HYDROGEOLOGIC ANALYSIS OF PERKASIE WATER SUPPLY WELLS AND CONSULTANT'S REPORT FOR THE YEAR 2020

Prepared for:
THE PERKASIE REGIONAL AUTHORITY
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INTRODUCTION

Background

The Perkasie Regional Authority (PRA) is the water supplier to residential, commercial, and industrial customers located within the Borough, portions of East Rockhill Township and a small neighboring portion of Hilltown Township. PRA supplies water to a population of approximately 12,800 customers via 4,972 connections. 13 new connections were added in 2020.

Ground water is the only available and viable source of water supply in the Perkasie area. PRA derives its water supply from the underlying aquifer via production wells designated as Well Nos. 5, 6, 7, 10 and 11. Well Nos. 10 and 11 are located within the Perkasie Borough boundaries and Well Nos. 5, 6, and 7 are located in East Rockhill Township, near the PRA service area. Pumping at Well Nos. 10 was discontinued in 2011 because of the concentration of arsenic in the ground water which exceeds the drinking water standard. After installation of the treatment system for removal of the arsenic from the ground water, pumping resumed at well No. 10 in September 2011. As of 2020, Well No. 12 is maintained as an emergency backup.

Well No. 7 was approved by the Delaware River Basin Commission (DRBC) on September 24, 2008 under Docket No. D-97-12 CP-3. The well had previously been approved by PADEP on June 16, 2008 (public water supply permit no. 0908503). The well commenced operation on May 25, 2009. The docket allows a maximum withdrawal from Well No. 7 of 11.67 mg/30 days (0.389 mg/d) while maintaining the system withdrawal allocation to a maximum of 40.2 mg/30 days (1.34 mgd). Ground water withdrawals at Well No. 7 replaced the withdrawals at Well No. 12 where, as indicated above, pumping was discontinued because of the concentration of arsenic.

Well No. 9 was not pumped in 2020 due to an electrical fire during late 2012. Pumping at Well No. 9 has been discontinued as a result. As of the date of this report, five production wells supply the PRA system, Well Nos. 5, 6, 7, 10 and 11. In 2020, the wells and water

supply system were operated in accordance with the terms and conditions of Docket No. D-1997-012 CP-4.

Before entering the distribution system and being used by customers, the ground water is chlorinated. Well No. 10 is also equipped with an air stripper for removal of low levels of volatile organic compounds (VOCs), as well as arsenic, and well No. 11 is equipped with a treatment system for removal of arsenic.

The storage component of the PRA water supply system consists of a two-million gallon capacity standpipe located in East Rockhill Township, and a one-million gallon covered reservoir located in Perkasie Borough.

For emergency use, the PRA has interconnections with the Sellersville Borough and with the Hilltown Township Water and Sewer Authority Water Supply Systems. However, none of these systems would be able to provide any water to Perkasie, except, perhaps, on an emergency basis, whereas PRA would be able to supply any of the interconnected systems.

PRA operates within the Ground Water Protected Area of Southeastern Pennsylvania as designated by the Delaware River Basin Commission (DRBC). In December 2019, DRBC Docket No. D-1997-012 CP-4 was approved for PRA Well Nos. 5, 6, 7, 10 and 11. The new Docket increases PRA's withdrawal allocation to 44.83 mg/30 days (1.494 mgd). Total withdrawal from the wells located in the Tohickon Three Mile Run sub-basin (Well Nos. 5, 6, and 7) shall not exceed 24.99 million gallons per 30 days (mg/30 days), and total withdrawal from the wells located in the East Branch Perkiomen Morris Run sub-basin (Well Nos. 10 and 11) shall not exceed 19.84 mg/30 days.

The long-term monitoring program consists of a network of thirty-nine (39) monitoring wells, inclusive of the production wells. The wells are monitored on a monthly basis by PRA personnel.

This report has been prepared by RMS Environmental LLC on behalf of PRA in order to satisfy docket conditions.

Scope

The DRBC docket permitting the PRA wells requires, among others, that water level and withdrawal data from the production wells and water level data from selected monitoring wells, be analyzed by a hydrogeologist and that a report be submitted annually to the Commission. This report covers the calendar year 2020.

This report has been prepared and is submitted in compliance with conditions f. and m., Paragraph I, under Decision, DRBC Docket No. D-1997-012 CP-4 (Revision), as follows:

f. "The project withdrawals shall be metered with an automatic continuous recording device that measures to within 5 percent of actual flow. An exception to the 5 percent performance standard, but no greater than 10 percent, may be granted if maintenance of the 5 percent performance is not technically feasible or economically practicable. A record of daily withdrawals shall be maintained, and monthly totals shall be reported to the Bureau of Watershed Management, PADEP annually and shall be available at any time to the Commission if requested by the Executive Director".

l. A long-term monitoring program is required to obtain data on ground water hydrologic conditions in the project area. The docket holder shall implement the long-term monitoring program as submitted in a letter dated September 25, 1997. This program will include the following:

1. **Groundwater Level Monitoring** – PRA shall monitor thirty-nine (39) wells identified in the above referenced letter to estimate annual groundwater fluctuations caused by seasonal changes and/or production well pumping and detect water level declines that may affect the performance of public and private wells in the vicinity of the PRA production wells.
2. **Reports** - All monitoring data, including records required in Conditions "e." and "l." herein shall be submitted to the Commission annually, due by April 1. The docket holder is encouraged to submit the annual report electronically. The report shall be prepared by a hydrogeologist and shall assess the effects of well withdrawals on hydrologic conditions in the area. This report shall include an evaluation of the monitoring data required by this docket approval and such information as deemed appropriate by the hydrogeologist or required by the Executive Director.
3. The Executive Director may modify the monitoring program or temporarily suspend or modify this docket at any time if review of the hydrologic data and/or any other information indicates such action is necessary or appropriate.

PHYSICAL SETTING

Location

Perkasie Borough is located in northwest Bucks County, Pennsylvania (Figure 1). The Borough lies approximately 10 miles northwest of Doylestown, the County seat, and 16 miles southwest of the nearest point in the Delaware River. Perkasie is bounded by East Rockhill Township to the north and northeast, Hilltown Township to the southeast, Sellersville Borough to the southwest, and West Rockhill Township to the west.

Climatology and Precipitation

Perkasie is located in the eastern Coastal Climatic Province. The climate in this province is characterized by moderate temperature extremes, fairly high humidity, and abundant precipitation. Ground water recharge is low during the summer when evapotranspiration rates and temperatures are high. Recharge occurs mostly during the winter and spring months when evapotranspiration losses are minimal.

Precipitation data are available for the period 1991 to 2020 from the Pennridge Wastewater Treatment Plant (WWTP), which is located in West Rockhill Township, about one mile southwest of Perkasie. Annual precipitation over the period of record is illustrated in Figure 2. The monthly precipitation totals and the monthly averages for this period are included in Table 1. Daily precipitation records for 2020 are included in Appendix A. Table 2 presents monthly precipitation departures from the 1991-2020 average for the year 2020.

