Internal Monitoring Report

Policy # O-2E Sustainability **Date:** January 31, 2017
Frequency: Twice a year

Policy Language:

Madison residents will benefit from a sustainably managed ground water supply to ensure that water is available to protect public health, and to maintain and improve the economy and environment in Madison, now and in the future.

Accordingly,

1. Aquifers and wells will be monitored and the data evaluated to identify trends in water levels and potential contaminants.
2. Appropriate city, county, state and federal agencies will be called upon to enforce all pollution control and prevention measures within their authority, in order to protect water quality in the well head protection area of each unit well.
3. The adopted Conservation Plan shall be monitored and evaluated regarding progress to fulfill the goal of a 20% reduction per capita residential use of water by 2020, which equates to 58 gallons/capita/day. (Residential is defined as single family and duplex dwellings.)
4. The water supply system shall be expanded so that the pumpage from individual unit wells shall not exceed 50% of the annual rated capacity of the unit well.
5. Water rates will complement economic growth in Madison (as stated in 0-2D).

General Manager's interpretation and its justification:

This policy prescribes certain activities intended to ensure the long term environmental, public health, and economic sustainability of Madison's water supply. Our actions relating to these objectives are detailed below.

Data directly addressing the General Manager's interpretation:

1. Aquifers and wells will be monitored and the data evaluated to identify trends in water levels and potential contaminants.

Water Levels

The water levels in the aquifers beneath Madison continue to be monitored on a routine basis. A deep groundwater monitoring well located in the basement of the State Capitol has provided water levels since 1946. A review of the monthly data indicates levels continue to vary on a seasonal basis, a direct result of demand (pumping) and recharge (precipitation.) As in past years, summer levels were lower than those experienced during the winter. Levels were approximately 13 to 14 feet lower during the months of May through October. Overall, levels appear to be increasing or rebounding with an increase of approximately 12 – 14 feet since 2005. This is a good indication that the local aquifers are in the process of rebounding/recovering to pre-pumping levels. The water levels beneath the central part of our city during the last 30 years are displayed in Figure 1.

The static and pumping water levels in many of the Utility's wells varied slightly during the second half of 2016. Variations, however, were significantly less than those experienced during past years (i.e., 2012) when we were subject to extremely hot and dry summer conditions. Water levels in the Utility's wells continue to fluctuate seasonally and are greatly influenced by precipitation events. A review of the recent water level data indicates that, with the exception of several wells, most of the water levels are rising as winter demands decrease. The increase in water levels is consistent with those of last year at this time and the levels in all of the wells appear to be sustainable for the near future. Average static and pumping water levels between January 2012 and December 2016 are depicted in Table 1.

Total precipitation in 2016 was above average. We received 39.59 inches of precipitation in 2016 which is about 5.1 inches (14.9% more) more than the annual average of 34.44 inches. It is anticipated that precipitation amounts in the Madison area will continue to be above average into the near future.

Madison Kipp Corporation/UW #8 Sentinel Well

The Madison Kipp Corporation (MKC) continues to run its groundwater extraction and treatment system at its Waubesa Street site. The remedial system is being utilized to remove volatile organic compound (VOC) mass and hydraulically contain VOC contaminated groundwater present in the upper bedrock aquifer beneath the site.

The pumped groundwater is still being treated using an air stripper located on-site. The treated water (~40 - 45 gpm) is discharged to the storm sewer under a WPDES Discharge Permit. The most recent compliance samples were below WPDES discharge limits. The recovery operation began in early July of 2015 and is expected to operate for a number of years.

Between January 1, 2016 and June 30, 2016 they pumped and treated slightly over 9.4 million gallons of contaminated groundwater. Approximately 160 pounds of VOCs were removed from the groundwater during this period. Since the system started in 2015, PCE concentrations in water from the recovery well have fallen from 3000 ug/l to 1500 ug/l.

The Soil Vapor Extraction system at the MKC site also continues to run. This system has operated continuously for more than 3 years. PCE concentrations in the soil are decreasing.

The Utility continues to work with MKC, their consultant ARCADIS, the WDNR, and the WGNHS on the area's groundwater contamination issues. In December of 2015, the Utility hired Eric Oelkers and SCS Engineers to continue the hydrogeological review initiated by Jessica Meyer. Eric and SCS are finishing up with their study and will provide a final report soon.

Groundwater at and adjacent to the facility continues to be monitored routinely for VOCs. The most recent groundwater sampling, conducted in 2016, indicates that PCE levels in the groundwater between the site source and UW 8 remain relatively constant. The southeastern extent of the plume appears stable with the edge approximately 600 horizontal feet from UW 8.

The installation of a sentinel well, originally proposed to be installed adjacent to Elmside Circle Park, is in the Utility's budget for 2018.

UW 29 Sentinel Well

Water from the sentinel well located between UW 29 and the Sycamore Landfill continues to be monitored for both inorganic and volatile organic compounds on a semi-annual basis. Sampling is conducted in April and October of each year with fifteen samplings conducted to date.

In terms of VOCs, the samples are analyzed for a total of 51 different compounds. Results from the latest October 2016 sampling revealed some minor VOC detects.

- Toluene, which can be attributed to the coating on the well liner, was detected in all six ports at concentrations between 0.23 – 1.1 ug/l. The MCL for toluene is 1000 ug/l. There have been no detects of toluene in an adjacent groundwater observation well which is unlined and located 25 feet away.

- No VOCs were detected in water from UW 29.

For inorganics, a total of 22 different parameters are analyzed for. Several different inorganics were detected at elevated levels in the water tested in October.

- Port 1 had a chloride concentration of 250 mg/l this round (MCL). Chloride levels in this port have steadily increased over the last six years and are likely a result of local road salt practices.

- Port 3 had an arsenic level of 10.8 ug/l (MCL = 10 ug/l). It is thought that the arsenic here is also a result of the coating on the liner.

- Lead was detected at 20.3 ug/l in Port 5 and at 27.7 ug/l in Port 6, above the MCL of 15 ug/l. This metal has been detected at similar concentrations in these ports during past samplings.

- Water from UW #29 tested high for iron and manganese. Water from this well is filtered for these two constituents prior to entering the distribution system.

Sampling indicates that the migration of contaminants from the Sycamore landfill is not a significant threat to water quality at Unit Well 29 at this time.

