	12,950	>100%	>18,500

Notes:  
 1 - At Level 4, JVWCD will determine the water supply availability as a ratio to wholesale contract amounts (i.e., 90 percent, 85 percent, etc.) at the time that this level of water supply availability is established.  
 2 - Reduction targets and max delivered volumes are taken from Table 6-1 of the JVWCD Drought Contingency Plan.

*Fig.1: JVWCD Contract Reductions during Drought*

Due to the potential for supply reductions, the District has determined a strategy for reducing demand and increasing its drought-resilient supply by accessing additional groundwater resources. The District owns additional groundwater rights that can be utilized to make up for a supply shortage, though the groundwater contains higher levels of iron, manganese and ammonia that need to be removed to reduce water quality complaints and concerns.

During a drought, the District will implement one of 5 Drought Levels:

- Level 0:** Education and Public Awareness of water use within the District’s boundaries, and a focus on water loss reduction. This is the default level unless additional restrictions are warranted.
- Level 1:** Voluntary water conservation, including suggestions for outdoor irrigation and additional public outreach.
- Level 2:** Voluntary time of day, watering frequency and/or other voluntary water restrictions, in addition to public outreach.
- Level 3:** Mandatory time of day, watering frequency and/or other voluntary water restrictions, in addition to public outreach. Temporary increases to Tier III and IV water rates.
- Level 4:** Emergency water use restrictions, including bans on certain types of outdoor irrigation and a reduction to the size of Tier III.

Based on these Drought Levels, it is anticipated that water use reductions will occur in the range of 5 to 30 percent. In 2021, the District saw a demand reduction from 10 to 15 percent without declaring a drought level, just based on outreach from the State of Utah and the media. For planning purposes, the District should not count on long-term demand reductions if summers become hotter and drier due to climate change. Snow levels are also expected to reduce long-term, leading to less surface water available for the Wasatch Front. Based on potential cutbacks and marginal groundwater quality, the District should pursue the construction of an additional well and an additional groundwater treatment plant to reduce reliance on surface water supplies from JVWCD and increase drought resiliency.

## 1. INTRODUCTION

Granger-Hunter Improvement District (District) provides potable water distribution and wastewater collection services to approximately 130,000 residents in a 24.5 square mile area in West Valley City, Utah. The District’s mission is: “Stewards of Water: delivered clean and safe for daily use and collected responsibly to protect public health and the environment.” The District has approximately 375 miles of potable water piping, ranging in size from 4-inch to 30-inch, along with nine storage reservoirs and eight deep wells. The wastewater system consists of 12 lift stations along with 300 miles of collection piping. The District is governed by a 3-member Board of Trustees, with 75 staff handling the day-to-day operations. The District’s eight deep wells provide approximately 25 percent of its potable water, with the remainder coming from Jordan Valley Water Conservancy District (JVWCD). The District’s wastewater is treated by Central Valley Water Reclamation Facility (CVWRF).

The District purchases approximately 75 percent of its potable water from Jordan Valley Water Conservancy District (JVWCD) through a wholesale "take-or-pay contract." JVWCD’s water sources include the Central Utah Project, the Provo Reservoir Water Users Company, the Central Water Project (groundwater from Utah County), the Utah Lake System (storage in Strawberry Reservoir), groundwater, and other smaller sources. JVWCD generally allows for a yearly overage of 20% of the contract, though generally the District remains close to utilizing 18,500 Acre-feet per year (AFY). In addition, JVWCD’s yearly increases include a factor for ‘peaking’, which encourages the District to utilize JVWCD water at a similar amount throughout the year and peak on its own supplies.

The remaining 25 percent of potable water is self-supplied through seven deep wells, as shown below. For planning purposes, Well No. 4 is not currently utilized due to water quality issues.

Well Name	Pumping Capacity <sup>1</sup> (gpm)	Annual Yield 6-Month Operation (Acre-Ft/Year)	Annual Yield Year-Round <sup>2</sup> (Acre-Ft/Year)
Well No. 1	1,000	807	1,613
Well No. 4	0	0	0
Well No. 8	1,700	1,371	2,742
Well No. 12	2,300	1,855	3,710
Well No. 14	650	524	1,048
Well No. 15	2,600	2,097	4,194
Well No. 16	2,500	2,016	4,033
Well No. 17	3,300	2,661	5,323
<b>Total Capacity</b>	<b>14,050</b>	<b>11,331</b>	<b>22,663</b>

*Table 1-1: District Well Supply*

The entire 22,663 AFY shown in Table 1-1 is not currently able to be utilized, due to limitations on pumping capacity in the summer and that water demand in the non-irrigation season is significantly less than the pumping capacity. In addition, many of the District’s wells have higher levels of ammonia, manganese, and iron. These constituents impact water quality in the District by creating taste, odor and aesthetic complaints. Iron and Manganese are currently secondary standards, and as such there are only guidelines for aesthetic considerations. It is possible that Manganese becomes a primary drinking water standard in the future, therefore the District is planning on treating its wells with the highest amounts, starting with Wells No. 1, 12 and 17 with a treatment plant that is already under construction.

The District’s wholesale supply is contingent on JVWCD supplying the full contract amount (18,500 acre-feet). JVWCD has indicated, in times of drought, that they may set water demand targets as follows:






Water Supply Availability Level	Water Shortage Description	Water Demand Reduction Target
 Level 0	Normal	None
 Level 1	Moderate	5% reduction in typical use for wholesale Member Agencies and JWCD retail customers, but in any event, JWCD will not supply more than 120% of wholesale contract amounts
 Level 2	Severe	10% reduction in typical use for wholesale Member Agencies and JWCD retail customers, but in any event, JWCD will not supply more than 110% of wholesale contract amounts
 Level 3	Extreme	20% reduction in typical use for wholesale Member Agencies and JWCD retail customers, but in any event, JWCD will not supply more than wholesale contract amounts
 Level 4	Critical/Exceptional	30% reduction in typical use for wholesale Member Agencies and JWCD retail customers. JWCD will determine the water supply availability as a ratio to wholesale contract amounts (i.e. 90%, 85%, etc.) at the time that this water supply availability is established

Table 1-2: JWCD Drought Water Demand Reduction Targets

In addition, JWCD has indicated they may temporarily increase the wholesale dollar rate of water during times of drought, specifically water taken above the reduced contract amount. Due to the possible curtailment of the contract amount, appropriate actions need to be taken to ensure an adequate water supply is available.

## 2. DROUGHT HISTORY

Utah has experienced periods of water shortages since the pioneers first settled in the Salt Lake Valley. The lengthy droughts of the 1930s and 1950s caused significant economic problems for the state. While the drought of 1976-77 was not as long, the consequences were still intense and costly. In 2016, after several years of drought conditions that started in 2012, Utah Lake dropped to levels causing the Utah State Engineer to prohibit diversions of more than 100,000 acre-feet (AF) of secondary storage rights (junior water rights holders) in Utah Lake. The low water levels also intensified a widespread algal bloom in Utah Lake, prompting public health advisories. Declining water levels and algal blooms caused by drought conditions are chronic issues.