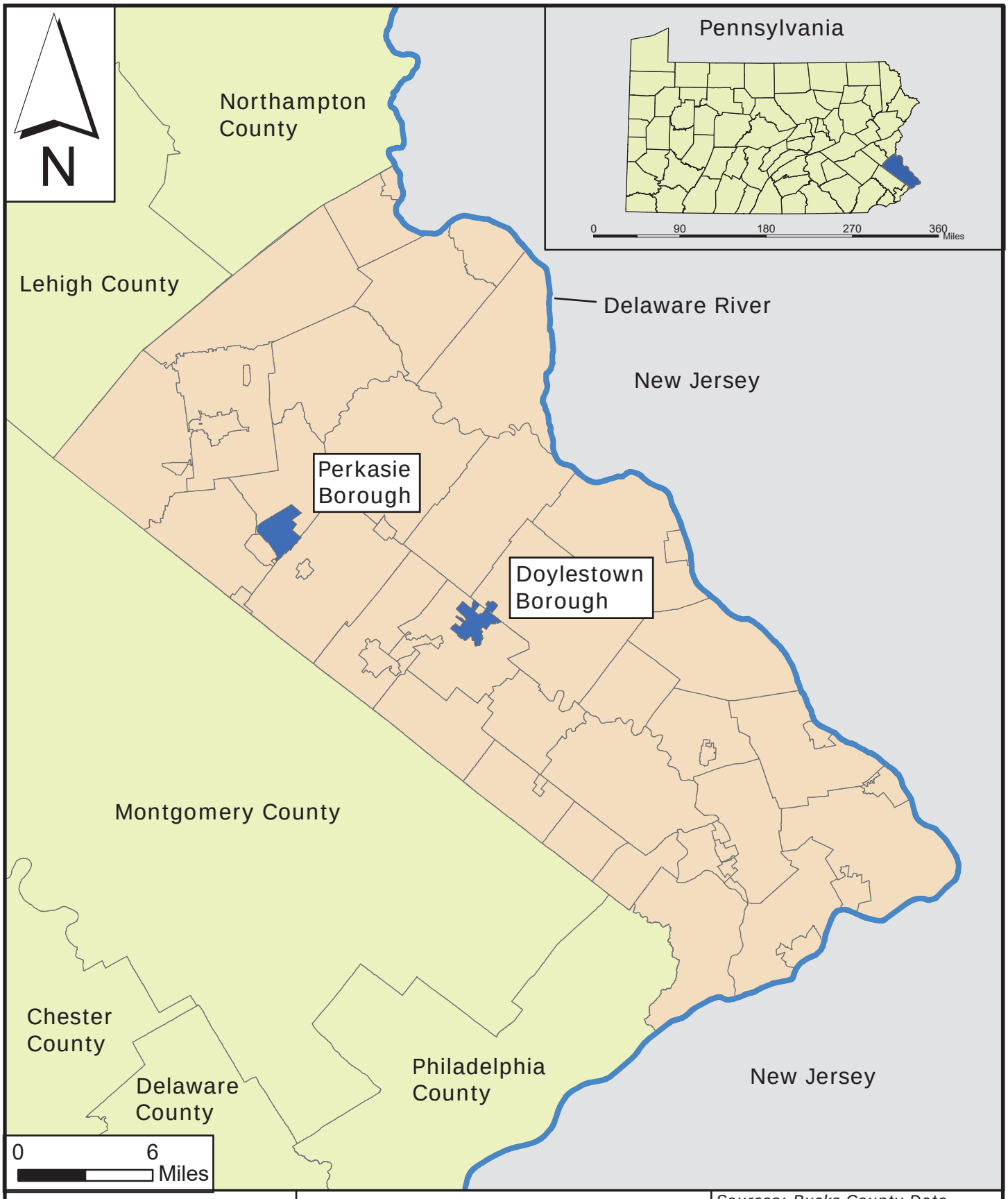
Longer term (55 years) precipitation data are available for the Central Bucks County airport near Doylestown, PA, which is located approximately 10 miles southeast of Perkasie. Perkasie lies at higher altitude and receives more precipitation than Doylestown. The 30-year precipitation record from Pennridge WWTP is therefore considered a more appropriate long-term data set for Perkasie Borough.

In 2020, total recorded precipitation was 55.10 inches which is 5.06 inches above the long-term average of 50.04 inches. August had the highest precipitation, 9.36 inches. Precipitation was also above average in April, July, November and December. The lowest amount was recorded in February (2.74 inches) (Table 2). Precipitation was below average

for January, February, March, May, June, September and October. In the previous recording period (2019), May was the month that registered the highest amount of precipitation while September registered the lowest.

A precipitation deficit (greater than half an inch) was measured in five (5) months of 2020 (Figure 3). June had the largest deficit of -1.37 inches. August recorded the greatest surplus (+4.94 inches).

One inch of precipitation corresponds to approximately 47,000 gallons per square mile. In 2020, the total precipitation for the year was 55.10 inches, or about 2.59 million gallons per square mile.



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LOCATION OF PERKASIE BOROUGH
BUCKS COUNTY, PENNSYLVANIA

Sources: Bucks County Data Portal, Esri.

Figure: 1
Drawn: DS
Checked: MM
7/28/2020

Figure 2

Annual Precipitation at Pennridge WWTP from 1991 to 2020

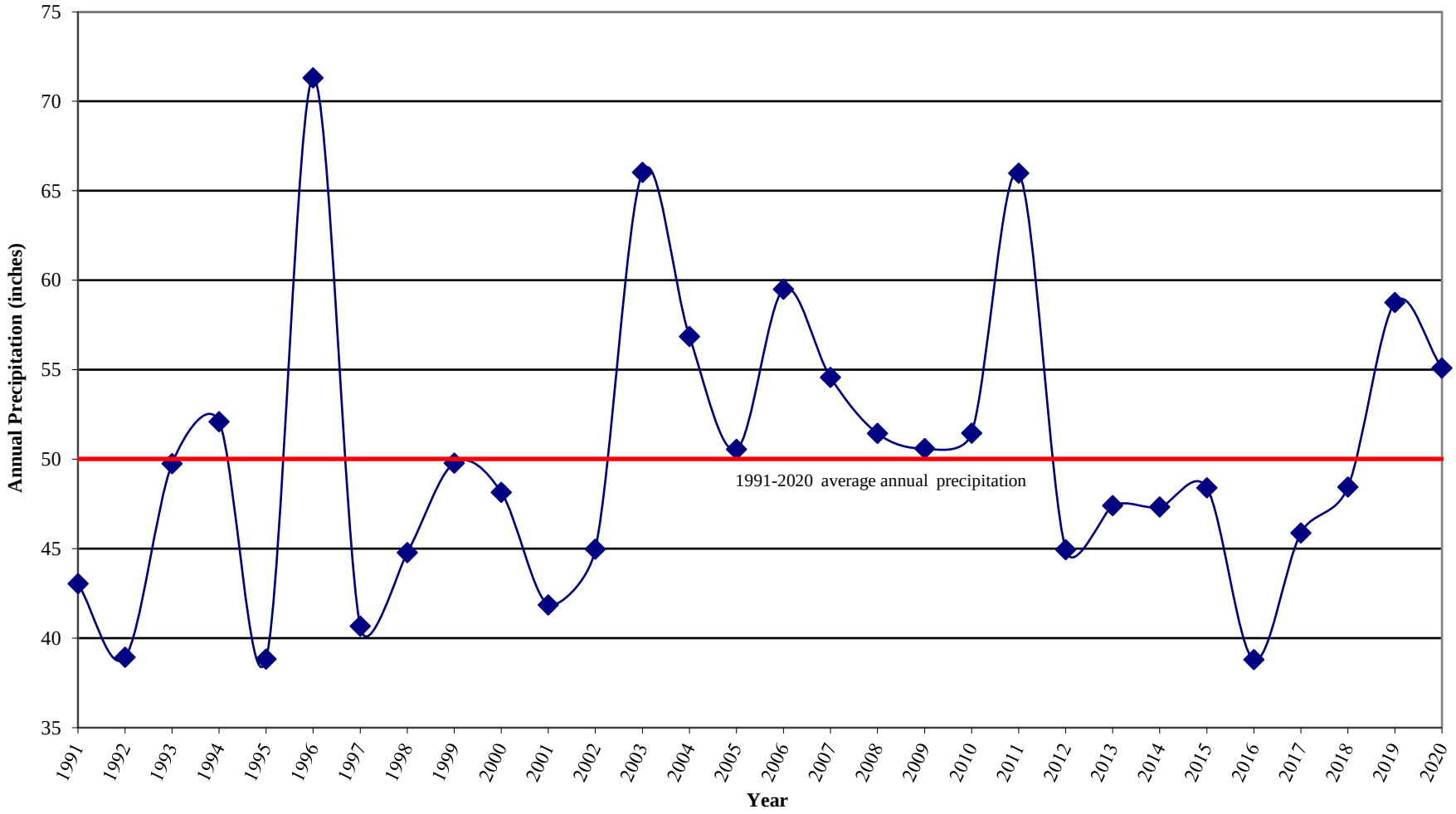


TABLE 1

Long-Term Precipitation Recorded at Pennridge WWTP 1991-2020 (inches)