UW 14 - Chloride Study

The pump at UW 14 was recently removed from the borehole as it needed to be replaced/ repaired. It has become evident that the water quality at this well is being impacted by road salting practices, specifically the use of sodium chloride. The Utility is utilizing the down time at this well to conduct some borehole characterization to determine where the majority of the chloride might be entering the well. The following activities have been completed:

- Municipal Well & Pump recently televised the well. This provided a visual inspection of the well casing and length of the borehole. It allowed an evaluation of the physical condition of the casing and the identification of major fractures, caverns, encrustations, etc. in the well. In addition, the inspection revealed the amount of fill that is in the bottom of the borehole (~160 feet).

- The Wisconsin Geological and Natural History Survey logged the well under static (non-pumping) conditions. They measured temperature, conductivity, gamma radiation, and borehole diameter from the base of the casing to the bottom of the hole. These tests provided a geo-physical profile of the well. Spinner flow logging was then conducted to identify regions of lateral flow – water movement into and out of the formation at various depths – under non-pumping conditions.

- After reviewing the data and profiles that were generated, stressed flow logging was conducted. During this test, a temporary pump was operated at rates of 1000 - 1500 gpm to identify contributing intervals in the upper aquifer and associated water quality information (Cl, Na, Fe, Mn, conductivity, etc.) within these intervals. The primary objectives were to identify chloride source areas, assess whether blocking regions of the borehole is feasible, and if this may improve water quality – specifically, to reduce the levels of chloride and sodium present in the water.

The Wisconsin Geological and Natural History Survey is currently compiling the collected logging data. Groundwater samples are being analyzed and results should be available in several weeks. The new pump has been ordered and should be installed in approximately three weeks.

<u>UW 15 – VOC Source</u>

The WDNR recently requested that a groundwater investigation be performed at the former Day One Formal Wear site. This property, 3939 Lien Road, is located approximately 800 feet to the southeast of UW 15. Located at 3900 East Washington Avenue, Well 15 has levels of PCE near the MCL. The Utility recently implemented an air stripper at this site to remove the PCE.

Results from a groundwater monitoring well recently installed at the Lien Road property revealed significant amounts of PCE in the groundwater. It appears that the contaminants at the site are deeper than expected and were not present in the original groundwater wells screened at shallower depths. As a result, the WDNR has requested the installation of an additional deeper groundwater monitoring well and several rounds of groundwater sampling. The monitoring well will be installed north of the property which is the direction of groundwater flow.

It is very likely that the Lien Road site will undergo active remediation. An SVE system is being designed to remediate the soils around the building. The system will address the residual PCE that exists within the unsaturated zone, with the goal of keeping it out of the groundwater. An active groundwater recovery system is also being discussed for the higher levels of PCE that exist in the groundwater beneath the Lien Road site.

The site is thought to have used dry cleaning solvents in the 1980s. It was originally identified as a possible contaminant source for the PCE in UW 15. Low levels of PCE vapors were detected in soil gas probes at the site in a 2012 study. However, shallow groundwater samples collected did not identify any VOCs at that time. MWU is awaiting the sampling results requested by the WDNR.

UW 27 - Radium Study

The Utility, with the assistance of the Wisconsin Geologic and Natural History Survey, is planning a subsurface study in the UW 27 area. Radium has been detected at slightly elevated levels in the water at this well. The subsurface study will focus primarily on identifying the source of radium and where it might be entering the well. If successful, the Utility may be able to prevent additional radium from entering the well. There are a number of tasks tied to the investigation of which the majority will be completed via public works contract:

- Drilling of a deep 6 inch diameter test hole in Klief Park, located southeast of the well.
- Geophysical Logging of the test hole – extensive geological characterization.
- Groundwater sampling, with pumping, for radium and isotope analysis.
- Installation of a groundwater monitoring well within the test hole after sampling is complete for future groundwater sampling.
- Televising UW 27 borehole with limited geophysical logging.
- Groundwater sampling at UW 27 while pumping.

UW 31 - Zone 4 Production Well

The production well at the Tradewinds Parkway site was drilled and completed during the winter of 2014. The well is currently capped and awaiting the construction of a well house with filter. The 1.5 million gallon reservoir has been constructed and painted. Design plans for the well house, filter, and pumping equipment are complete and have been bid out. Construction is scheduled to begin in April of 2017 and will be completed during the summer of 2018.

In terms of well head protection, the zoning overlay for Wellhead Protection District No. 31 was incorporated into the Madison General Ordinances [MGO 28.102] last year.

The WDNR continues to monitor the groundwater monitoring and remedial activities associated with the GE Health care site, a contaminated site located to the northeast. There are no new updates to report for this site. To date, no TCE or any other volatile organic compounds have been detected at the Tradewinds Parkway well. The Tradewinds Parkway site is located over 6000 feet from the source of the TCE contamination.

2. *Appropriate city, county, state and federal agencies will be called upon to enforce all pollution control and prevention measures within their authority…*

As previously mentioned, the Utility continues to work with the Mayor's office and the WDNR in monitoring the remediation of the PCE contaminated groundwater at the Madison Kipp site.

At the request of the WDNR, the Madison Water Utility, City Engineering, and Public Health continue to review the remedial strategies and plans proposed by MKC and their consultants. The Utility continues to remind the WDNR of the City's plans to upgrade UW #8 with an iron and manganese filter. Once upgraded, UW 8 would be pumped throughout the year at a much higher volume. A meeting with the WDNR to discuss local groundwater investigative options has been proposed and will likely occur after Eric Oelkers finalizes his review.

3. The adopted Conservation Plan shall be monitored and evaluated regarding progress to fulfill the goal of a 20% reduction per capita residential use of water by 2020…

MWU pumped a total of 9,848,137,000 gallons of water to the distribution system during 2016. This is approximately 1.3%less than the 9,977,181,000 gallons pumped last year.

Average Day: 26,907,000 gpd (last year 27,335,000 gpd)
Max Day: 38,270,000 gpd on July 15 (last year 39,846,000 gpd on July 29)
Min Day: 19,540,000 gpd on December 25 (last year 19,680,000 gpd on December 27)

As mentioned earlier in this report, precipitation for the year was above average. In addition, rainfall events occurred on a fairly regular basis limiting the number of heavy pumpage days.

Residential consumption in gallons per capita by year:

1980-2000	81.5	
2002-2007	71.8	
2008	69.8	
2009	67.8	
2010	65.0	
2011	65.2	
2012	70.3	
2013	61.0	
2014	62.2	
2015	60.9	55.0*
2016	Pending	
Goal: 2020	***58.0***	

* Average per-person daily consumption for **all** Madison residents - includes people living in apartments. MWU is now able to include all residents in this calculation whereas before it was only single family and duplexes.

