Internal Monitoring Report

Policy # O-2E Sustainability **Date:** August 15, 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, winter water levels were approximately 11 to 13 feet higher than those experienced during the summer months. Overall, water levels continue to rise, with an increase approximately 11 – 12 feet over the last 10 years. This is a good indication that the aquifers are in the process of rebounding/recovering to former 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 first six months of 2017. 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 both pumping and precipitation events. A review of the recent water level data indicates that, with the exception of several wells, most of the water levels (static and pumping) are dropping as summer demands increase. The decrease in water levels is minor and consistent with those of last year at this time. Water levels in all of the wells appear to be sustainable for the near future. Average static and pumping water levels between July 2012 and June 2017 are depicted in Table 1.

Total precipitation during the first half of 2017 was above average. We received 22.4 inches of precipitation from January through June, 2017 which is about 6.1 inches more (37.4% more) than the six month average of 16.3 inches. It is anticipated that precipitation amounts in the Madison area will continue to be above average into the near future. This is important to note as the aquifers are recharged to a great extent by precipitation events.

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.

During the months of July through December, 2016 they pumped and treated slightly over 10.5 million gallons of contaminated groundwater. Approximately 130 pounds of VOCs were removed from the groundwater during this period with almost 350 pounds of VOCs removed to date. Since the system started in 2015, PCE concentrations in water from the recovery well have fallen from 3000 ug/l to 1700 ug/l.

The Soil Vapor Extraction system at the MKC site also continues to run. This system has operated continuously for more than 3.5 years. PCE concentrations in the soil decreased approximately 25% over the course of the year.

The Utility continues to work with MKC, their consultant ARCADIS, the WDNR, and the WGNHS on the area's groundwater contamination issues. The Utility hired Eric Oelkers and SCS Engineers to continue the hydrogeological review initiated by Jessica Meyer. The remaining tasks of this review include:

1. A review and analysis of the Madison Kipp data for 2016. So far they have focused primarily on trends of PCE. They will also take a look at trends of cis-1,2-DCE in some of the outlying wells.

2. Finalize a number of particle tracking scenarios using the Dane County groundwater flow model and hopefully get a review of these results by WGNHS.
3. Identify potential locations and propose construction details for one or more "sentinel"groundwater monitoring wells between the Kipp site and Unit Well #8
4. Submit a final report documenting the findings of SCS's investigation.

The study and report are scheduled to be complete by the end of September 2017.

Groundwater at and adjacent to the facility continues to be monitored on a semi-annual basis for VOCs. The most recent groundwater sampling from which we have results was conducted in October of 2016. Results for the 2017 sampling have not yet been submitted to the WDNR. The October, 2016 sampling indicated that PCE levels in the groundwater between the site source and UW 8 have remained 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.

<u>UW 29 Sentinel Well</u>

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 sixteen samplings conducted to date.

The well was sampled in May of this year to allow the Wisconsin Geological and Natural History Survey access to the sampling event. Scientists from the WGNHS collected water from the well during the sampling event as part of a city wide radium study they are conducting.

In terms of VOCs, the samples are analyzed for a total of 51 different compounds. Results from the latest May 2017 sampling revealed two minor VOC detects.

- Trichlorofluoromethane was detected in the shallowest port at a level of 0.43 ug/l. This detect is below the level of quantification (1.1 ug/l) and there is no MCL for this compound. Trichlorofluoromethane exists in the water table aquifer at low concentrations throughout the area and is not related to the landfill.

- Toluene, which can be attributed to the coating on the well liner, was detected in Port #4 at a concentration of 0.28 ug/l. The MCL for toluene is 1000 ug/l. There have been no detects of toluene to date 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 were analyzed. Several different inorganics were detected at elevated levels in the water tested in May.

- Port 3 had an arsenic level of 22.8 ug/l (MCL = 10 ug/l). Similar concentrations of arsenic have been reported in the water from this port in the past. It is thought that the

arsenic here is also a result of the coating on the liner.

- As in past samplings, elevated levels of manganese (198 ug/l) were detected in the water from Port #5. It is believed that the manganese is naturally occurring and exits at this depth through the area.

- Water from UW 29 tested high for iron and manganese. Water from this supply 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 29 continues to be pumped at half capacity (1100 gpm).

UW 14 - Chloride Study

Geophysical logging of Well 14 conducted by the Wisconsin Geological and Natural History Survey identified two major fractures that predominantly supply water to the well. These features are located at depths of 117 feet, at the base of the steel casing, and 230 feet, the boundary between the Wonewoc and Eau Claire formations. It is estimated that each fracture contributes approximately 50% of the flow to the well. High conductivity water was observed at each of these fractures relative to the remainder of the well.