	1991	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*	*2018*	*2019*	*AVG.*	*2020*	*Diff.*
Jan.	3.44	1.63	2.57	5.60	3.34	8.52	3.74	3.82	6.90	2.97	3.30	2.22	1.74	2.58	5.58	4.76	4.22	1.32	2.45	5.22	3.83	3.17	4.00	5.12	4.11	4.25	4.03	1.85	5.25	3.85	3.06	-0.79
Feb.	1.54	1.53	0.95	2.14	2.97	3.69	1.75	4.10	3.56	2.53	3.04	0.64	5.64	3.32	2.10	2.69	1.63	6.07	0.65	5.68	1.87	1.07	2.35	4.43	4.83	4.51	1.72	5.11	2.85	2.93	2.74	-0.19
March	4.80	3.07	5.94	5.52	2.59	5.05	4.29	4.40	5.67	5.81	4.45	4.14	4.29	3.31	4.32	0.79	5.04	4.39	2.13	7.68	6.96	2.24	2.94	4.98	5.76	1.76	2.88	2.50	3.85	4.19	4.04	-0.15
April	4.28	0.76	6.03	4.82	2.28	9.09	2.23	5.75	3.42	4.37	2.45	3.39	2.54	5.01	7.14	3.19	9.65	2.78	3.00	2.86	6.47	3.16	3.68	5.31	2.24	2.48	5.13	2.65	3.82	4.14	4.94	0.80
May	2.81	2.32	0.79	4.09	3.65	3.16	5.19	7.59	1.35	5.51	5.46	5.12	3.79	4.36	1.70	2.85	3.11	5.69	6.32	3.32	4.83	5.66	3.46	4.68	0.55	4.45	5.27	5.12	9.63	4.20	3.36	-0.84
June	2.74	3.71	2.29	5.97	1.16	3.42	2.55	5.66	0.99	4.81	5.25	5.01	7.97	2.96	3.62	12.24	6.30	3.50	5.51	1.56	3.65	2.48	6.71	3.99	8.12	2.71	4.23	2.36	5.23	4.37	3.00	-1.37
July	4.90	5.92	4.95	6.19	5.30	7.94	4.91	1.96	0.50	3.02	5.39	0.77	5.42	8.33	5.31	5.91	4.06	4.92	6.26	4.81	3.17	4.66	7.86	4.94	4.89	5.80	5.76	3.85	9.23	5.07	5.37	0.30
Aug.	3.42	3.85	7.28	5.86	1.06	5.13	4.92	2.88	5.96	5.19	3.87	2.48	6.56	3.39	2.68	4.65	4.25	0.96	6.46	1.39	13.20	5.78	4.16	2.33	3.19	2.30	5.51	6.32	3.21	4.42	9.36	4.94
Sept.	3.91	3.95	6.19	3.04	4.57	5.04	2.68	2.20	10.93	3.43	4.23	4.84	9.59	9.77	0.78	6.96	1.02	7.53	4.41	2.83	9.53	5.36	1.54	1.42	3.76	3.00	2.62	8.29	2.10	4.67	4.13	-0.54
Oct.	3.12	2.28	3.10	2.07	5.50	7.46	2.41	3.63	3.07	1.72	0.63	6.58	8.13	2.09	11.54	5.92	7.17	4.31	6.27	10.03	3.46	5.63	2.19	2.98	3.98	1.05	4.81	1.83	5.51	4.43	3.60	-0.83
Nov.	2.95	4.42	4.01	3.97	4.30	3.8	3.11	1.32	3.80	2.51	0.99	4.94	4.71	5.28	3.87	5.51	3.45	3.01	1.22	2.47	4.50	1.10	2.55	2.73	1.97	2.24	1.71	5.39	3.08	3.27	3.65	0.38
Dec.	5.14	5.49	5.65	2.83	2.12	9.02	2.90	1.48	3.64	6.28	2.80	4.84	5.65	6.46	1.91	4.03	4.67	6.96	5.92	3.61	4.53	4.64	5.97	4.42	5.01	4.25	2.21	3.18	5.00	4.50	7.85	3.35
Total	**43.05**	**38.93**	**49.75**	**52.10**	**38.84**	**71.32**	**40.68**	**44.79**	**49.79**	**48.15**	**41.86**	**44.97**	**66.03**	**56.86**	**50.55**	**59.50**	**54.57**	**51.44**	**50.60**	**51.46**	**65.99**	**44.95**	**47.41**	**47.33**	**48.41**	**38.80**	**45.88**	**48.45**	**58.76**	50.04	**55.10**	**5.06**