4. The water supply system shall be expanded so that the pumpage from individual unit wells shall not exceed 50% of the annual rated capacity of the unit well.

Our service level for capacity planning is 50% utilization and system expansion is being planned to accomplish this level. The Utility continues to propose and build additional booster

stations and new well facilities to help achieve this goal. In addition, variable speed drives (VFDs) are being added to existing motors/pumps each year to optimize system flows.

Overall, utilization rates during 2016 were very similar to those experienced in 2015. Through December 31, 2016, six different wells exceeded the 50% utilization rate. Well repair/reconstruction projects and the necessary use of seasonal wells on a year round basis continue to significantly influence individual well rates.

- Ground storage reservoir 113 was completed in late 2016 and is now in service. This 1 million gallon reservoir floats on Zone 6E. The use of this storage tank will allow us to significantly reduce the utilization rate of UW 13, a well located at the far north edge of the pressure zone, during 2017. We are currently running UW 13 primarily at night when electrical rates are less expensive. The water from the 113 reservoir is then used during the day or during on peak hours.
- Unfortunately, the 50% goal was significantly exceeded again at UW 14 (78.8%). The use of this site is not likely to lesson without the addition of a Zone 8/Zone 6W booster/transfer station (BS 114).
- UW 19 was out of service for repairs during much of 2016 and was utilized at only 19.2% of its capacity. This is one of the wells that is regularly above the 50% utilization rate. To compensate, UW 6 (a seasonal well) was in service the entire winter and has increased its rate to almost 50%.
- MWU continued to lower the utilization rates at one of its most heavily pumped wells (UW 20) by utilizing BS 106 more.
- UW 26's utilization rate was cut from 72.4% to 57.4% by leaving UW 28 in service over the winter months. MWU plans to reduce the use of UW 26 even more this year.
- Although UW 30 was slightly above 50% in 2016, the Utility was able to reduce its rate 3% by running UW 18 slightly more.

The addition of VFDs on the deep wells at several of the sites has allowed the Utility to directly minimize the utilization rates of these wells. A VFD was installed on the deep well at UW 30 during the fall of 2016. It is estimated that the addition of this VFD is saving the Utility approximately $60 a day ($1800 a month) in electric costs. The installation should also help with managing the well's utilization rate. Indirectly, VFDs on booster pumps have also allowed us to minimize deep well pumping at other sites. MWU is in the process of installing VFDs on the booster pumps at UW 16 and UW 17. Actual utilization rates for 2015 and 2016 are shown in Tables 2 and 3.

Current construction projects which will affect utilization rates:

- The reconstruction of UW 12, making it a two zone well, will reduce utilization rates in the far west pressure zones (UW 12, UW 20, and UW 26). This project has been rescheduled to 2017.
- The connection of Zone 11 to Zone 10 and the construction of the Blackhawk Tower (228) on the far west side will help reduce the utilization rate of UW 26/Tower 126. Additional pipeline/main improvements are scheduled for this year.
- Construction of UW 31 will begin this year and the well should be in service by spring of

2018. The addition of this well will significantly lower the utilization rate of UW 9, the only other well in Zone 4.

Energy Conservation Assessment

UW Engineering Grad student, Connor Mancosky, is continuing his study of pump efficiencies and VFD optimization. In addition, he is conducting an energy analysis of several different pressure zones with the following objectives:

- Identify pumping design criteria that will optimize energy conservation.
- Identify projects with the highest potential for energy reduction.
- Evaluate and recommend energy conservation projects to the Utility.
- Implement a pilot study to verify calculations and assumptions.

5. Water rates will complement economic growth in Madison (as stated in O-2D).

Please refer to the Monitoring report for the Affordability Outcomes Policy (O2-D).

I report compliance.

Attachments:
Aquifer Water Levels Graph
Unit Well Water Levels Table
Unit Well Capacity Tables