The recently completed Weber River and Bear River tree-ring stream flow reconstructive studies and JWCD's *Preparing for Climate Change—A Management Plan* forecast the likelihood of much more severe and longer-term droughts in the future. Per "Rapid Intensification of the emerging southwestern North American megadrought in 2020-2021", Nature Climate Change, Mar. 2022, Williams, Park A. et. Al., "the drought will very likely persist through 2022, matching the duration of the late-1500s megadrought," which lasted for 22 years, and modeling shows the current drought may last for another 2-8 years. Figure 2-1 shows the history of soil moisture from 800 CE onward, with a clear reduction since 2000.

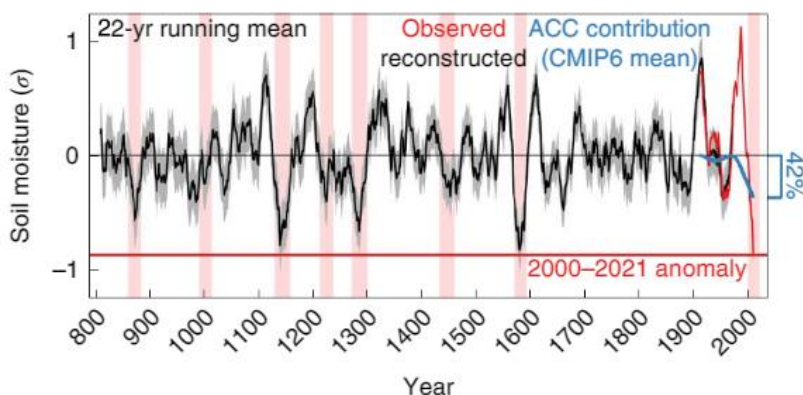


Fig. 2-1: Soil Moisture History from 800 CE, “Rapid Intensification of the emerging southwestern North American megadrought in 2020-2021”, *Nature Climate Change*, Mar. 2022, Williams, Park A. et. Al.

In April of 2022, the Utah Department of Natural Resources indicated that 99.39 percent of the state was in severe drought or worse, with 43.46 percent of Utah in extreme drought with the snowpack at only 75 percent of normal. Of Utah's largest 45 reservoirs, 19 were below 55 percent of available capacity, and overall statewide storage was only at 59 percent of capacity. Of the 94 measured streams, 59 were flowing below normal despite spring runoff, and two streams were flowing at record low conditions. On April 21, 2022, Governor Spencer J. Cox declared a state of emergency due to the dire drought conditions affecting the entire state.

### 3. PURPOSE OF DROUGHT PLANNING

The 2012 drought contributed to public-health issues threatening state economic growth, agricultural users and recreational activities restrictions, and damage to the vibrant ecosystems surrounding the shrinking Great Salt Lake and Utah Lake. In May 2017, JWCD completed a study called *Preparing for Climate Change—A Management Plan* (revised March 2018), which indicates that the drought mitigation projects of the 20th century are likely inadequate to compensate for the impacts of climate change and to mitigate the area's longest droughts. JWCD stakeholders, including the District, agreed that planning to mitigate the risks associated with a severe drought could no longer be delayed. JWCD assembled stakeholders from the municipal, industrial, agricultural, recreational, and environmental communities and developed its 2021 Drought Contingency Plan, which includes projects, actions, and partnerships to prepare for and reduce water shortages and provide better drought resilience for the area's diverse water users.

In 2021 after participating in the drought planning with JWCD, the District implemented drought water rates to address when and if, in times of drought, JWCD may curtail a percentage of the water contract dependent on the severity of the drought. In addition, JWCD has indicated they may temporarily increase the wholesale rate of water during times of drought, specifically water taken above the reduced contract amount. DISTRICT felt that due to the possible curtailment of the contract amount, appropriate actions must be taken to ensure an adequate water supply is available to District customers.

In 2022, the District decided to create its own Drought Contingency Plan (DCP) to evaluate its system vulnerabilities and impacts further and identify the most effective and efficient mitigation actions that will reduce the effects of drought in the future. The DCP has been added as an appendix to the District's Water Master Plan.

The DCP provides a practical and systematic means for the District to manage emergency supply conditions within its own service area. This plan is intended to serve as a guiding document for managing water supply and delivery in the event of severe or prolonged drought and will be monitored and adjusted as more information becomes available.

#### 4. DISTRICT WATER CONSERVATION AND SUPPLY

During preparation of the District’s Water Master Plan in 2022, the District analyzed its gallons per capita/day (gpcd) rate. This was compared to the State of Utah’s Regional Water Conservation Goals for the Salt Lake Region. Table 4-1 shows the compiled information. Based on the analysis, the District is already well ahead of the regional goals but has committed to reducing gpcd use by another 6% by 2030 and 10% by 2040.

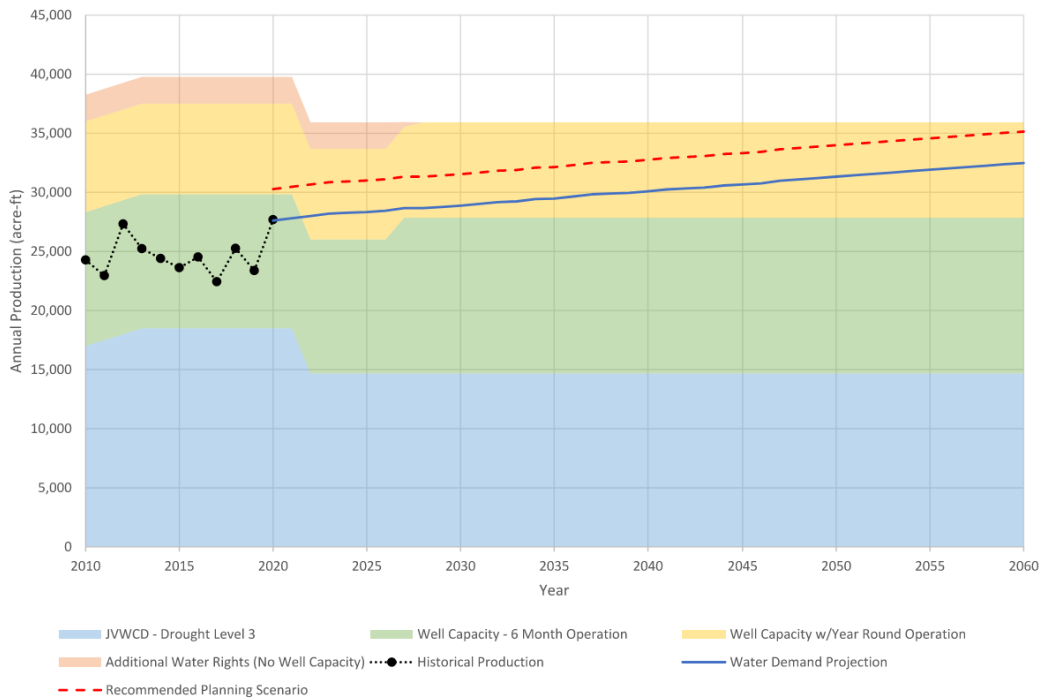
Year	State of Utah (gpcd)	State of Utah (%)	GHID (gpcd)	GHID (%)
2015	210			
2020	-		187	
2030	187	11%	176	6%
2040	178	15%	169	10%
2065	169	19%	161	14%