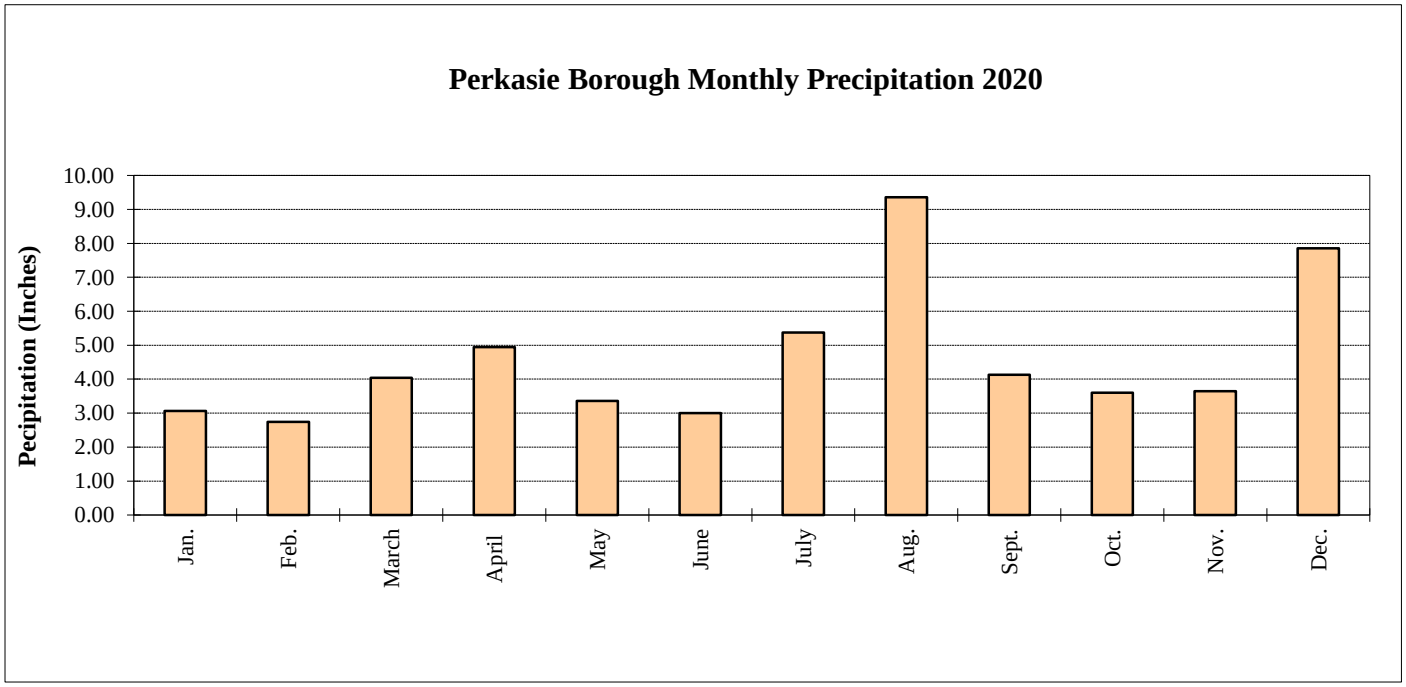
Table 2

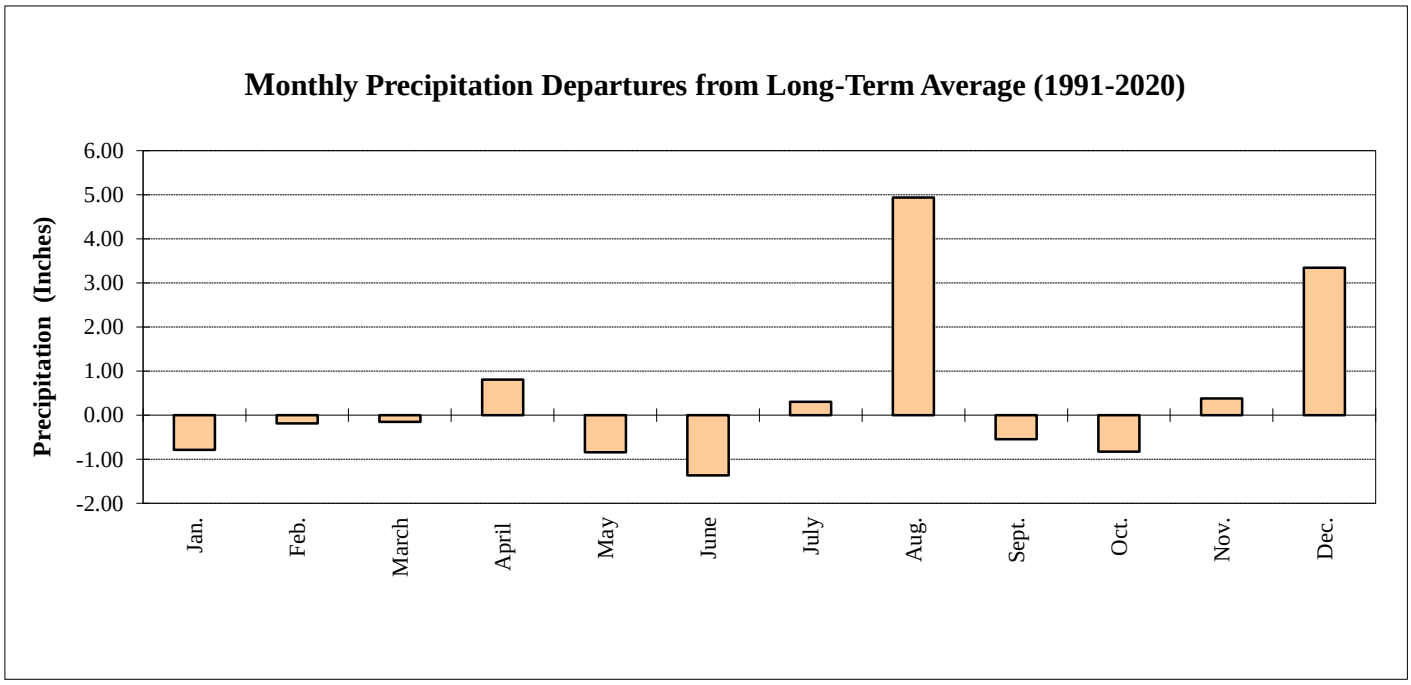
Monthly Precipitation and Departure from Average
Recorded at Pennridge WWTP in 2020

	2020	30-Year * Average	Departure
January	3.06	3.85	-0.79
February	2.74	2.93	-0.19
March	4.04	4.19	-0.15
April	4.94	4.14	0.80
May	3.36	4.20	-0.84
June	3.00	4.37	-1.37
July	5.37	5.07	0.30
August	9.36	4.42	4.94
September	4.13	4.67	-0.54
October	3.60	4.43	-0.83
November	3.65	3.27	0.38
December	7.85	4.50	3.35
Total	55.10	50.04	5.06

*1991-2020

Figure 3


Perkasie Borough Monthly Precipitation 2020
Pecipitation (Inches)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Jan.
Feb.
March
April
May
June
July
Aug.
Sept.
Oct.
Nov.
Dec.


Monthly Precipitation Departures from Long-Term Average (1991-2020)
Precipitation (Inches)
6.00
5.00
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
Jan.
Feb.
March
April
May
June
July
Aug.
Sept.
Oct.
Nov.
Dec.

SYSTEM WITHDRAWALS AND WATER LEVELS

DRBC docket conditions allow the PRA a maximum withdrawal of 44.83 million gallons (mg) of ground water during any 30-day period from their five (5) permitted wells, or approximately 1.494 million gallons per day (mgd). The locations of the production wells and the system-wide monitoring network wells are shown on Figure 4.

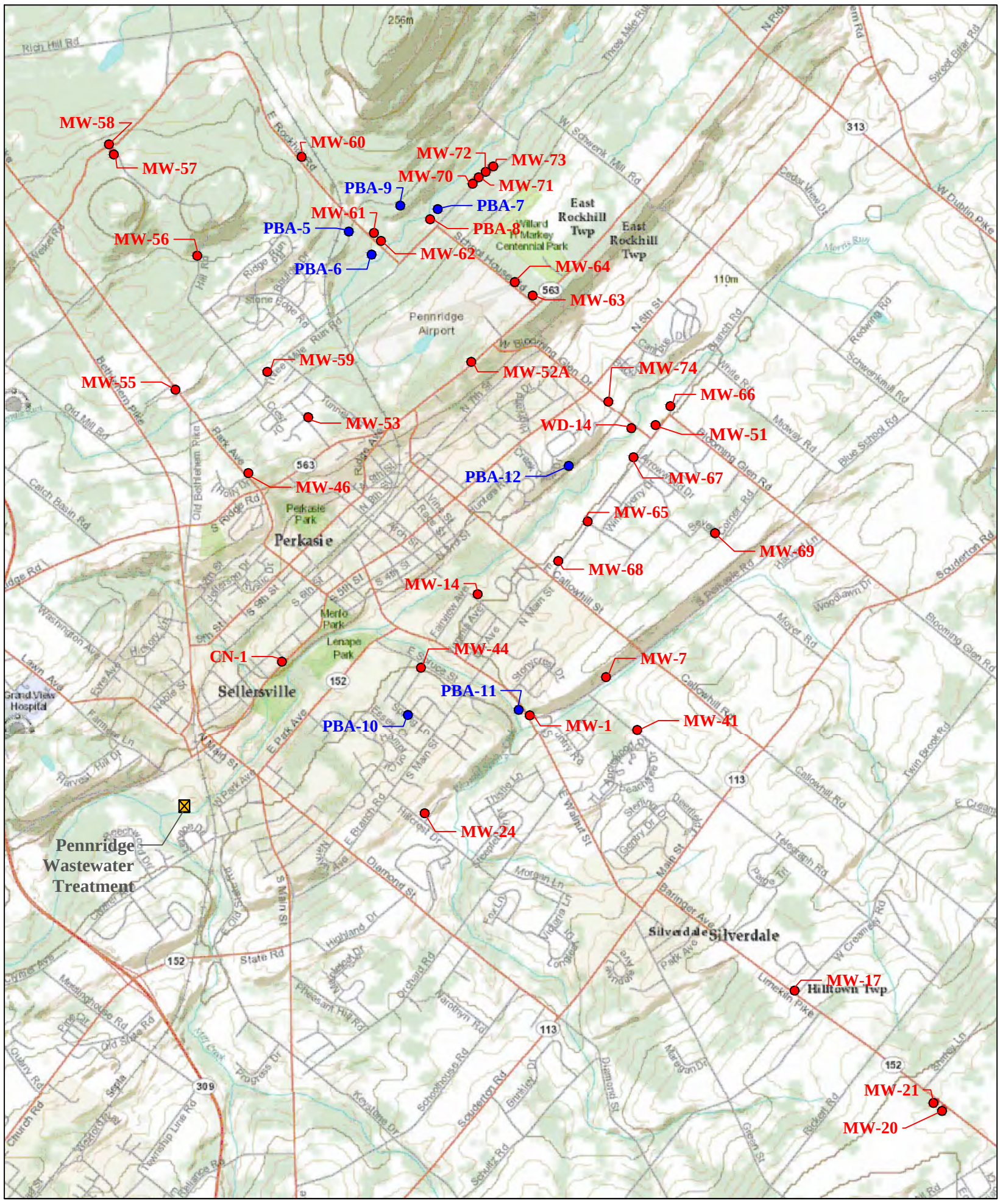
The average daily withdrawal by month, monthly production averages, total production for individual wells and the entire system, and the 2020 yearly totals for the individual wells and the system are summarized in Table 3. The complete set of data is included in Appendix A. The monthly production of each well also is graphed for the year 2020 in Figure 5.