A second phase of the study involved re-defining the time-related capture zones using the updated Dane County Groundwater Model and identifying potential chloride and sodium source areas to the well. Four areas were identified through field inspection:

- The 110,000 sq ft uncurbed parking lot at 610 N Whitney Way
- The Village of Shorewood Hills salt shed
- The uncurbed portions of Lake Mendota Drive and Merrill Springs Road
- The storm sewer outlet into Spring Harbor. The drainage area for the storm sewer contains portions of the Beltline highway, dozens of city streets, and many parking lots including West Towne.

Finally, particle tracking suggests an estimated 2-year travel time from the storm sewer discharge to Well 14. Because the lake is essentially an outcrop of the aquifer, and the model simulates water being drawn from the lake bed, high salinity water from this discharge point could be drawn directly into the aquifer and continue to the well. The utility plans to investigate this hypothesis through the installation and sampling of a shallow monitoring well nearby the storm sewer outlet.

UW 15 – VOC Source

Late last year, the WDNR 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. It is thought that this site might be the source of the PCE detected in the water at UW 15.

The WDNR reports that the responsible party has conducted a groundwater investigation beneath and adjacent to the former Day One Formal Wear property. The results of this investigation however, have not been reported to the WDNR as of yet. In addition, the party is working on a remediation plan for the soil and groundwater contamination which exits at their site. This plan is expected to be completed soon.

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 later this year. 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. Construction of the well facilities began earlier this year and should be complete in 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. Wellhead protection signs have been installed identifying the immediate 1200' protected area around the well.

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 later this year.

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 4,672,276,000 gallons of water to the distribution system during the first half of 2017. This is approximately 3.5%less than the 4,843,731,000 gallons pumped during the first six months of last year.

Average Day: 25,814,000 gpd (last year 27,335,000 gpd)
Max Day: 38,887,000 gpd on June 16 (last year 35,500,000 gpd on June 22)
Min Day: 19,430,000 gpd on January 14 (last year 19,810,000 gpd on January 2)

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 the first half of 2017 were very similar to those experienced in 2016. Through June 30, 2017, seven different wells exceeded the 50% utilization rate. Five of these wells however were in the low 50's, an improvement from several years ago. 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 has allowed us to significantly reduce the utilization rate of UW 13, a well located at the far northern edge of the pressure zone, during the first half of 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. Operationally, this reservoir has also made it easier to pump UW 7, 11, and 15 on a more equal basis.
- Unfortunately, the 50% goal was significantly exceeded again at UW 12 (74.6%). The use of this site is not likely to lesson without the addition of a new well in Zone 7 or a Zone 8/Zone 7 booster/transfer station (scheduled for 2019).
- After repairs, UW 19 was back in service for the first half of 2017. As a result, it was utilized at a rate of 54.4% this year compared to 4% last year at this time.
- 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 61.6% to 53.9% by leaving UW 28 in service over the winter months. MWU plans to reduce the use of UW 26 even more this year.
- The VFDs installed at UW 7 have allowed us to run this well just below the 50% rate (46.6%). The Utility plans to use this well at the 50% rate in the future as it provides high quality filtered water.

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 $50 a day ($18,000 a year) in electric costs. The installation has also helped 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 2016 and 2017 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 is scheduled to be complete in 2019.
- 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. This project will be complete in 2018. Additional pipeline/main improvements are

scheduled for this year.
- Construction of UW 31 began 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.
- After some pipeline improvements this spring, a portion of Zone 7 was moved/incorporated into Zone 8. This should alleviate some of the stress on the Zone 7 wells (UW 12 and UW 20) which are currently over the 50% rate.

Energy Conservation Assessment

UW Engineering Grad student, Connor Mancosky, has finished his studies, received his degree and moved onto his first job. Connor did a great job and developed analytic methods that will continue to benefit the Utility for years to come.

As reported to the Water Board in July, Connor identified the deep well vertical turbine pump at Well 30 as a good candidate for conversion to variable speed drive. The VFD was installed on the deep well pump in the fall and data was collected before and after installation to measure and verify energy savings of the investment. Preliminary findings indicate a savings of approximately $1500 per month while pumping at an average rate of 2.1 million gallons per day. The pay back on this investment would be less than 2 years.

Connor also laid the groundwork for analyzing energy requirements for Pressure Zones 8, 10, and 11 as a system. This far west area is isolated from the system allowing analysis of energy consumption, pump efficiency, and operating characteristics as a total water supply system. This work will be useful in optimizing pump operations with regard to energy usage.

A new graduate student will be starting in the fall and will continue to study energy conservation and system optimization. This work has proven to provide a significant return on investment and a great benefit to water utility operations.