*Table 4-1: District Conservation Goals*

During the preparation of the 2022 District Water Master Plan, the hydraulic model was used to determine if the current water system could support the full summertime demand given the potential for reductions in JVVCD supply. The most likely source loss for the District is a reduction of the supply due to the JVVCD Drought Contingency Plan. At the different drought levels, JVVCD could implement voluntary or mandatory reductions in supplied water between 5 and 30% of typical use. Between 2014 and 2021, the District’s typical use of JVVCD wholesale water was 18,900 AFY. The targeted volume and max deliveries from JVVCD are different because many member agencies routinely exceed their contract amounts by large percentages. Because the District routinely uses close to its contract amount, less significant reductions are mandatory, but are still targeted and suggested.

The District currently has 27 million gallons (MG) of storage with plans to purchase and/or construct an additional 8 MG. Due to the long-term nature of the drought, storage is not a critical element for drought mitigation, and as such is not included in the plan.

As shown below, a Drought Level 3 would reduce supply by up to 3,700 AFY, requiring additional use of DISTRICT wells.



*Fig. 4-1: Projected Annual Production Requirements at JWCD Drought Level 3 in 2022*

The Recommended Planning Scenario above is greater than the Water Demand Projection because it assumes that one of the District’s largest wells, Well No. 17, is offline and not available all summer. This graph also assumes year-around use of the District’s wells, which may not be possible given that demand during the non-irrigation season is less than be supplied by the District’s wells. The District’s Well No. 16 is the only well that can pump to the higher pressure zones on the south-western portion of the District, and if this well was out of service, supply to approximately 25 percent of the District’s service area would be disrupted if the JWCD max delivery had been reached. In addition, JWCD does not declare a drought level until May, which would make it difficult to predict if year-round operation of District wells is necessary.

#### 4.1 Water Tiered Rates

Starting in 2018, the District adopted a three-tiered water rate in order to promote conservation. While the incremental rates were small at first, in 2022 they were increased, and a fourth tier was added. The first two tiers, as shown in Table 4-2, are designed to keep rates low for indoor use (Tier I) and responsible outdoor use (Tier II). Tiers III and IV are designed to encourage responsible use of water, especially since any use above 45,000 gallons per month would be considered excessive for most single-family residential homes.

Water Tiers	Price (per 1,000 gallons)
Tier 1 (Less than 7,000 gallons)	\$1.77
Tier 2 (7,001 - 15,000 gallons)	\$1.90
Tier 3 (15,001 - 45,000 gallons)	\$2.20
Tier 4 (45,001 gallons and above)	\$3.00
Multi-Unit (apartments, condos, etc.)	\$2.10

*Table 4-2: District Water Rates*

It is the District’s intention to continue to assess rates that assign a higher cost to high outdoor water use. In addition, the District has adopted Drought Level 3 and 4 temporary water rate increases and reductions in Tier size. At Drought Level 3, Tier III increases from \$2.20/1,000 gallons to \$3.30, and Tier IV increases from \$3.00 to \$6.00. At Drought Level 4, Tier III reduces from 45,000 gallons to 35,000 gallons, and Tier IV begins at 35,001 gallons.

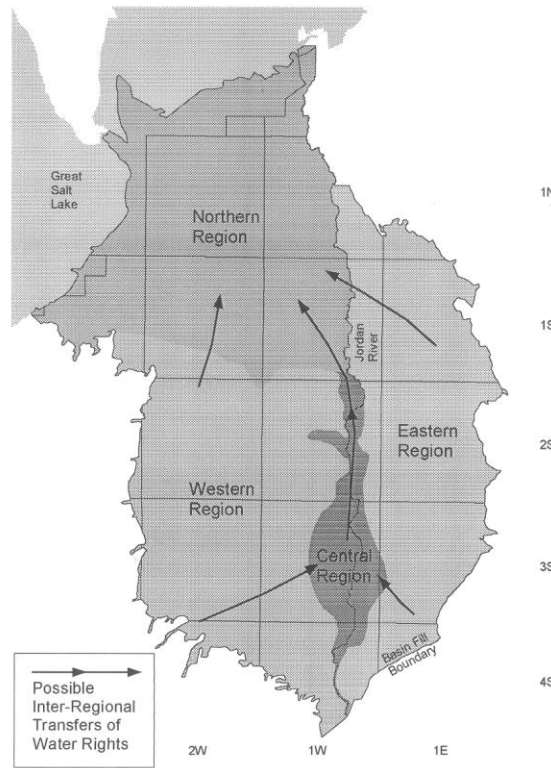
<b>Drought Contingency Rates</b>	
Level 3: As defined by Jordan Valley Water/Board of Trustee	
Tier 3 Rates	\$3.30
Tier 4 Rates	\$6.00
Level 4: As defined by Jordan Valley Water/Board of Trustee	
Tier 3 Rates - 15,001 - 35,000 gallons per month	\$3.30
Tier 4 Rates - All > 35,000 gallons per month	\$6.00

*Table 4-3: Tiered Water Rates During Drought Levels*

## 4.2 Salt Lake Valley Aquifer Safe Yield

The District’s seven wells pull water from the deep Salt Lake Valley Aquifer. This aquifer has provided water to Salt Lake County residents for many years. In 2002, a coalition of stakeholders prepared a final “Salt Lake Valley Groundwater Management Plan” in which the objectives were to promote the wise use of groundwater resources, protect existing water rights, and address water quality issues and over-appropriation of groundwater in the valley. The Salt Lake Valley is closed to new appropriations. From 1986 to 2000, water-level declines in the aquifer were noted in the south portion of the valley, but none in the north-western portion where the District operates its wells. In addition, it noted that the safe use of the aquifer was 165,000 AFY and that the current use was 130,000 AFY.

The report also determined safe aquifer yields by section as part of their analysis:



*Figure 4-2: Salt Lake Valley Aquifer Regions*

Region	Safe Yield (acre-feet per year)
Western	25,000
Eastern	90,000
Central	20,000
Northern	30,000

*Table 4-4: Safe Aquifer Yields*

The District utilizes groundwater from both the Northern and Western sections, where the total safe yield is 55,000 AFY. The AFY amounts pumped by others are currently unknown, but the maximum the District has recently pumped is 7,400 AFY.

Other agencies in the Northern and Western sections include Magna Water District, Taylorsville-Bennion Improvement District, Kearns Improvement District, West Jordan City, Riverton, Herriman and Bluffdale. While it is unknown the exact quantities other agencies are pumping, averages of annual water use data are available from [waterrights.utah.gov](http://waterrights.utah.gov). Based on these averages, approximately 42,000 AFY is being used in the Northern and Western areas for potable water. It is unknown how much is used for secondary irrigation systems.