Pumping and non-pumping water levels, daily ground water withdrawal at each individual well, and precipitation recorded at Pennridge WWTP during 2020 are shown on Figures 6A through 11A. Pumping and non-pumping water levels at each individual well, average daily withdrawal by month, and precipitation from January 2016 to December 2020 are shown on Figures 6B through 11B.

System-wide withdrawals for the twelve (12) months of this reporting period were 264.336 million gallons. Well No. 6 was the greatest producer (0.208 mgd), while Well No. 11 was the smallest producer (0.091 mgd). Well No. 12 was not in operation because the arsenic concentrations are above the limit. Well No. 9 was not in operation due to a fire that occurred in October 2012. Combined monthly withdrawals from the five (5) production wells that were in operation during the 2020 pumping year ranged from a high of 24.876 million gallons in July to a low of 19.173 million gallons in February. The system daily average withdrawal for 2020 was 0.721 mgd.

Operation of the wells for the twelve months of 2020 was consistent with the conditions set forth in Docket No. D-97-12 CP-4.

Ground water withdrawals and water level trends for PRA production wells from January to December 2020, and for the 5-year period from January 2016 to December 2020 are discussed below.



PERKASIE REGIONAL AUTHORITY
WATER SUPPLY SYSTEM

Legend

- Municipal Production Well
- Monitoring Well
- Sewage Treatment Plant

N

Scale 1:3000

3000 0 3000 6000 Feet

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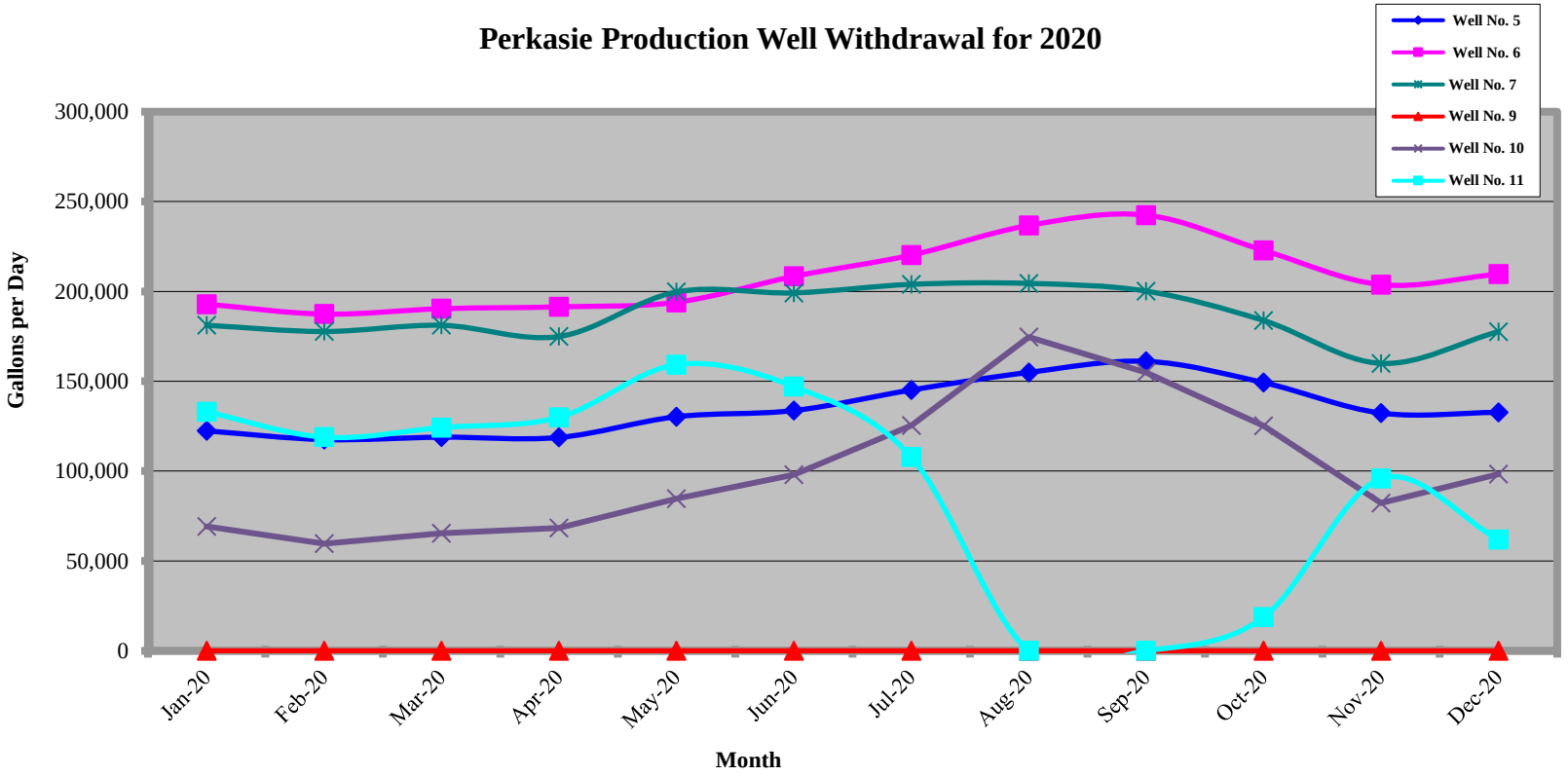
FIGURE 4

TABLE 3

Well and System Withdrawals for the Year 2020 (Gallons)