Figure 1: Aquifer Water Levels - State Capitol Well

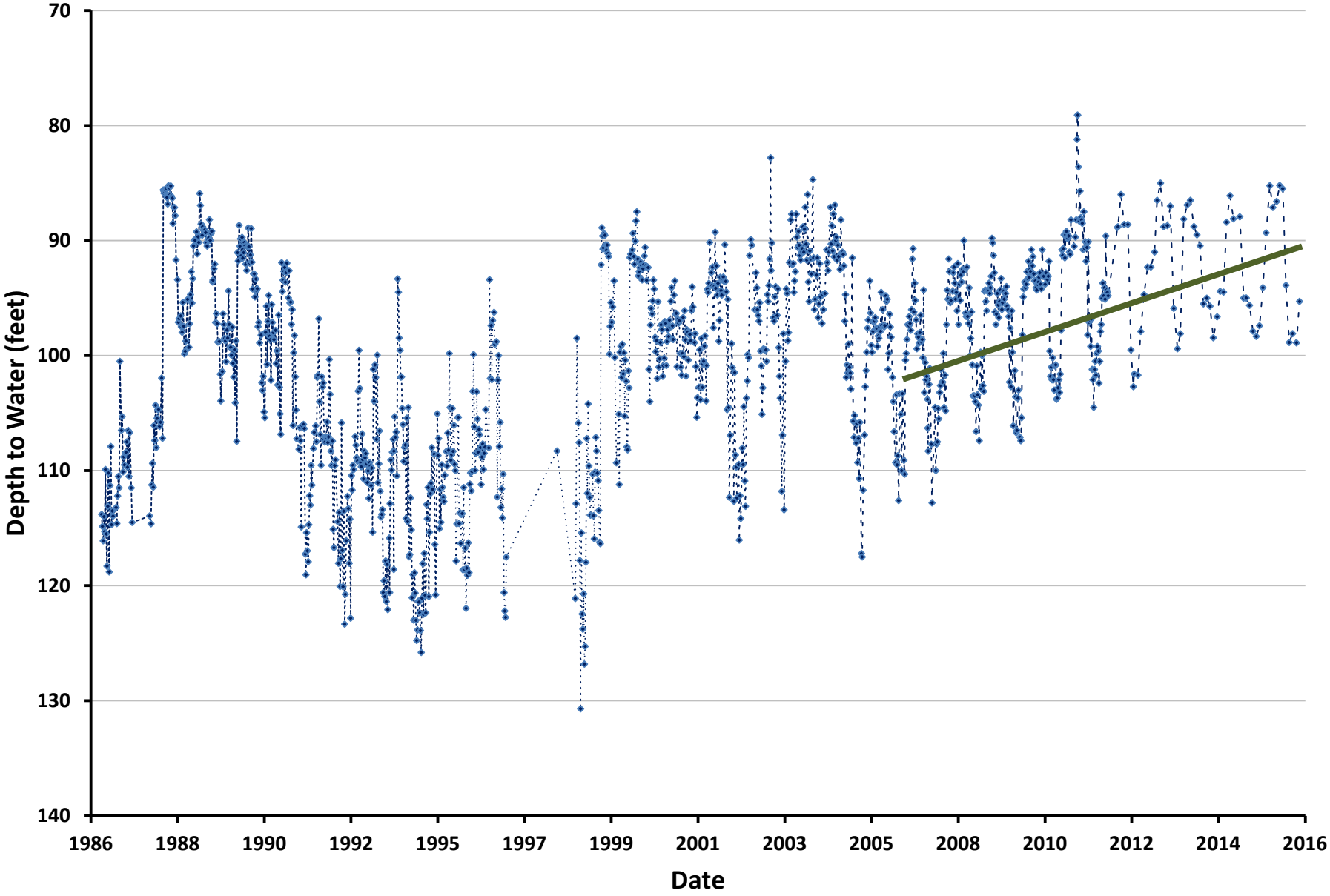

Table 1: Average Water Levels - Wells (Feet to Water)