Objectives of this energy conservation and system optimization research project include:
1) Identify pumping design criteria that will optimize energy conservation,
2) Identify projects with the highest potential for energy reduction;
3) Evaluate, recommend, and demonstrate energy conservation projects to the Utility, and
4) Lay the framework for system operational optimization.

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

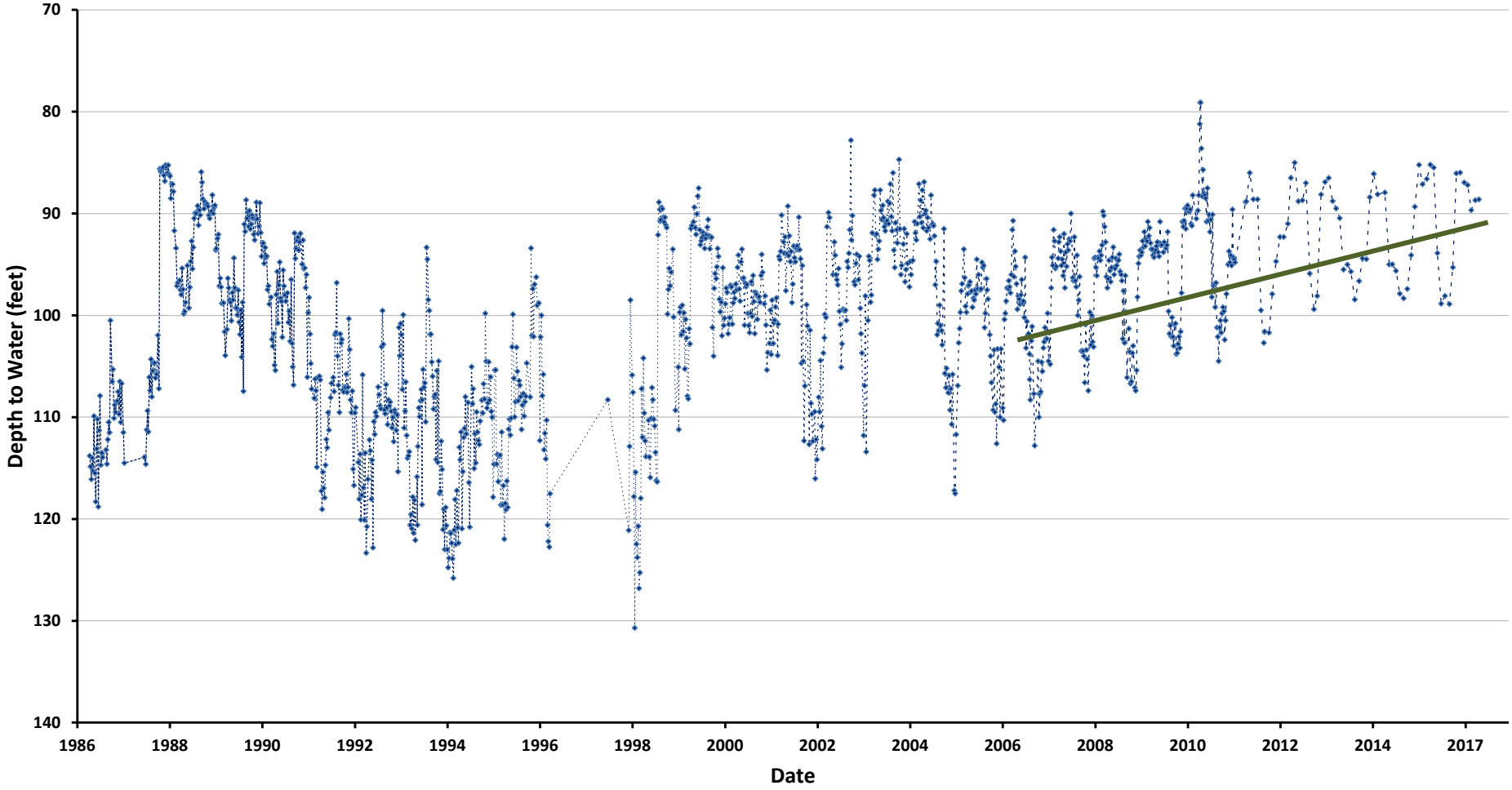

Table 1: Average Water Levels - Wells (Feet to Water)