Month	Three Mile Run Well Field										East Branch of Perkiomen Well Field						Daily System Average	Total System Withdrawal
	Well No. 5		Well No. 6		Well No. 9		Well No. 7		Well Field Total		Well No. 10		Well No. 11		Well Field Total			
	Monthly Total	Daily Average	Monthly Total	Daily Average	Monthly Total	Daily Average	Monthly Total	Daily Average	Monthly Total	Daily Average	Monthly Total	Daily Average	Monthly Total	Daily Average	Monthly Total	Daily Average		
Jan-20	3,794,000	122,387	5,980,000	192,903	0.000	0.000	5,616,000	181,161	**15,390,000**	**496,452**	2,144,000	69,161	4,123,000	133,000	**6,267,000**	**202,161**	**698,613**	**21,657,000**
Feb-20	3,409,000	117,552	5,434,000	187,379	0.000	0.000	5,153,000	177,690	**13,996,000**	**482,621**	1,729,000	59,621	3,448,000	118,897	**5,177,000**	**178,517**	**661,138**	**19,173,000**
Mar-20	3,686,000	118,903	5,902,000	190,387	0.000	0.000	5,616,000	181,161	**15,204,000**	**490,452**	2,027,000	65,387	3,852,000	124,258	**5,879,000**	**189,645**	**680,097**	**21,083,000**
Apr-20	3,562,000	118,733	5,742,000	191,400	0.000	0.000	5,247,000	174,900	**14,551,000**	**485,033**	2,053,000	68,433	3,898,000	129,933	**5,951,000**	**198,367**	**683,400**	**20,502,000**
May-20	4,038,000	130,258	6,012,000	193,935	0.000	0.000	6,191,000	199,710	**16,241,000**	**523,903**	2,623,000	84,613	4,936,000	159,226	**7,559,000**	**243,839**	**767,742**	**23,800,000**
Jun-20	4,011,000	133,700	6,251,000	208,367	0.000	0.000	5,975,000	199,167	**16,237,000**	**541,233**	2,939,000	97,967	4,411,000	147,033	**7,350,000**	**245,000**	**786,233**	**23,587,000**
Jul-20	4,499,000	145,129	6,826,000	220,194	0.000	0.000	6,322,000	203,935	**17,647,000**	**569,258**	3,886,000	125,355	3,343,000	107,839	**7,229,000**	**233,194**	**802,452**	**24,876,000**
Aug-20	4,803,000	154,935	7,338,000	236,710	0.000	0.000	6,338,000	204,452	**18,479,000**	**596,097**	5,412,000	174,581	0	0	**5,412,000**	**174,581**	**770,677**	**23,891,000**
Sep-20	4,833,000	161,100	7,274,000	242,467	0.000	0.000	6,005,000	200,167	**18,112,000**	**603,733**	4,645,000	154,833	0	0	**4,645,000**	**154,833**	**758,567**	**22,757,000**
Oct-20	4,627,000	149,258	6,908,000	222,839	0.000	0.000	5,698,000	183,806	**17,233,000**	**555,903**	3,880,000	125,161	581,000	18,742	**4,461,000**	**143,903**	**699,806**	**21,694,000**
Nov-20	3,969,000	132,300	6,113,000	203,767	0.000	0.000	4,799,000	159,967	**14,881,000**	**496,033**	2,467,000	82,233	2,876,000	95,867	**5,343,000**	**178,100**	**674,133**	**20,224,000**
Dec-20	4,114,000	132,710	6,499,000	209,645	0.000	0.000	5,507,000	177,645	**16,120,000**	**520,000**	3,051,000	98,419	1,921,000	61,968	**4,972,000**	**160,387**	**680,387**	**21,092,000**
Daily Average for the Year																		
		134,747		**208,333**		**0**		**186,980**		**530,060**		**100,480**		**91,397**		**191,877**	**721,937**	
Total Withdrawals for the Year																		
	49,345,000		**76,279,000**		**-**		**68,467,000**		**194,091,000**		**36,856,000**		**33,389,000**		**70,245,000**			**264,336,000**

FIGURE 5


Perkasie Production Well Withdrawal for 2020
Well No. 5
Well No. 6
Well No. 7
Well No. 9
Well No. 10
Well No. 11
Gallons per Day
300,000
250,000
200,000
150,000
100,000
50,000
0
Jan-20
Feb-20
Mar-20
Apr-20
May-20
Jun-20
Jul-20
Aug-20
Sep-20
Oct-20
Nov-20
Dec-20
Month

Production Well No. 5

Well No. 5 was pumped for 366 days during the 2020 reporting period. (Figure 6A). The pumping rate ranged between 10,000 gpd (on August 4, 2020) and 206,000 gpd (on September 7, 2020) and averaged 134,822 gpd during the entire year (Table 4A). Total withdrawal was 49,345,000 gallons (Table 3), 5.864 million gallons more than the previous year. The daily average pumping rate of Well No. 5 for 2020 was higher than the average pumping rate for the last 5 years (January 2016 to December 2020) (Figure 6B, Table 4B).

The pumping water level ranged between 93 and 128 feet throughout the reporting period. The non-pumping water level exhibits a trend similar to the pumping water level trend, but with values ranging between 68 and 98 feet. The water level ranges are consistent with previous reporting periods.

Production Well No. 6

Well No. 6 production was pumped for a total of 365 days during the 2020 reporting period. The pumping rate fluctuated between 19,000 gpd (on August 4, 2020) and 326,000 gpd (on September 28, 2020). The daily average pumping rate for the year was 208,413 gpd (Table 5A). The total withdrawal from this well was 76,279,000 gallons (Table 3), 6.914 million gallons more than the previous year. The daily average pumping rate for 2020 is higher than the average pumping rate computed for the last 5 years (Figure 7B, Table 5B).

The pumping water level for Well No. 6 ranged between 51 and 104 feet throughout the year. The non-pumping water level exhibits a trend similar to the pumping water level trend, but with values ranging between 4 and 44 feet. The water level ranges are consistent with previous reporting periods.

Production Well No. 9

There was no production at Well No. 9 during the 2020 year (Figure 8A). The well was not pumped due to an electrical fire during late 2012. Data from Well No. 9 will be removed from the Hydrogeologic Report for 2020 (Figure 8B, Table 6B). Pumping at Well No. 9 has been discontinued.

Production Well No. 7

Well No. 7 was connected to the system on May 25, 2009. Ground water withdrawals at Well No. 7 replaced the withdrawals at Well No.12 where pumping was discontinued because the concentration of arsenic exceeds the drinking water standard.

Well No. 7 was pumped for a total of 365 days during the 2020 reporting period (Figure 9A). The pumping rate ranged between 27,000 gpd (November 16, 2020) and 308,000 gpd (on August 4, 2020). The daily average pumping rate for the year was 187,068 gpd (Table 7A). The total withdrawal from this well was 68,647,000 gallons (Table 3), 0.006 million gallons less than the previous year. The production of the well during 2020 is 4,000 gpd higher than the five-year average while the Well has been in operation. (Figure 9B, Table 7B)

The pumping water level ranged between 52 and 200 feet throughout the reporting period. Slightly deeper than historic pumping water levels were caused by above-average production. The non-pumping water level fluctuated between 40 and 107 feet.

Production Well No. 10

Well No. 10 was pumped for a total of 365 days during the 2020 reporting period (Figure 10A). The production rate of Well No. 10 ranged between 23,000 gpd (January 10, 2020) and 297,000 gpd (August 5, 2020). The daily average pumping rate for the year was 100,699 gpd (Table 8) which is 6,000 gpd less than the five year average. Total production for the year was 36,856,000 gallons (Table 3), and was 9.668 million gallons more than the previous year.

Well No. 10 is equipped with a treatment system for the removal of arsenic, as previously discussed in this report.

The pumping water level for Well No. 10 ranged between 135 and 176 feet throughout the year. The non-pumping water level exhibits a trend similar to the pumping water level trend, but with values ranging between 44 and 74 feet.

Production Well No. 11

Well No. 11 was pumped for 262 days during the 2020 reporting period (Figure 11A). The production rate of Well No. 11 ranged between 1,000 gpd (June 27, 2020) and 292,000 gpd (January 1, 2020). The daily average pumping rate for the year was 91,227 gpd (Table 9A). Total production for the year was 33,389,000 gallons (Table 3), 17.813 million gallons less than the previous year. The daily average pumping rate for 2020 is about 60,000 gpd less than the average pumping rate for the last five (5) years (Figure 11B, Table 9B).

The pumping water level ranged between 32 and 67 feet throughout the reporting period. The non-pumping water level fluctuated between 2 and 6 feet.