	6		7		8		9		11		12		13		14		15		16		17	
Date	Static	Pumping	Static	Pumping	Static	Pumping	Static	Pumping	Static	Pumping	Static	Pumping	Static	Pumping	Static	Pumping	Static	Pumping	Static	Pumping	Static	Pumping
Jan-12			68.0	124.8			105.3	178.1	47.3	151.9	169.6	258.4	23.9	124.2	27.1	53.9	74.4	140.0	175.2	275.0		
Feb-12			51.3	119.6			106.5	179.3	33.6	174.6	168.3	257.6	17.5	115.5	27.4	54.1	84.5	140.2	177.4	276.8		
Mar-12			53.4	106.9			106.4	179.3	46.4	150.9	166.3	257.9	17.6	116.0	27.3	53.9	67.2	139.0	176.2	275.7		
Apr-12	97.8	178.1	51.8	102.8			106.8	179.7	41.8	151.1	163.5	255.2	18.0	113.2	26.9	53.6	64.3	138.4	175.0	274.4		
May-12	75.2	182.1	50.9	134.3			108.5	181.0	41.0	152.8	170.7	261.2	18.3	113.2	26.8	53.6	67.8	140.1	176.0	276.3		
Jun-12	70.0	185.8	56.1	174.9			113.5	184.8	44.0	154.5	183.4	272.2	20.1	114.4	27.7	54.3	70.4	141.9	186.3	284.8	48.9	122.0
Jul-12	116.2	192.6	63.1	185.4		159.7	122.9	189.7	46.2	155.9	190.1	281.9	20.8	114.6	29.2	55.3	82.4	144.5	199.7	294.4	58.4	126.5
Aug-12	116.7	184.1	55.1	179.2	61.3	146.1	117.0	185.3	43.6	154.7	183.1	271.0	20.3	113.2	28.4	54.4	62.7	141.1	186.7	285.2	52.9	122.2
Sep-12	128.4	190.7	59.7	176.4			116.3	184.4	41.5	154.0	186.6	269.8	20.6	113.6	25.9	53.0	63.3	140.7	186.6	284.7	52.8	120.8
Oct-12	142.1	187.2	53.4	174.7			112.1	181.4	38.6	153.6	173.2	261.6	19.8	112.8	27.2	53.8	61.7	140.5	182.2	281.3	46.9	116.3
Nov-12	142.2	188.4	51.8	169.4			109.3	178.9	42.2	153.1	165.0	252.7	19.2	111.7	27.8	53.7	60.1	141.4	177.0	276.3	43.0	113.5
Dec-12	145.0	187.9	53.4	174.8			108.4	178.0	41.3	152.9	162.7	251.1	19.5	110.6	28.5	54.0			174.5	274.3	45.7	116.1
Jan-13	78.2	185.1	54.3	174.7			108.7	178.3	45.8	153.2	163.4	253.4	20.0	110.3	28.9	54.0	50.4	123.4	174.5	274.3	45.6	115.4
Feb-13	86.1	185.9	55.7	163.9			107.5	177.7	36.7	152.6	166.4	256.5	18.9	109.1	28.8	54.0	70.2	139.9	175.8	275.4		
Mar-13	49.2	186.4	61.9	144.8			106.9	177.2	38.9	152.3	164.5	254.7	19.3	108.7	28.9	53.9	60.7	138.7	175.4	274.9		
Apr-13	48.8	186.5	64.1	161.3			105.6	176.5	37.3	150.1	166.3	255.8	17.7	108.6	28.7	53.6	59.1	137.3	175.8	274.8		
May-13	74.5	182.4	74.1	169.7			107.0	177.7	37.5	150.5	169.9	259.2	16.8	103.8	34.7	53.8	67.0		177.5	276.3		
Jun-13	96.0	187.3	87.1	172.3			108.0	178.0	35.7	148.9	171.0	260.4	16.4	101.7	39.0	55.3	63.3	111.4	179.2	277.5		
Jul-13	66.2	189.7	119.5	178.3		175.8	109.9	179.7	37.1	149.5	175.5	262.8	23.4	120.3	28.1	53.4	79.7	116.4	181.2	281.1	51.3	128.1
Aug-13	55.1	191.0	66.9	164.1			113.3	181.4	39.3	151.7	180.7	265.7	15.9	105.4	28.5	53.6	67.4	108.8	184.9	285.1	48.7	120.0
Sep-13	51.9	191.5	83.4	161.4			112.0	180.0	41.7	150.8	183.1	267.8	16.6	105.9	28.6	53.7	66.3	106.8	184.9	283.2	51.2	120.9
Oct-13	53.8	187.8	109.5	160.3			108.3	178.2	39.8	149.9	171.3	260.8	16.7	105.5	27.9	53.2	63.6	104.8	176.8	276.0	47.2	118.2
Nov-13	61.8	188.8	122.6	167.9			105.9	175.9	36.1	148.8	170.5	258.8	56.8	145.3	27.9	53.9	52.9	102.9	174.9	274.9		
Dec-13	81.5	187.2	126.1	163.4			106.2	176.3	37.5	149.7	167.2	257.2	60.9	148.3	28.2	53.1	55.8	100.3	174.1	273.3		
Jan-14	86.0	186.7	129.7	162.4			108.3	178.0	41.8	150.8	167.4	257.5	62.1	150.4	28.3	53.0	43.4	86.9	174.1	272.6		
Feb-14	85.5	189.4	139.2	168.7			112.4	181.4	45.8	152.4	171.3	260.6	68.0	153.7	28.7	53.3	44.4	80.8	176.2	275.3		
Mar-14	68.6	186.9	141.9	171.1			109.6	178.7	38.3	151.1	174.5	262.3	72.6	157.4	29.0	53.4	57.8	85.9	179.5	277.4		
Apr-14	51.9	188.6	145.2	178.2			107.1	177.4	40.7	150.2	175.1	261.4	71.1	157.1	28.5	53.0	50.0	96.9	177.2	275.2	46.4	119.5
May-14	50.8	187.1	135.8	181.1			107.8	177.6	40.8	150.3	174.8	263.2	17.1	98.3	28.5	52.9	54.1	88.5	178.5	276.1	44.9	115.5
Jun-14	52.7	189.1	134.1	170.7			110.1	180.0	46.4	152.8	174.1	263.9	16.9	98.0	28.6	53.0	50.4	93.6	180.3	277.7	48.5	119.0
Jul-14	52.7	189.5			77.5		108.6	178.7	44.2	152.1	171.4	266.2	15.4	96.6	28.5	54.5	56.2	98.8	186.1	280.3	45.7	116.9
Aug-14	55.3	191.7			67.8	149.0	107.9	178.6	42.5	152.2	177.6	269.2	15.7	96.5	28.9	55.6	56.0	109.4	194.6	278.3	49.8	119.5
Sep-14	53.7	191.6			77.5		107.1	176.9	38.5	151.2	175.5	264.5	15.7	96.4	28.7	52.7	53.3	90.3	174.9	276.5	48.2	117.1
Oct-14	56.7	190.2			76.6		105.1	175.6	41.4	150.4	177.0	263.2	15.8	96.3	28.1	55.4	57.9	85.9	178.1	266.5	45.8	115.0
Nov-14							106.2	175.7	35.7	149.8	169.6	262.1	15.4	96.3	27.9	54.5	51.9	84.7	170.7	264.5	46.2	117.4
Dec-14							103.5	174.9	36.1	149.7	169.4	262.2	15.8	96.9	28.4	52.9	52.5	84.8	171.4	266.8		
Jan-15							102.8	175.1	37.6	150.2	167.0	261.3	16.4	97.0	28.5	53.6	52.2	85.5	172.9	269.0		
Feb-15							103.3	175.6	37.6	151.1	176.9	263.6	17.1	97.6	28.7	55.9	52.4	85.6	171.4	271.3		
Mar-15							103.3	176.1	39.5	151.2	178.0	265.0	17.4	97.9	28.9	53.5	52.3	85.9	175.2	270.6		
Apr-15	30.0	156.7	61.0	110.0			104.5	175.9	39.0	150.8	176.6	265.2	16.8	97.5	28.6	55.3	53.1	85.7	176.6	270.4	50.0	120.0
May-15	32.0	154.9	49.0	130.0			106.3	177.5	37.4	150.9	182.4	264.7	15.3	96.9	28.5	53.2	53.6	86.1	176.6	271.2	44.9	117.7
Jun-15	29.0	154.9	64.0	128.0	77.7		107.1	179.4	36.4	151.2	172.1	257.8	16.6	97.4	28.5	52.2	53.9	95.3	175.6	271.2	46.1	117.9
Jul-15	30.0	156.4	63.8	128.6	73.8	145.6	109.9	180.5	37.4	150.8	184.8	262.8	16.6	96.3	28.8	52.2	57.8	98.2			48.5	119.8
Aug-15	29.7	155.8	52.7	127.0	78.9	145.5	109.9	180.7	36.5	150.1	170.7	270.2	17.3	96.2	29.3	52.4	58.2	98.5			50.6	119.8
Sep-15	29.6	157.5	55.5	130.4	79.8	152.9	111.5	179.9	37.3	151.3		270.1	17.3	97.0	29.0	51.3	49.0	96.7			51.1	120.9
Oct-15	31.2	154.3	53.4	130.3			102.4	176.5	35.6	149.8	181.3	265.7	16.5	97.3	28.5	51.7	51.7	96.7				
Nov-15	29.1	153.7	50.7	122.3			105.4	175.5	35.3	149.2	171.1	264.3	16.2	96.0	28.2	50.1	47.8	94.6				
Dec-15	30.8	154.3	65.9	125.4			104.6	174.2	33.6	149.4	178.8	262.4	15.5	95.7	28.1	52.6	46.6	91.1	173.1	268.9		
Jan-16	29.1	153.1	45.7	119.8			104.2	174.2	33.1	148.6	194.1	263.9	15.6	96.2	28.0	49.6	50.9	85.1	176.1	271.1		
Feb-16	31.5	155.0	47.3	121.9			104.6	174.5	34.0	148.3	190.2	265.2	15.7	96.2	31.8	49.9	48.7	86.5	177.0	272.2		
Mar-16	33.0	155.5	46.1	120.1			104.3	173.9	33.6	149.0	180.5	263.9	15.5	95.9	28.1	49.3	48.8	87.8	177.7	270.6		
Apr-16	32.3	155.2	46.0	121.7			103.8	174.0	33.5	148.7	188.8	264.4	14.7	95.4	27.8	49.0	52.2	93.3	178.8	270.8		
May-16	32.5	156.5	50.1	123.5			104.9	175.4	34.5	148.1	183.0	263.1	14.7	95.6	27.8	48.9	52.7	106.3	177.2	270.8	50.5	117.4
Jun-16	33.5	156.2	53.8	133.3			108.7	178.2	36.7	149.4	169.6	264.8	15.2	95.5	28.0	48.7	51.3	105.8	183.7	272.9	44.8	116.1
Jul-16	33.5	157.1	54.2	137.0		142.1	110.2	179.1	38.5	150.3	186.0	268.6	15.8	96.0	28.5	48.8	52.5	107.6	187.6	276.3	46.7	117.0
Aug-16	32.6	157.1	53.1	142.3		148.6	108.8	177.9	36.6	149.2	193.7	267.6	14.4	95.7	28.1	48.3	55.2	108.3	184.0	275.0	47.3	117.3
Sep-16	32.4	157.3	46.5	137.9			106.7	176.1	38.2	147.3	182.8	264.7	15.0	95.0			46.6	101.0	180.4	272.2	46.6	116.5
Oct-16	33.9	157.1	46.1	129.5			104.0	173.7	34.5	146.4	186.9	263.0	14.3	94.5			48.1	85.9	175.8	269.5		
Nov-16	30.1	153.8	48.1	132.3			102.3	172.1	32.5	145.4	189.0	264.6	13.5	94.1			45.5	83.7	176.3	269.7		
Dec-16	29.3	153.7	66.8	143.2			102.3	171.8	33.3	146.0	179.9	263.2	11.2	92.7			45.7	85.8	173.2	267.4		