	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
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		
Jan-17	29.7	148.8	65.7	144.0			102.2	172.0	35.2	147.1	181.2	262.7	10.4	92.4	30.3	46.8	49.4	86.8	173.3	257.3		
Feb-17	30.2	154.7	52.9	126.8			102.8	172.5	31.2	142.9	171.5	264.0	9.6	86.6			46.8	86.7	157.0	266.0		
Mar-17	33.3	154.0	52.0	138.6			103.6	172.7	34.0	147.3	187.5	265.6	9.9	92.0			46.8	86.3	169.4	268.5		
Apr-17	28.2	150.8	59.3	142.7			103.0	172.9	33.2	146.9	186.5	262.8	9.5	91.1	24.0	55.2	46.1	86.7	174.6	267.6		
May-17	27.2	154.1	54.2	140.0			104.1	173.8	32.9	146.6	188.0	263.4	9.2	90.9	24.3	55.3	45.5	86.1	176.3	268.7	51.7	120.4
Jun-17	28.9	153.7	61.4	144.4			106.0	175.6	36.1	148.7	190.0	265.6	9.1	91.3	25.4	56.0	52.9	98.8	178.4	271.0	47.5	118.4

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
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
Jan-17	97.0	310.8	60.2	212.9	274.5	395.3			42.0	197.5	93.7	260.6	330.4	401.1			147.9	278.7		173.4	134.4	231.2
Feb-17	86.6	312.1	77.1	224.7	246.1	396.3			41.1	200.1	86.1	261.8	297.4	398.5			147.4	277.9		174.0		233.4
Mar-17	97.0	312.6	73.2	224.3	276.9	397.2			39.0	199.4	92.7	261.6	321.3	401.8			143.3	277.6		173.9		214.6
Apr-17	97.0	313.5	64.1	222.1	275.0	395.1			41.2	199.9	94.4	260.9	330.0	400.8			148.3	284.5		174.0		201.9
May-17	97.0	315.1	63.6	221.7	276.5	396.1			44.2	203.4	94.7	261.1	330.7	400.4	44.2	212.1	148.5	284.0		173.8	107.0	208.8
Jun-17	99.9	317.8	68.2	224.0	279.4	398.3			44.9	206.3	96.4	262.0	334.7	404.9	52.5	216.4	151.5	286.9		176.7	115.0	215.2

Table 2: 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)

Table 3: 2017 Unit Well Capacity

Start Date: **January 01, 2017** **End Date:** **June 30, 2017**

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	740.2	224.1	30.3%		1,504.5	2,839.5	65.4%	34.6%
7 *	2,200	3.2	573.4	267.4	46.6%		2,583.9	1,760.1	40.5%	59.5%
8	1,980	2.9	516.1	0.0	0.0%		0.0	4,344.0	100.0%	0.0%
9	1,720	2.5	448.3	215.4	48.1%		2,056.1	2,287.9	52.7%	47.3%
11	2,090	3.0	544.7	251.2	46.1%		1,777.5	2,566.5	59.1%	40.9%
12	2,430	3.5	633.4	472.5	**74.6%**		3,639.1	704.9	16.2%	83.8%
13	2,620	3.8	682.9	207.2	30.3%		1,328.6	3,015.4	69.4%	30.6%
14	2,000	2.9	521.3	273.3	**52.4%**		2,009.3	2,334.7	53.7%	46.3%
15 *	2,200	3.2	573.4	168.2	29.3%		2,441.8	1,902.2	43.8%	56.2%
16	2,300	3.3	599.5	257.2	42.9%		1,819.9	2,524.1	58.1%	41.9%
17	2,290	3.3	596.9	44.8	7.5%		338.0	4,006.0	92.2%	7.8%
18	1,720	2.5	448.3	206.7	46.1%		2,002.0	2,342.0	53.9%	46.1%
19	2,020	2.9	526.5	286.2	**54.4%**		1,994.9	2,349.1	54.1%	45.9%
20	2,025	2.9	527.7	275.6	**52.2%**		2,282.4	2,061.6	47.5%	52.5%
23	1,310	1.9	341.4	0.0	0.0%		0.0	4,344.0	100.0%	0.0%
24	2,025	2.9	527.8	230.3	43.6%		1,917.1	2,426.9	55.9%	44.1%
25 *	2,000	2.9	521.3	156.7	30.1%		1,620.5	2,723.5	62.7%	37.3%
26	2,010	2.9	523.9	282.6	**53.9%**		2,350.5	1,993.5	45.9%	54.1%
27	1,775	2.6	462.6	66.4	14.4%		611.0	3,733.0	85.9%	14.1%
28	2,380	3.4	620.3	112.8	18.2%		823.4	3,520.6	81.0%	19.0%
29 *	2,200	3.2	573.4	334.5	**58.3%**		4,294.0	50.0	1.2%	98.8%
30 *	2,400	3.5	625.5	339.1	**54.2%**		3,850.2	493.8	11.4%	88.6%

* Denotes wells with variable frequency drives (VFDs)