AGENCY	ESTIMATED ANNUAL WITHDRAWAL
DISTRICT	8,000 AFY
TBID	8,000 AFY
KID	2,000 AFY
MAGNA	5,000 AFY
WEST JORDAN	2,000 AFY
RIVERTON	SECONDARY ONLY
HERRIMAN	5,000 AFY
BLUFFDALE	SECONDARY ONLY
JVWCD	7,000 AFY
OTHER	5,000 AFY
<b>TOTAL</b>	<b>42,000 AFY</b>

*Table 4-5: Average Groundwater Use by Agencies in the Northern and Western Sections of the Salt Lake Aquifer*

Based on this analysis, there are 13,000 AFY of safe yield remaining in the Northern and Western regions of the aquifer, which would give the District an allowance to use its entire 22,000 AFY of water rights during a drought year without impairment of the aquifer. The District, through its Supervisory Control and Data Acquisition (SCADA) system, would monitor aquifer levels to ensure no regional drawdown is occurring. If drawdown is occurring, yields would need to be reduced in order to ensure the long-term sustainability of the aquifer.

### 4.3 Salt Lake Valley Aquifer Water Quality

The District's seven wells are generally higher in TDS, manganese, iron and ammonia than JVWCD water quality. As shown in Figure 4-4, the total dissolved solids (TDS) of groundwater in the District's area ranges from 250 to greater than 1,000 milligrams per liter, with the TDS generally increasing since 1988.

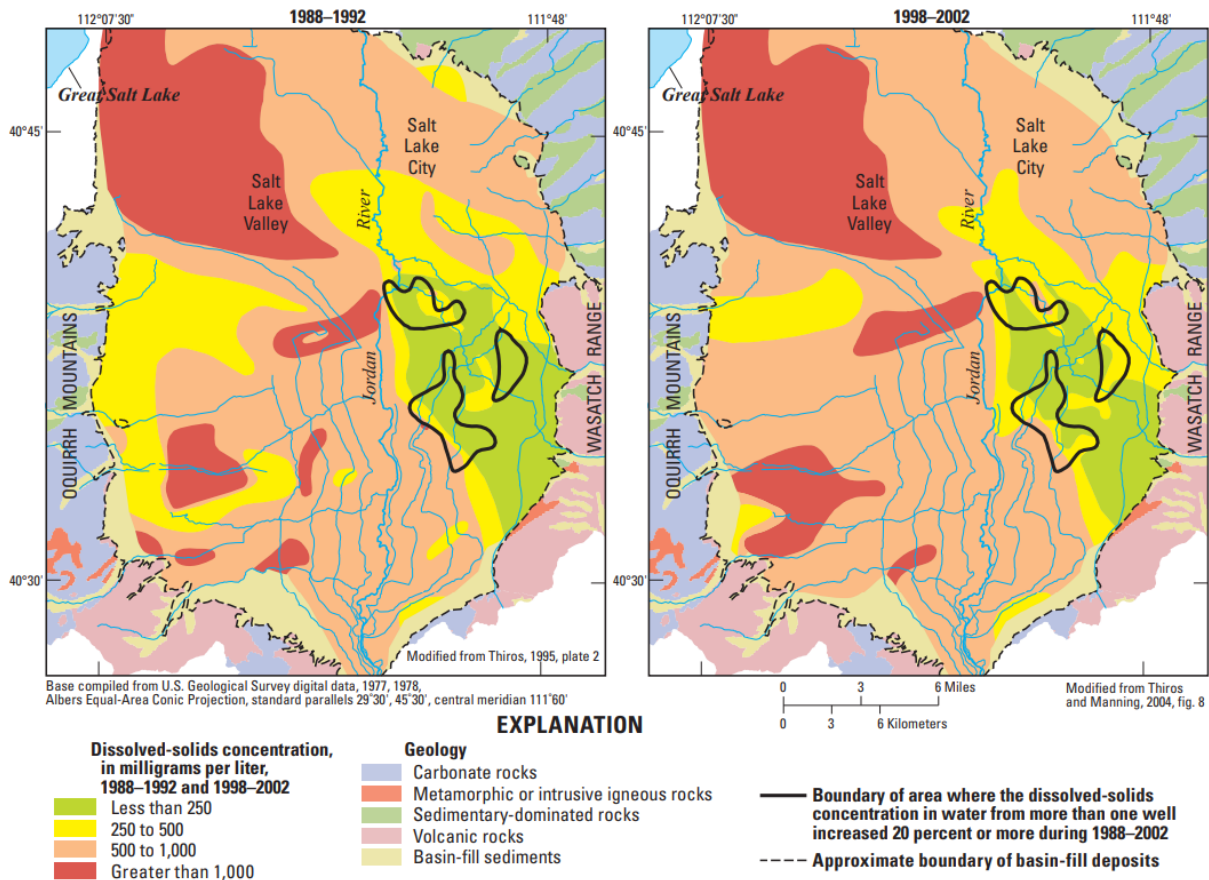


Figure 4-4: TDS Concentrations in the Salt Lake Valley Aquifer, Conceptual Understanding and Groundwater Quality of Selected Basin-Fill Aquifer in Salt Lake Valley, Utah, USGS, Paper 1781

While the TDS levels have not yet reached levels that have caused large issues, the levels of iron, manganese and ammonia in the groundwater can cause aesthetic problems and lead to excessive water quality complaints. A study conducted by the District and Confluence Engineering Group determined that the level of manganese entering the system from several wells was above 0.05 mg/L. Often, other metals (iron, lead, and arsenic) can co-accumulate, causing a potential health risk if scaling on pipe walls is released. Table 4-6 shows a summary of water quality conditions in 2018.

Parameter (units)	Well Number (and number of Data Points)							USEPA Standard	Recommended Limit*
	Well 1 (n=7)	Well 8 (n=2)	Well 12 (n=5)	Well 14 (n=0)	Well 15 (n=6)	Well 16 (n=1)	Well 17 (n=7)		
Ammonia (mg/L as N)	0.22 (0.02 - 0.34)	-- (0.38 - 0.39)	0.34 (0.30 - 0.38)	NM	0.40 (0.36 - 0.44)	0.60 (-)	0.17 (0.13 - 0.34)	NA	NA
Conductivity (µS/cm)	596 (560 - 630)	-- (473 - 474)	732 (688 - 796)	NM	636 (541 - 706)	913 (-)	902 (828 - 972)	NA	NA
Iron (mg/L)	0.06 (0.02 - 0.12)	-- (0.09 - 0.10)	0.12 (0.01 - <b>0.40</b> )	NM	0.17 (0.10 - <b>0.36</b> )	0.05 (-)	0.12 (0.08 - 0.23)	0.3 †	0.1
Manganese (mg/L)	0.04 (0.01 - <b>0.09</b> )	-- ( <b>0.06 - 0.07</b> )	<b>0.10</b> (0.03 - <b>0.20</b> )	NM	<b>0.05</b> (0.04 - <b>0.07</b> )	<b>0.06</b> (-)	0.04 (0.01 - <b>0.06</b> )	0.05 †	0.02
pH (units)	7.7 (7.5 - 7.9)	-- (7.7 - 7.9)	7.7 (7.6 - 7.9)	NM	7.8 (7.0 - 8.1)	7.8 (-)	7.8 (7.6 - 7.9)	6.5 - 8.5 †	NA
Total Dissolved Solids (mg/L) †	371 (348 - 393)	-- (292 - 293)	458 (430 - 499)	NM	396 (336 - 441)	<b>573</b> (-)	<b>566</b> ( <b>519 - 611</b> )	500 †	NA
Turbidity (NTU)	0.7 (0.2 - 1.2)	NM	0.9 (0.3 - 3.4)	NM	0.7 (0.2 - 1.8)	NM	0.4 (0.2 - 1.0)	5 †	NA