Table 1 Cont.: Average Water Levels - Wells (Feet to Water)

	18		19		20		23		24		25		26		27		28		29		30	
Date	Static	Pumping	Static	Pumping	Static	Pumping	Static	Pumping	Static	Pumping	Static	Pumping	Static	Pumping	Static	Pumping	Static	Pumping	Static	Pumping	Static	Pumping
Jan-12	97.0	310.7	61.9	202.6	259.8	378.0		159.7	60.7	243.5	118.5	253.3					151.0	274.6			121.7	268.9
Feb-12	98.2	312.4	66.9	205.8	260.5	381.0	58.4	121.5	62.6	246.3	116.6	254.4					150.0	274.6			124.2	270.8
Mar-12	102.6	311.6	67.7	206.3	262.6	379.0	51.0	111.1	60.0	248.1	106.4	236.3					149.1	274.0			124.3	271.2
Apr-12	100.7	310.6	54.9	200.4	262.5	378.1	51.7	111.1	60.7	248.8	106.6	237.4	323.8	380.7			147.8	275.1	103.4	148.8	125.4	272.4
May-12	100.2	312.6	53.8	202.2	270.0	383.2	52.0	112.2	60.9	252.5	110.8	238.8	334.8	406.3	34.2	214.3	148.7	276.5	129.0	176.4	127.3	273.6
Jun-12	104.7	317.8	61.2	206.3	282.7	390.6	53.2	114.7	63.8	256.2	120.8	257.0	342.1	417.0	65.4	217.3	160.1	284.4	147.3	183.4	145.9	290.1
Jul-12	107.4	319.3	68.8	211.4	292.3	392.4	62.2	117.3	63.1	258.2	133.6	268.8	369.6	427.5	68.0	222.1	170.2	292.2	151.9	186.9	156.7	299.4
Aug-12	100.8	316.0	63.0	206.5	287.7	394.3	55.9	114.2	64.5	254.6	129.4	249.6	362.9	418.3	64.9	219.4	159.8	283.2	147.0	182.5	146.2	290.9
Sep-12	103.9	316.3	68.2	210.5	291.3	399.0	53.3	113.3	67.8	256.0	127.2	248.7	352.5	416.5	55.1	223.8	160.7	284.4	148.6	182.5	146.5	290.0
Oct-12	100.3	314.4	63.6	210.4	284.4	394.2	55.3	150.2			125.3	248.7	344.3	410.1	49.3	214.6	154.6	281.9	148.1	181.5	140.8	285.9
Nov-12	97.6	311.9	57.1	201.7	276.7	388.7			60.0		122.6	246.7	338.5	404.3					145.0	178.4	133.0	280.0
Dec-12	97.5	309.8	54.7	201.9	276.7	388.5			60.8	231.6	123.5	247.5	338.5	403.2					144.5	177.9	129.3	277.2
Jan-13	97.9	312.1	55.6	201.8	277.7	389.5			61.1	227.9	125.2	245.0	338.1	403.5					146.8	178.7	127.5	276.2
Feb-13	99.4	312.5	58.3	203.7	279.1	390.4			60.4	233.1	125.8	244.7	338.3	404.9					149.1	181.4	129.5	278.1
Mar-13	98.2	311.7	58.7	203.2	279.4	390.2			60.3	229.6	109.6	247.6	338.3	404.4					147.9	180.1	126.8	276.7
Apr-13	101.8	311.8	58.8	204.7	275.8	387.9	45.2	108.6	60.5	228.0	108.0	244.4	335.6	402.9	66.6	213.9			145.2	177.4	128.9	277.5
May-13	105.0	313.8	58.5	204.8	278.8	390.5	47.4	110.6	60.3	229.3	113.3	258.9	337.7	405.1	61.2	211.6	146.2	272.0	143.2	176.1	130.4	278.4
Jun-13	97.1	309.8	58.1	204.6	267.6	390.0	48.9	109.5	60.8	229.2	116.5	258.8	336.1	404.5	55.4	211.1	152.6	273.4	144.7	177.7	137.0	285.1
Jul-13	103.7	313.7	57.9	203.4	284.4	394.3	47.8	110.5	63.3	232.6	116.1	259.8	341.9	408.6	83.2	212.7	150.8	272.4	146.9	180.1	137.1	284.1
Aug-13	101.5	316.3	61.1	204.9	287.1	397.1	50.1	111.5	65.0	233.7	119.3	258.6	349.7	410.8	136.8	213.5	153.1	273.4	149.8	182.6	138.3	285.4
Sep-13	98.0	315.3	60.1	202.4	281.0	398.6	53.7	112.0	63.5	234.4	117.6	255.9	347.3	412.1	155.0	213.6	121.3	278.5	118.8	164.7	141.0	288.6
Oct-13	97.0	313.1	55.0	198.5	279.6	393.6	50.9	111.0	62.5	229.2	110.8	253.6	342.7	406.5	141.8	218.5	126.5	279.5			134.3	283.8
Nov-13	97.0	310.9	54.7	198.3	276.4	392.8	48.4	109.9	61.2	225.8	110.3	252.6	337.8	403.7	101.3	217.9					132.0	282.2
Dec-13	97.0	310.5	52.8	194.7	279.8	393.7	48.9	110.1	60.2	224.5	106.6	253.5	337.5	404.1	133.6	206.8				179.3	132.6	282.5
Jan-14	97.0	311.1	52.5	194.4	276.3	394.3	51.1	111.6	60.2	224.7	107.6	254.1	339.5	405.1	161.2	214.3			140.2	176.7	132.3	282.1
Feb-14	97.0	312.6	56.6	195.7	282.5	395.4	50.4	111.5	60.2	226.3	111.1	255.0	340.3	405.8	165.2	227.9			122.5	177.2	138.4	287.4
Mar-14	97.0	311.9	56.5	194.8	283.4	396.8	49.6	110.8	60.0	225.4	113.0	254.4	344.1	407.4	51.2	213.2				178.6	138.8	286.9
Apr-14	97.0	312.7	58.1	193.9	279.3	395.5	47.2	109.6	60.6	229.1	111.3	254.1	343.5	406.6	49.3	210.4	143.1	270.1	127.2	177.2	137.0	286.1
May-14	97.0	313.1	54.8	192.0	282.3	396.0	47.9	109.7	61.2	226.2	115.3	254.4	343.6	407.1	49.1	209.5	148.6	277.1	115.8	177.5	136.6	284.9