Well No. 11 is equipped with a treatment system for the removal of arsenic, as previously discussed in this report.

Production Well No. 12

Pumping at Well No. 12 was discontinued because of the concentration of arsenic in the ground water which exceeds the drinking water standard. The status has been changed to emergency backup.

FIGURE 6A

PRA Well No. 5
Water Level, Pumpage and Precipitation for the Period January to December 2020

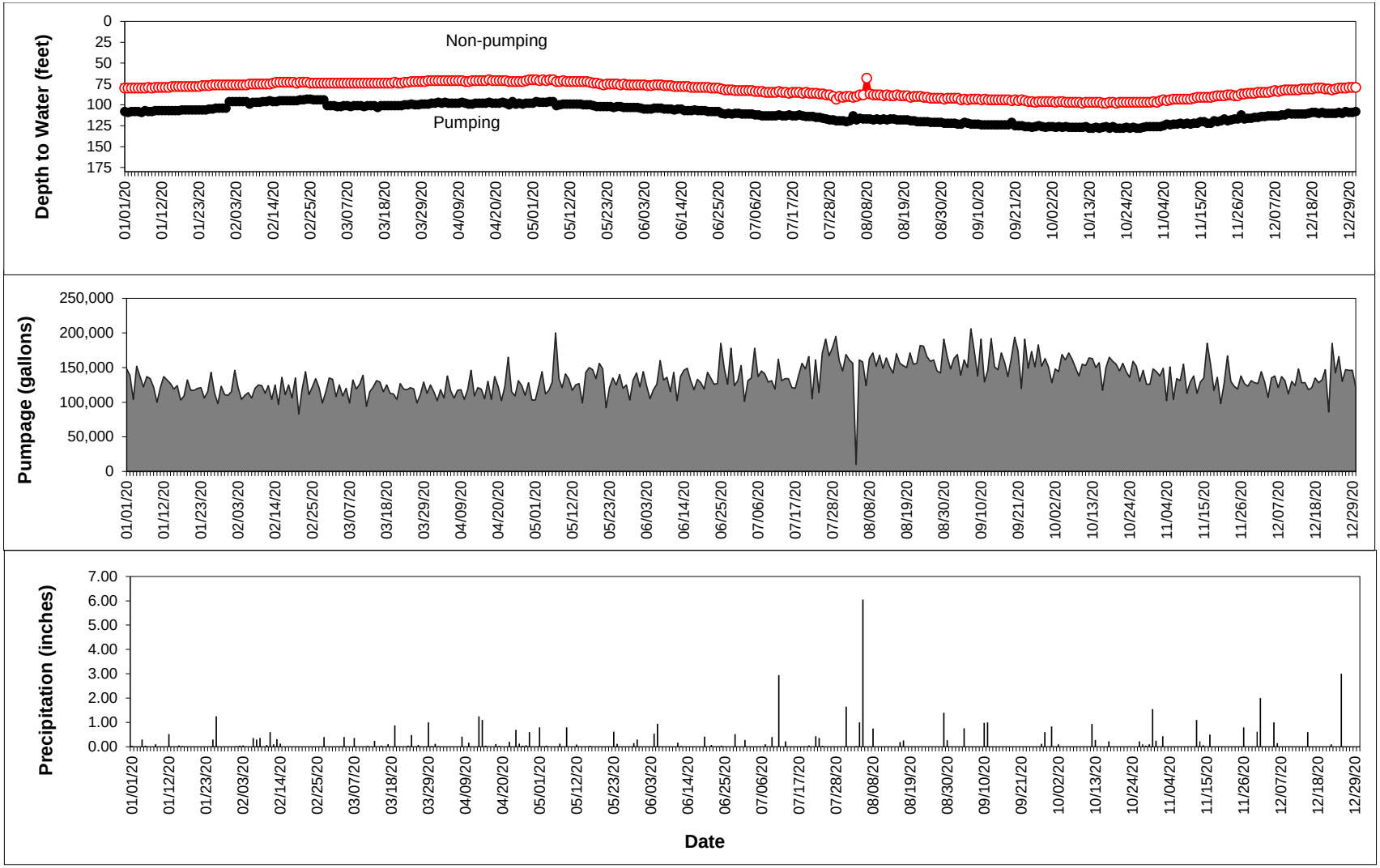
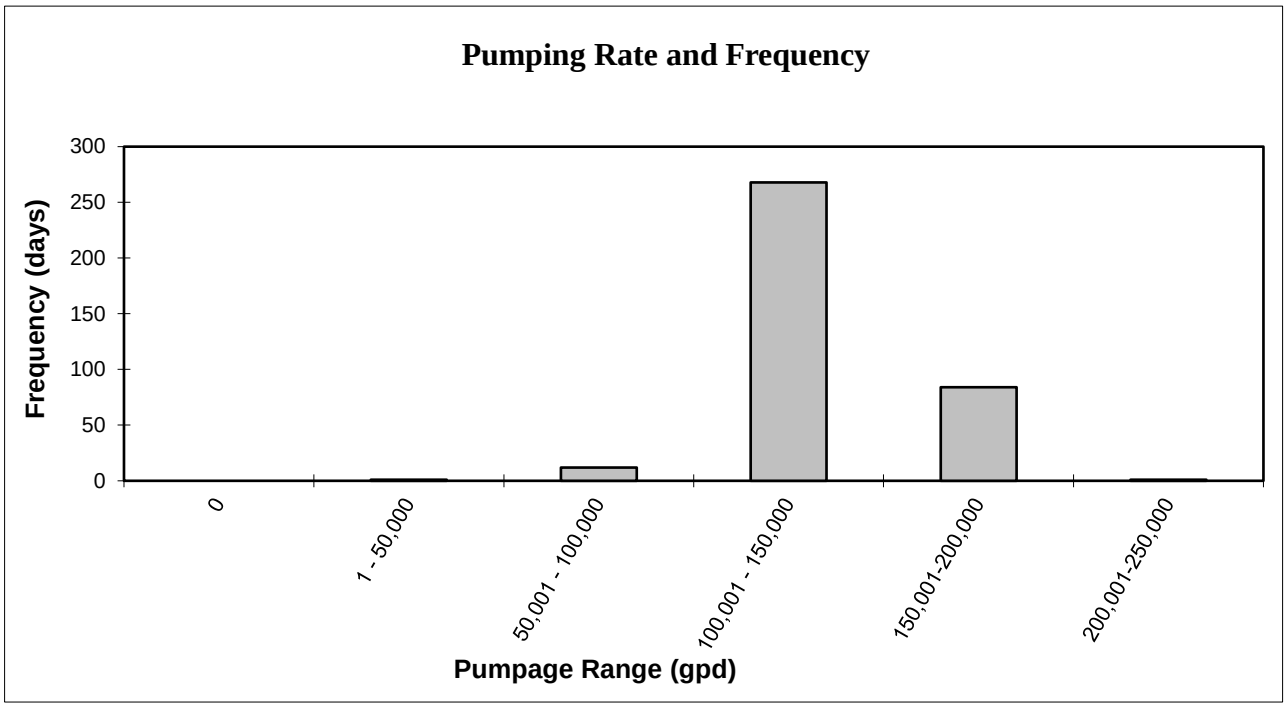


Table 4A

PRA Well No. 5
Statistical Summary of Pumpage and Water Levels from January to December 2020

	Pumpage (gal/day)	Water Level(pumping)*	Water Level(non pumping)*
Mean	134,822	110	82
Standard Deviation	23,284	10	9
Minimum (non-zero)	10,000	93	68
Maximum	206,000	128	98

* Feet below ground surface



Pumpage Range (gpd)	Frequency
0	0
1 - 50,000	1
50,001 - 100,000	12
100,001 - 150,000	268
150,001-200,000	84
200,001-250,000	1
250,001-300,000	0