Methods: Ammonia (HACH Method 10205 ULR TNTplus 830), Iron (HACH Method 8008 FerroVer pillows), and Manganese (HACH Method 8149 PAN pillows).

**Bolded, red data** are above the USEPA Standard

NA = No standard / not applicable

NM = Not measured

-- Not calculated due to lack of data

† TDS calculated based on conductivity

‡ Secondary (aesthetic) standard

\* Recommended limits based on industry best practices

Based on the conclusions of the study, well water treatment was recommended in order to remove iron, manganese, and ammonia, reduce water quality complaints and reduce the likelihood of non-compliance if the US EPA adopts manganese primary drinking water standards. The District has proceeded with constructing a water treatment plan for Wells No. 1, 12, and 17, but Wells No. 15 and No. 16 both have elevated levels as well and require treatment.

## 5. Operational and Administrative Framework

The operational and administrative framework lays out how the District will monitor and determine its drought level and who will oversee implementation of the drought response. The District's General Manager, under the direction of the District's Board of Trustees, will oversee implementation of the plan with assistance from staff.

### 5.1 Drought Monitoring

As most of the District's potable water is supplied from JWCD (75 percent) on a take-or-pay contract, the District's drought monitoring process will follow that of JWCD's, outlined in their Drought Contingency Plan. The JWCD drought monitoring process includes five water supply conditions or drought levels that are based on three drought monitoring triggers including:

- JWCD supply availability of CUP with storage in Jordanelle reservoir as provided by CUWCD
- JWCD supply availability of Provo River Project as determined by PRWUA
- JWCD supply availability of high-quality groundwater as reported by Utah DEQ.

Since the remaining 25 percent of the District's water is supplied through seven deep wells, these three drought monitoring sources were found to be sufficient to accurately identify the drought level the District will implement throughout the year. The five water supply conditions/drought levels are generally described in Table 5-1 below.

Water Supply Conditions / Drought Level	Water Shortage Description	Triggering Criteria Applied to Water Supply Availability Levels		
		CUWCD Supply Availability (Jordanelle Storage of CUP)	PRWUA Supply Allocation (in the Provo River Project)	Salt Lake Valley Groundwater Conditions
0	Normal	At least 95 percent supply availability	At least an 80 percent supply allocation	3-year average diversions less than safe yield
1	Moderate	At least 95 percent supply availability	75 – 80 percent supply allocation	JVWCD groundwater diversions to compensate for shortage exceeds 12,000 AF, or 3-year average exceeds safe yield
2	Severe	At least 90 – 95 percent supply availability	75 – 80 percent supply allocation	JVWCD groundwater diversions to compensate for shortage exceeds 16,000 AF, or 3-year average exceeds safe yield
3	Extreme	At least 90 – 95 percent supply availability	Less than 75 percent supply allocation	JVWCD groundwater diversions to compensate for shortage exceeds 20,000 AF, or 3-year average exceeds safe yield
4	Critical / Exceptional	Less than 90 percent supply availability	Less than 45 percent supply allocation	JVWCD groundwater diversions to compensate for shortage exceeds 20,000 AF, or 3-year average exceeds safe yield

*Table 5-1: JVWCD Water Supply Conditions and Triggers*

Each year JVWCD considers feedback and updated water supply forecast information and determines a final drought level recommendation no later than May 1. JVWCD establishes the water supply availability level by formal action of its Board of Trustees at its May Board Meeting and encourages each Member Agency to similarly establish the water supply availability level by formal action of their respective governing bodies.

The District will monitor the water supply availability level set by JVWCD in May of each calendar year and will follow a similar process for implementing the drought level and associated response actions to be followed by DISTRICT water users. At the May Board Meeting, the District’s Board of Trustees will analyze JVWCD’s drought level and determine the District’s Drought Level. The General Manager will be responsible for recommending a drought level.

## 5.2 Drought Response Implementation

As laid out in Section 8, the levels of drought response set guidelines for action for District staff to implement. The General Manager will oversee the implementation of the guidelines as directed by the District’s Board of Trustees. The District’s Director of Administrative Services will be responsible for implementing outreach with the District’s customers utilizing the Customer Service and Meter Department staff. The District Operations and I.T. staff will be responsible for monitoring overall water use and providing information to Management on current supply and demand.

## 6. VULNERABILITY ASSESSMENT

As part of this drought planning effort, a vulnerability assessment was conducted to evaluate the likelihood of a prolonged drought based on historical data and evaluate potential risks and impacts that a drought would present to the District’s service area. The vulnerabilities to JVWCD’s water supply are well documented within their

Drought Contingency Plan. It includes risk factors that contribute to reduced supply which were identified and weighted based on their likelihood of occurrence and the reliance JWCD has on that particular supply source as a percentage of its portfolio. The risk factors that JWCD identified are also risk factors to the District’s system due to its reliance on the same sources for water supply.

The key drought vulnerabilities identified, along with the associated risks and their potential impacts by sector, are outlined in Table 6-1 below.

Key Drought Vulnerabilities	Risks	Impacts by Sector		
		Municipal	Agricultural	Environmental
Available Water Supply	<ul style="list-style-type: none"> <li>• JWCD contract curtailment</li> <li>• Reliance on surface flows subject to minimum flow requirements</li> <li>• Local mountain streams lack holdover storage</li> <li>• Climate Change</li> <li>• Groundwater Overpumping</li> </ul>	✓	✓	✓
Source Water Quality Degradation	<ul style="list-style-type: none"> <li>– Algal by-products/blooms impacting usability of JWCD sources</li> </ul>	✓	✓	✓
Increased Water Costs	<ul style="list-style-type: none"> <li>– Tiered rate structure with JWCD contract</li> <li>– JWCD contract costs are 50% greater than groundwater production costs prior to treatment</li> </ul>	✓	✓	
Inability to Utilize Available Supply due to Aging Infrastructure	<ul style="list-style-type: none"> <li>• Aging wells</li> <li>• Mechanical failure of wells or treatment equipment</li> </ul>	✓	✓	
Heavy Reliance on JWCD	<ul style="list-style-type: none"> <li>• Currently, 75 percent of water supplied from JWCD</li> </ul>	✓	✓	✓

Table 6-1: Key Vulnerabilities, Risks, and Impacts by Sector

## 6.1 Key Drought Risks and Impacts by Sector

**Municipal and Industrial (M&I)** - The M&I sector relies on each water source in the District’s portfolio and the various assets used to store, convey, or treat the water. Any form of disruption to these sources can heavily impact this sector. Outdoor landscaping is particularly susceptible to disruption, as reductions in outdoor use may lead to the death of plants and groundcover.