Jun-14	99.2	314.3	58.1	192.7	282.6	396.5	49.1	109.7	63.4	230.4	115.3	255.7	339.0	406.8	47.7	210.2	156.9	285.3	126.3	180.2	143.0	290.7
Jul-14	94.4	314.6	62.4	197.5	284.8	397.9	46.6	105.0	61.5	228.5	110.3	255.8	335.7	408.0	46.4	209.5	159.9	286.5	127.4	180.2	141.5	289.8
Aug-14	93.9	315.4	60.7	190.9	263.3	399.3			67.9	230.7	111.6	257.3	322.4	411.8	51.0	211.3	162.4	288.7	140.3	181.5	146.3	293.4
Sep-14	92.6	313.4	58.4	189.1	275.9	395.2			67.7	228.3	107.4	255.3	326.0	405.4	51.5	211.1	152.6	284.1	145.6	178.8	142.7	290.3
Oct-14	97.0	312.3	62.5	185.6	279.5	393.1			66.6	228.1	111.7	257.5	337.2	403.9	55.7	209.2	151.2	289.9	146.4	177.8	140.5	287.9
Nov-14	97.7	312.0	58.5	186.3	271.8	394.7			62.1	225.4	102.3	255.6	337.0	404.8	52.5	210.0	146.1		144.6	177.4	138.0	289.0
Dec-14	96.4	311.3	61.3	190.7	280.1	395.5			61.4	223.8	104.3	254.3	333.9	403.5	58.7	209.6	143.8		144.1	177.1	144.6	293.5
Jan-15	94.3	310.3	65.6	191.6	272.8	395.5			60.4	222.8	99.4	254.7	333.0	402.2	58.1	207.9	145.7		131.2	175.6	146.1	292.5
Feb-15	92.7	311.8	72.0	194.2	279.2	395.1			61.4	225.4	105.7	255.0	335.2	402.8	64.9	210.1	146.1		130.6	179.0	141.8	290.9
Mar-15	97.0	312.0	71.3	192.7	276.3	397.7			60.0	225.6	105.0	255.1	325.2	405.9	92.0	212.3	146.8			179.7	130.3	287.8
Apr-15	100.3	311.0	70.5	188.9	280.6	397.6			60.4	227.9	105.8	254.6	314.9	404.6	77.8	210.1	147.1		131.5	179.5	138.7	287.7
May-15	95.8	310.5	62.2	182.1	282.9	399.2	48.9	117.5	60.0	227.3	107.9	254.6	338.2	406.1	71.1	208.3	151.3	281.3		179.8	139.3	288.5
Jun-15	96.4	310.9	63.4	177.7	282.0	401.3	55.5	119.5	60.0	218.4	109.5	255.2	341.4	407.8	72.7	208.0	158.2	288.1		180.8	139.5	288.4
Jul-15	99.9	311.1	62.7	176.2	277.1	400.7	53.6	118.8	57.2	205.4	110.0	253.2	332.3	409.1	85.3	209.9	165.3	291.5	133.2	181.7	140.4	289.3
Aug-15	96.6	313.0	61.8	172.8	266.4	401.6	54.6	119.7	55.3	209.2	104.2	254.6	349.6	413.1	88.9	212.4	167.6	296.6		182.9	146.6	294.1
Sep-15	97.1	312.3	60.6	170.6	261.4	398.7	52.8	119.0	57.3	207.8	107.0	255.9	347.0	411.4	105.1	211.2	170.3	294.1		181.8	142.3	290.9
Oct-15	91.7	311.2	60.5	165.1	270.6	397.6			57.0	202.8	106.9	254.4	342.0	407.8	145.2	209.8	157.9	287.6		180.3	135.8	287.6
Nov-15	95.2	310.9			269.0	395.8			49.1	201.9	109.7	253.2	328.3	405.9	135.0	209.7	155.0	285.8	127.2	179.0	136.8	286.5
Dec-15	94.6	310.0			274.7	394.8			57.5	198.8	99.9	250.9	328.2	405.8	97.0	207.6	150.1	286.1	133.0	177.5	135.6	285.8
Jan-16	98.5	310.6			275.4	395.2	46.4		39.0	198.5	112.1	251.0	337.6	405.3	97.1	206.7	148.1	280.6	116.7	177.3	134.5	284.8
Feb-16	97.8	310.3			275.9	395.8	46.6		38.3	199.8	113.4	249.2	341.9	405.9	116.9	207.4	149.1	282.1		177.9	135.3	285.6
Mar-16	97.1	309.2			275.0	394.6	46.0		38.5	199.8	110.7	248.8	336.1	407.4	138.4	207.6	150.9	283.4	120.8	176.7	135.7	286.0
Apr-16	98.0	310.9			275.3	394.7	45.3		40.7	201.5	113.9	249.1	349.1	404.6	94.9	209.4	150.9	284.3		178.1	137.9	287.8
May-16	97.2	311.5	75.8	215.7	279.0	398.1	45.6	124.0	44.5	205.6	116.5	246.2	341.5	406.4	83.2	208.0	150.4	283.1		178.4	134.6	287.1
Jun-16	97.9	312.1			279.2	398.4	45.6	120.5	43.7	205.6	126.9	248.6	334.8	404.3	76.2	209.3	154.3	286.2	122.4	177.6	134.0	286.2
Jul-16	98.8	312.9			278.5	398.8	51.0	118.6	45.5	206.1			339.0	407.3	77.8	210.4	155.2	287.5		177.0	139.5	289.7
Aug-16	97.0	312.4	64.7	212.7	278.7	398.6	45.2	120.0	43.5	205.8	101.3	268.2	337.7	405.6	78.5	210.5	155.0	288.6		176.5	138.1	289.1
Sep-16	97.0	306.4	64.8	222.0	275.9	396.4			42.7	204.4	99.6	264.6	332.4	401.0	98.9	213.2	153.9	287.5		174.9	137.8	289.3
Oct-16	98.3	312.1	64.4	221.9	275.2	395.2			41.7	200.4	97.2	262.9	329.9	399.2			151.5	285.7		174.3	136.0	287.3
Nov-16	97.0	311.7	66.8	222.5	275.6	395.8			38.9	198.5	93.4	260.5	330.0	399.7			148.7	282.5		172.2	134.5	260.3
Dec-16	97.0	312.1	60.3	218.3	276.3	396.2			40.7	198.4	93.2	262.0	331.7	401.9			147.3	282.4		172.3	135.0	231.9