**Agricultural** - Groups within this sector rely on quality water, and any adverse impacts to the water quality due to drought can quickly interrupt water sources in this sector. The previously mentioned 2016 algal blooms in Utah Lake that prompted secondary water systems to shut down are an example of this. Without the ability to use these secondary water systems, this sector’s demand on JWCD’s system is increased.

**Environmental** - Lower stream and groundwater flows and altered runoff patterns impact ecosystems that rely on these water sources. During drought, water quality can also be compromised, affecting ecosystems and critical aquatic habitats such as the lower Provo River, a critical habitat for the June Sucker, an endangered species.

## 6.2 High Water Users

The District's service area also includes food manufacturing and bottling plants, whose entire business is reliant on water. Any disruptions to their supply could prove detrimental to their continued operations in the West Valley City area. High water users also include West Valley City (parks, government facilities) and the Granite School District (2 high schools and multiple middle and elementary schools).

It is the District's intention, during a drought, to work closely with both Industrial/Commercial and Governmental users to assist the District in meeting its conservation goals. This would take the form of outreach to the organizations with information on their water use and methods to reduce it, while ensuring that these vital uses have enough supply to continue their viability as employers and to preserve our vital open space.

## 6.3 Possible Future Climate Change Scenarios

Climate change impacts are anticipated to exacerbate existing extreme weather events, including the length and intensity of drought and floods, through changes in precipitation and temperature. Although there is uncertainty in the degree of potential changes in the hydrologic cycle, projected trends according to the Intergovernmental Panel on Climate Change (IPCC) indicate a high likelihood of increases in temperature and changes in the severity and intensity of precipitation events. IPCC prepared studies at the regional and local levels using dendrochronology along the Weber and Bear Rivers. This study yielded relevant information on paleohydrology and has demonstrated significant annual and decadal climate variability, including drought periods that are much longer and drier than those experienced in recorded history.

JVWCD, within their Drought Contingency Plan, has used these studies and past palaeohydrological data to understand how past severe droughts occurred and the potential impacts if they were to recur in the future. These impacts include changes in precipitation and general hydrologic patterns, reduction of snowpack and water supply, water quality impacts, and potential increases in water demand.

The climate of the State of Utah has seen high variability across the past 1,000 years, with more significant variability in terms of extremes for both wet and dry periods experienced in the recent study Period. Utah has demonstrated an increasing trend in temperature that corresponds to trends predicted by global climate models. The impacts of this changing condition include changes in snowmelt flows and the anticipation of greater inefficiencies of these flows in the future. Early snowmelt resulting in the inefficient conversion of snowmelt runoff to reservoir inflow occurred between 2000-2004 during a drought that affected most Utah watersheds and is an example of what could be expected to continue with increasing temperatures. This early snowmelt shifts average peak streamflow periods currently relied upon by existing water supplies. Other impacts include the potential increase in evapotranspiration rate due to increased temperatures and an increase in the intensity of rainfall events.

Research from the University of Utah Department of Atmospheric Sciences summarizes and indicates potential key changes in temperature and precipitation may result in the following by the year 2100:

- Temperature increases between 1.5 to 5 degrees Celsius (°C)
- Precipitation increase between 5 to 10 percent (Wasatch), 20 percent (Uinta)
- Snowpack increase of 10 percent above 8,500 feet and decrease of 11 percent below 8,500 ft.

## 7. MITIGATION ACTIONS

## 7.1 Identification of Mitigation Actions

Key Drought Vulnerabilities	Risks	Possible Mitigation Actions
<b>Available Water Supply</b>	<ul style="list-style-type: none"> <li>- JWCD contract curtailment</li> <li>- Reliance on surface flows subject to minimum flow requirements</li> <li>- Local mountain streams lack holdover storage</li> <li>- Climate Change</li> </ul>	<ul style="list-style-type: none"> <li>- Drill additional wells and build treatment facilities to provide multiple water sources, including additional groundwater.</li> <li>- Improve public awareness and overall conservation through education.</li> </ul>
<b>Source Water Quality Degradation</b>	<ul style="list-style-type: none"> <li>- Algal by-products/blooms impacting the usability of JWCD sources</li> <li>- High manganese/iron/ammonia levels in groundwater.</li> </ul>	<ul style="list-style-type: none"> <li>- Build additional water treatment facilities to remove iron and manganese in existing wells.</li> </ul>
<b>Increased Water Costs</b>	<ul style="list-style-type: none"> <li>- Tiered rate structure with JWCD contract. JWCD contract costs are approximately 50% greater than groundwater production costs</li> </ul>	<ul style="list-style-type: none"> <li>- Drill additional wells and treatment facilities to provide less reliance on JWCD.</li> <li>- Educate the public about the cost of overuse of water for outdoor use. Develop guidance for how much water is required for outdoor use based on acreage.</li> </ul>
<b>Inability to Utilize Available Supply due to Aging Infrastructure</b>	<ul style="list-style-type: none"> <li>- Reduced production of wells and aging pumps and/or mechanical failure of wells or treatment equipment</li> </ul>	<ul style="list-style-type: none"> <li>- Improve drought reliability through system improvements that include replacing aging pipes, pumps, generators, and other equipment. Upgrade technology for monitoring, measuring, and providing security of the delivery system.</li> </ul>
<b>Heavy Reliance on JWCD</b>	<ul style="list-style-type: none"> <li>- 75 percent of District's water supply is dependent on JWCD</li> </ul>	<ul style="list-style-type: none"> <li>- Drill and equip new wells to fully utilize the District water rights to reduce dependency and provide drought resiliency.</li> </ul>

Table 7-1: Key Vulnerabilities, Risks, Possible Mitigation Actions

## 8. DROUGHT RESPONSE ACTIONS AND LEVELS

Response actions have been developed within the District's Drought Mitigation Plan, which was begun in 2021. These response actions are triggered by JWCD's associated drought levels used in times of drought, and the District has used them as a guide to their response actions and to mitigate the resulting impacts. These actions will be monitored, evaluated, and adjusted based on their effectiveness in reducing usage targets.

### Level 0 – Normal Water Supply

At this level, no additional water conservation actions are required. The District has adopted a tiered water rate system that encourages conservation through water pricing, including higher pricing for outdoor use in Tiers III and IV.

The District will continue its other conservation programs, including:

- Assisting with public education and outreach, including promulgating the Utah Outdoor Weekly Watering Guide.
- Continuing to remove turf areas from District property.

- Encouraging no outdoor watering during the middle of the day, using drought-tolerant plants and grasses, and using low water-use fixtures.
- Reaching out to customers whose water use trends indicate they may have a water leak.
- Looking for and repairing leaks in the distribution system by utilizing third-party contractors.
- Purchasing leak detection equipment for District maintenance crews.

Level 0 is always in effect unless the District's Board of Trustees adopts a higher level.

### Level 1 – Voluntary Water Conservation

At Level 1, the District will contact customers to request a voluntary reduction in water use. This drought action level aims to draw attention to the reduced water supply and for customers to use this resource wisely. The District's Board of Trustees shall define the means of communication with customers at the time of adoption of the drought level. These actions may include, in addition to those found in Level 0:

- E-mailing customers requesting voluntary water reductions.
- Mailing flyers requesting voluntary water reductions.
- Postings on social media and the District website requesting voluntary water reductions.

In addition, customers will be requested to follow the State of Utah Division of Water Resources lawn watering guide, which gives outdoor watering recommendations, including time of day of watering and length of watering.

JVWCD, if adopting a Level 1 restriction, expects to seek to voluntarily reduce the District's water contract by approximately 5 percent or approximately 1,000 AFY and in no case provide more than 120% of the contracted amount. The District's groundwater supply can provide the additional volume without additional cutbacks required if no savings are achieved. It is anticipated this drought level will lead to a minimum 5 to 10 percent decrease in water demand.

In 2021, the Governor of the State of Utah issued a drought emergency and the District's customers responded by cutting their use. Figure 8-1 shows the reduction (in yellow) from the District's customers compared to the blue line which represents the 5-year average. Taking into account the amount of rainfall and climate of 2021 versus the 5 previous years, it is likely District customers reduced their use by 10 to 15 percent. Based on these years of data, it seems probable that a 5 to 10 percent reduction in demand will be achievable at Level 1.

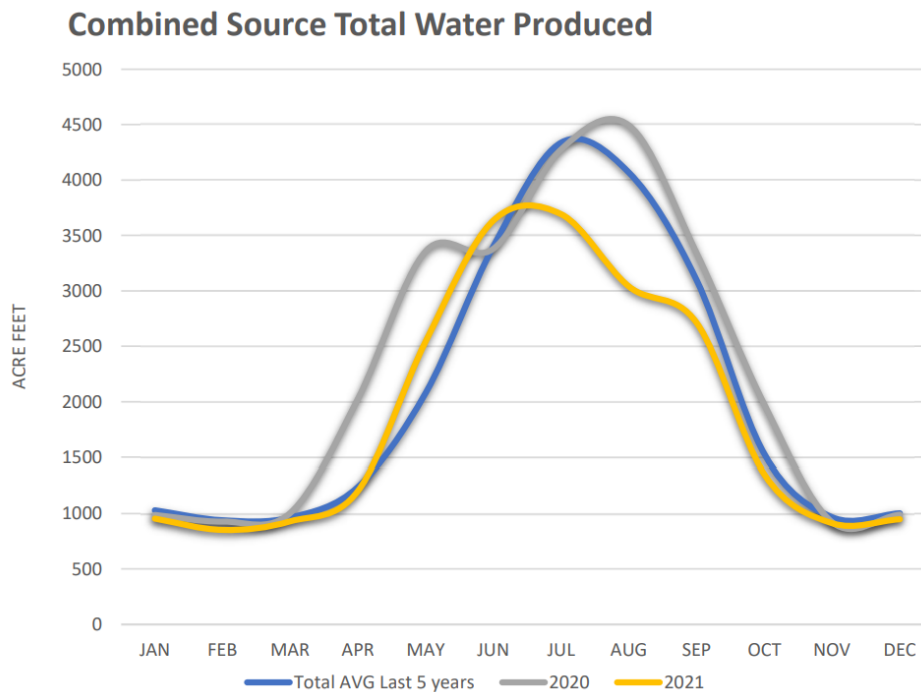


Figure 8-1: 2021 Drought Year Water Use

## Level 2 – Voluntary Water Restrictions

At this level, the District will begin contacting customers to request additional voluntary reductions in water use. The purpose of this drought action level is to continue to draw attention to reduced water supplies and to attempt to reduce water use even more than Level 1. The District's Board of Trustees shall define the additional means of communication, and the actions requested to reduce water use at the time of adoption of the drought level. These actions may include, in addition to those found in Levels 0 and 1:

- Voluntary time of day, watering frequency and/or other voluntary water restrictions. This may include even/odd watering based on address or other criteria and restrictions based on the Utah Division of Water Resources lawn watering guide. Outreach for these voluntary restrictions will begin with mailers/e-mail may escalate to phone calls or home visits.
- Additional e-mails, flyers, social media, and website postings requesting further water use reductions, including voluntary restrictions as defined above.

There are no penalties associated with these voluntary water restrictions.

JVWCD, if adopting a Level 2 restriction, expects to seek to voluntarily reduce the District's water contract by approximately 10 percent or approximately 2,000 AFY and in no case provide more than 110% of the contracted amount. The District's groundwater supply can provide the additional volume without additional cutbacks required even if no savings are achieved. It is anticipated this drought level will lead to a 10 to 15 percent decrease in water demand.

## Level 3 – Mandatory Water Restrictions

This level may include directives imposed by the District's Board of Trustees which may limit the manner of use of water, such as mandatory time of day and watering days per week limitations. The purpose of this drought action level is to reduce overall use by 20% throughout the year, specifically reducing outdoor water use. The District's

Board of Trustees shall define the requirements of Level 3 to reduce water use at the time of adoption of the drought level. These actions may include, in addition to the actions from Levels 0, 1, and 2:

- Mandatory time of day, watering frequency, and/or other water restrictions. This may include mandatory restrictions based on the Utah Division of Water Resources lawn watering guide or other limitations imposed by the Board of Trustees.
- Warnings and/or fines for violating the mandatory watering restrictions. Fines shall be assessed on customer water bills monthly.
  - First notice of violation – communication with customer with a reminder about restrictions.
  - Second notice of violation – communication with customer with a reminder about restrictions, and door flyer at the property.
  - Third notice of violation – communication with customer with a reminder about restrictions, door flyer at the property, site visit by customer service representative.
  - Fourth Notice and beyond – communication with customer with a reminder about restrictions, door flyer at the property, site visit by customer service representative, and/or fine.
- Temporary rate increases to the upper tier of water rates, as adopted in the 2022 water rates.
- Additional e-mails, flyers, social media, and website postings outlining the mandatory water use restrictions.

The District Board of Trustees may impose any additional limitations upon the adoption of Level 3. Notice of Level 3 Mandatory Water Restrictions shall be provided to customers by mailer, social media, and website updates.