Table 2: 2015 Unit Well Capacity

Start Date: January 01, 2015 **End Date: December 31, 2015**

Unit Well	DW Capacity GPM	Total Daily Capacity MGD	Total Capacity To Date Mil Gal	Actual Pumpage To Date Mil Gal	% DW Utilization		DW Run Hours To Date	DW Rest Hours To Date	% DW At Rest To Date	% DW Running To Date
6	2,823	4.1	1,483.9	313.4	21.1%		2,154.2	6,605.8	75.4%	24.6%
7 *	2,200	3.2	1,156.3	192.9	16.7%		2,204.8	6,555.2	74.8%	25.2%
8	1,992	2.9	1,047.2	17.5	1.7%		143.8	8,616.2	98.4%	1.6%
9	1,746	2.5	917.4	445.1	48.5%		4,271.7	4,488.3	51.2%	48.8%
11	2,105	3.0	1,106.3	448.5	40.5%		3,556.1	5,203.9	59.4%	40.6%
12	2,413	3.5	1,268.1	796.7	62.8%		5,358.4	3,401.6	38.8%	61.2%
13	2,592	3.7	1,362.6	849.7	62.4%		5,616.2	3,143.8	35.9%	64.1%
14	2,008	2.9	1,055.2	843.7	80.0%		7,010.6	1,749.4	20.0%	80.0%
15 *	2,200	3.2	1,156.3	388.6	33.6%		5,641.2	3,118.8	35.6%	64.4%
16	2,311	3.3	1,214.5	242.4	20.0%		1,749.3	7,010.7	80.0%	20.0%
17	2,328	3.4	1,223.7	308.4	25.2%		2,205.9	6,554.1	74.8%	25.2%
18	1,868	2.7	981.7	357.6	36.4%		3,192.2	5,567.8	63.6%	36.4%
19	1,724	2.5	906.4	463.0	51.1%		4,499.7	4,260.3	48.6%	51.4%
20	2,023	2.9	1,063.3	575.7	54.1%		4,716.1	4,043.9	46.2%	53.8%
23	1,259	1.8	661.8	58.8	8.9%		798.8	7,961.2	90.9%	9.1%
24	2,001	2.9	1,051.6	473.0	45.0%		3,851.2	4,908.8	56.0%	44.0%
25 *	2,000	2.9	1,051.2	414.3	39.4%		4,549.2	4,210.8	48.1%	51.9%
26	2,029	2.9	1,066.6	771.9	72.4%		6,347.6	2,412.4	27.5%	72.5%
27	2,085	3.0	1,095.9	317.8	29.0%		2,560.7	6,199.3	70.8%	29.2%
28	2,327	3.4	1,223.1	346.6	28.3%		2,558.1	6,201.9	70.8%	29.2%
29 *	2,200	3.2	1,156.3	660.3	57.1%		8,671.8	88.2	1.0%	99.0%
30	2,407	3.5	1,265.1	682.8	54.0%		4,824.9	3,935.1	44.9%	55.1%

* Denotes wells with variable frequency drives (VFDs)

* Denotes wells with variable frequency drives (VFDs)

Table 3: 2016 Unit Well Capacity

Start Date: January 01, 2016 **End Date:** December 31, 2016

Unit Well	DW Capacity GPM	Total Daily Capacity MGD	Total Capacity To Date Mil Gal	Actual Pumpage To Date Mil Gal	% DW Utilization		DW Run Hours To Date	DW Rest Hours To Date	% DW At Rest To Date	% DW Running To Date
6	2,840	4.1	1,496.8	678.9	45.4%		4,513.4	4,270.6	48.6%	51.4%
7 *	2,200	3.2	1,159.5	295.0	25.4%		2,948.4	5,835.6	66.4%	33.6%
8	1,980	2.9	1,043.5	18.1	1.7%		136.4	8,647.6	98.4%	1.6%
9	1,720	2.5	906.5	443.6	48.9%		4,262.4	4,521.6	51.5%	48.5%
11	2,090	3.0	1,101.5	403.3	36.6%		3,149.3	5,634.7	64.1%	35.9%
12	2,430	3.5	1,280.7	811.0	**63.3%**		5,876.3	2,907.7	33.1%	66.9%
13	2,625	3.8	1,383.5	826.0	**59.7%**		5,463.0	3,321.0	37.8%	62.2%
14	2,000	2.9	1,054.1	830.1	**78.8%**		7,353.4	1,430.6	16.3%	83.7%
15 *	2,200	3.2	1,159.5	365.3	31.5%		4,737.8	4,046.2	46.1%	53.9%
16	2,300	3.3	1,212.2	571.3	47.1%		4,138.6	4,645.4	52.9%	47.1%
17	2,290	3.3	1,206.9	303.8	25.2%		2,105.9	6,678.1	76.0%	24.0%
18	1,715	2.5	903.9	371.7	41.1%		3,133.5	5,650.5	64.3%	35.7%
19	2,020	2.9	1,064.6	203.9	19.2%		1,451.2	7,332.8	83.5%	16.5%
20	2,025	2.9	1,067.1	534.0	50.0%		4,403.9	4,380.1	49.9%	50.1%
23	1,310	1.9	690.4	51.4	7.4%		680.1	8,103.9	92.3%	7.7%
24	2,025	2.9	1,067.3	442.8	41.5%		3,611.7	5,172.3	58.9%	41.1%
25 *	2,000	2.9	1,054.1	336.9	32.0%		3,714.7	5,069.3	57.7%	42.3%
26	2,010	2.9	1,059.4	607.6	**57.4%**		4,999.6	3,784.4	43.1%	56.9%
27	1,775	2.6	935.5	178.7	19.1%		1,454.2	7,329.8	83.4%	16.6%
28	2,380	3.4	1,254.3	230.8	18.4%		1,688.9	7,095.1	80.8%	19.2%
29 *	2,200	3.2	1,159.5	680.4	**58.7%**		8,649.0	135.0	1.5%	98.5%
30	2,460	3.5	1,296.5	663.6	**51.2%**		5,008.1	3,775.9	43.0%	57.0%

* Denotes wells with variable frequency drives (VFDs)