JVWCD, if adopting a Level 3 restriction, expects to curtail the District's water contract by approximately 20 percent, or 4,000 AFY, and in any event will not supply more than the contracted amount. The District's groundwater supply can provide an additional 4,000 AFY, but it is anticipated this drought level will lead to a 15 to 20 percent reduction in water demand, so no water shortage is predicted.

#### Level 4 – Emergency Water Restrictions

This level may include directives imposed by the District's Board of Trustees which may limit the manner of use of water, such as mandatory time of day and watering days per week limitations, and temporary reductions in size of the top one or two water tiers. The purpose of this drought action level is to reduce overall use by 20% throughout the year, specifically targeting outdoor water use. The District's Board of Trustees shall define the requirements of Level 4 to reduce water use at the time of adoption of the drought level. These actions may include, in addition to those from Levels 0, 1, 2, and 3:

- Extreme restrictions and/or bans on outdoor watering of turf areas at private residential properties.
- Extreme restrictions on outdoor watering of turf areas at commercial, industrial and institutional properties.
- Warnings and/or fines for violating the emergency watering restrictions. Fines shall be assessed on customer water bills monthly.
  - First notice of violation – communication with customer with a reminder about restrictions.
  - Second notice of violation – communication with customer with a reminder about restrictions, and door flyer at the property.
  - Third notice of violation – communication with customer with a reminder about restrictions, door flyer at the property, site visit by customer service representative.

- Fourth Notice and beyond – communication with customer with a reminder about restrictions, door flyer at the property, site visit by customer service representative, potential fine.
- Temporary tier size reductions, as approved in the 2022 Rates and Fees. Any other changes to rates, fees or tier sizes may occur after a public hearing process.
- Additional e-mails, flyers, social media, and website postings outline the mandatory water use restrictions.

JVWCD, if adopting a Level 4 restriction, expects to curtail the District's water contract by approximately 30%, or 6,000 acre-feet. Because the Drought Level determination from JVWCD does not arrive until May, it is possible the District's groundwater supply may not be able to provide adequate supply if one or more of the wells are offline, and if little to no conservation is achieved. If conservation of 20 to 30 percent is achieved, there may be adequate supply to meet demands.

In the following planning scenario, JVWCD declares a Drought Level 4 in May and requests a cutback of 30 percent of the contract. The District activates all its wells in May, but Well No. 17 is down for pump repairs and no parts are available until the fall. Based on flow rate limitations, the District would need approximately 13,700 AFY from JVWCD but would only be provided 12,900 AFY, given a total demand of 24,300 AFY (5-year average). A shortfall of almost 1,000 AFY would occur, necessitating mandatory water use restrictions as outlined above. In order to increase emergency supply and reduce risk due to lack of redundancy, mitigating actions were determined as outlined in Section 9.

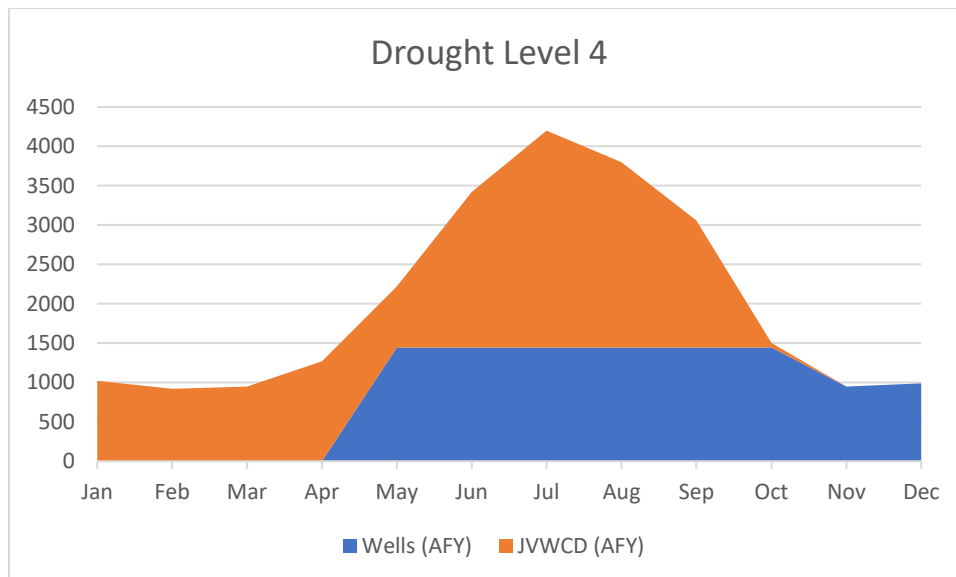


Figure 8-2: Drought Level 4 Water Supply

## 9. PRIORITY PROJECTS FOR DROUGHT RESILIENCY

Potential mitigation actions were evaluated based on what would best address the identified vulnerabilities. The estimated costs to complete actions were not part of the evaluation.

<b>Prioritized Drought Mitigation Actions</b>			
	<b>Project Specifics</b>	<b>Vulnerabilities Addressed</b>	<b>Opinion of Probable Cost</b>
<b>1</b>	<b>Anderson Water Treatment Plant Well No. 16 and Well No. 18:</b> Remove iron and manganese from an existing 3,000 GPM well No. 16 and treat New Well No. 18.	<ul style="list-style-type: none"> <li>– Available Water Supply</li> <li>– Source Water Quality Degradation</li> <li>– Increased Water Costs</li> <li>– Heavy Reliance on JWCD</li> </ul>	\$9,229,000.00
<b>2</b>	<b>Well No. 18:</b> Drill and equip a new well to utilize District water rights fully and for drought resiliency.	<ul style="list-style-type: none"> <li>– Available Water Supply</li> <li>– Increased Water Costs</li> <li>– Heavy Reliance on JWCD</li> </ul>	\$4,071,000.00
<b>3</b>	<b>Construction of new 4 MG buried concrete reservoir:</b> Help to meet existing and future water and fire suppression requirements.	<ul style="list-style-type: none"> <li>– Available Water Supply</li> <li>– Increased Water Costs</li> <li>– Heavy Reliance on JWCD</li> </ul>	\$6,000,000.00
<b>4</b>	<b>Well No. 15 Water Treatment Plant:</b> Remove iron and manganese from an existing 2,500 GPM well.	<ul style="list-style-type: none"> <li>– Available Water Supply</li> <li>– Source Water Quality Degradation</li> </ul>	\$3,500,000.00
<b>5</b>	<b>Annual Distribution Pipeline Replacements:</b> Multiple-year cast iron pipe replacements, anticipating approximately \$5 million yearly for ten years.	<ul style="list-style-type: none"> <li>– Inability to Utilize Available Supply due to Aging Infrastructure</li> </ul>	\$5,000,000 per year
<b>6</b>	<b>Well No. 1 Replacement:</b> Redrill and re-equip the existing 1,000 GPM well to increase capacity to 3,000 GPM.	<ul style="list-style-type: none"> <li>– Available Water Supply</li> <li>– Increased Water Costs</li> <li>– Heavy Reliance on JWCD</li> </ul>	\$2,500,000.00