FIGURE 6B

PRA Well No.5
Water Level, Pumpage and Precipitation for the Period January 2016 - December 2020

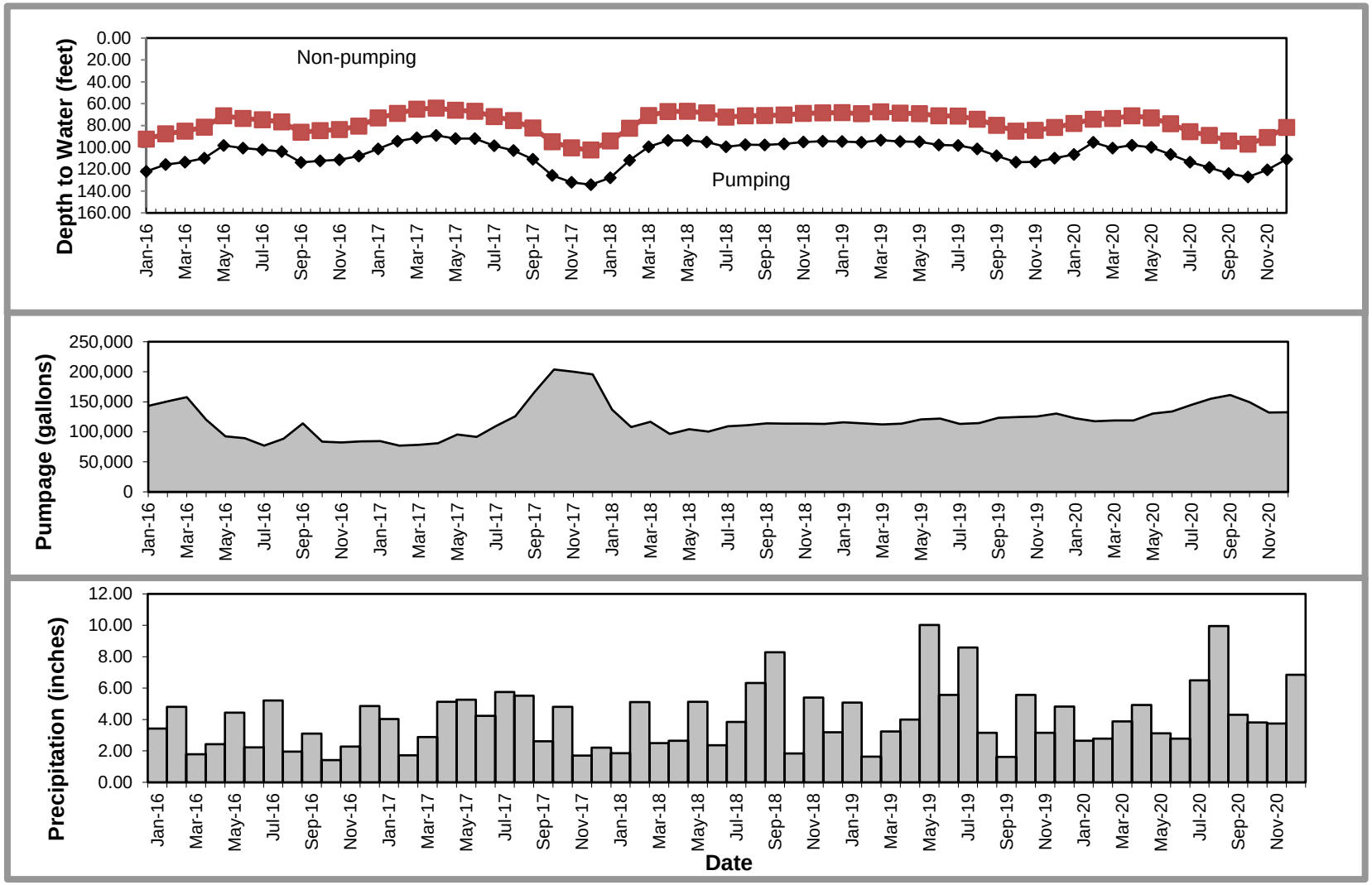
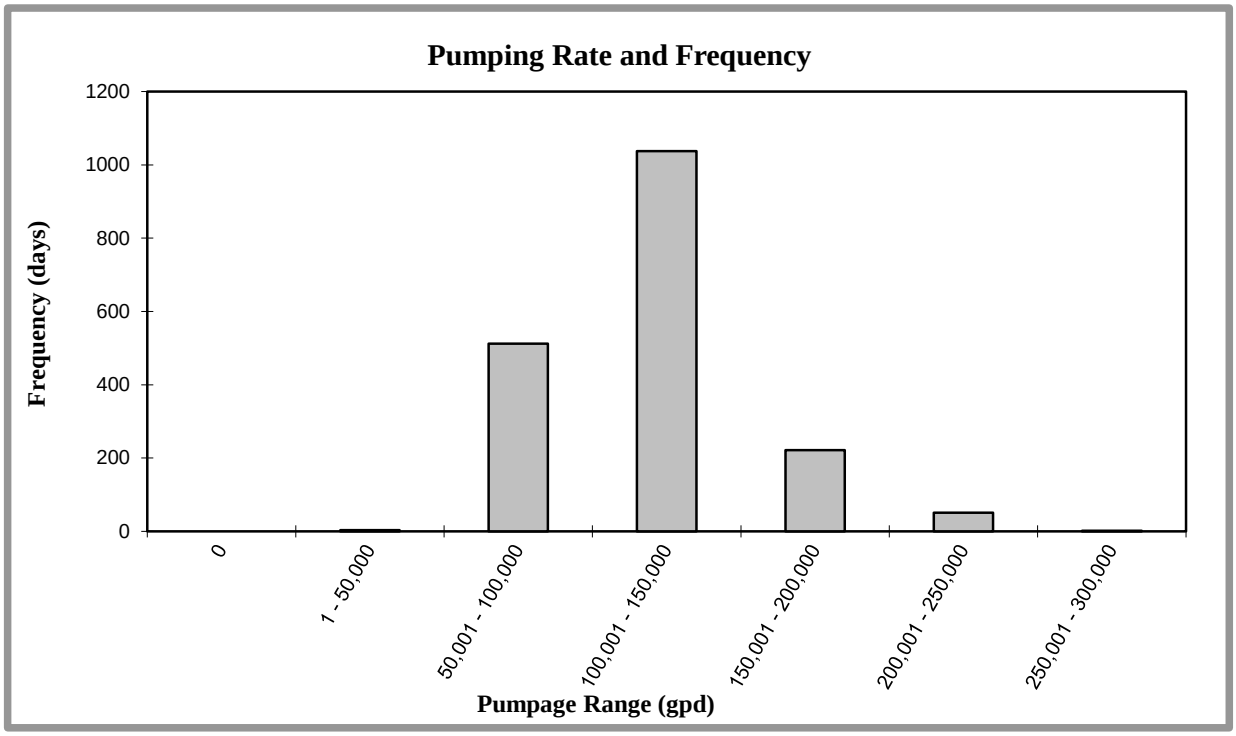


TABLE 4B

PRA Well No.5
Statistical Summary of Pumpage and Water Levels from January 2016 to December 2020

	Pumpage (gpd)	Water Level (pumping)*	Water Level (non-pumping)*
Mean	119,657	105	78
Standard Deviation	34,021	11	10
Minimum (non-zero)	10,000	56	10
Maximum	261,000	137	106

* Feet below ground level



Pumpage Range (gpd)	Frequency
0	0
1 - 50,000	3
50,001 - 100,000	512
100,001 - 150,000	1037
150,001 - 200,000	222
200,001 - 250,000	51
250,001 - 300,000	2

FIGURE 7A

PRA Well No. 6
Water Level, Pumpage and Precipitation for the Period January to December 2020

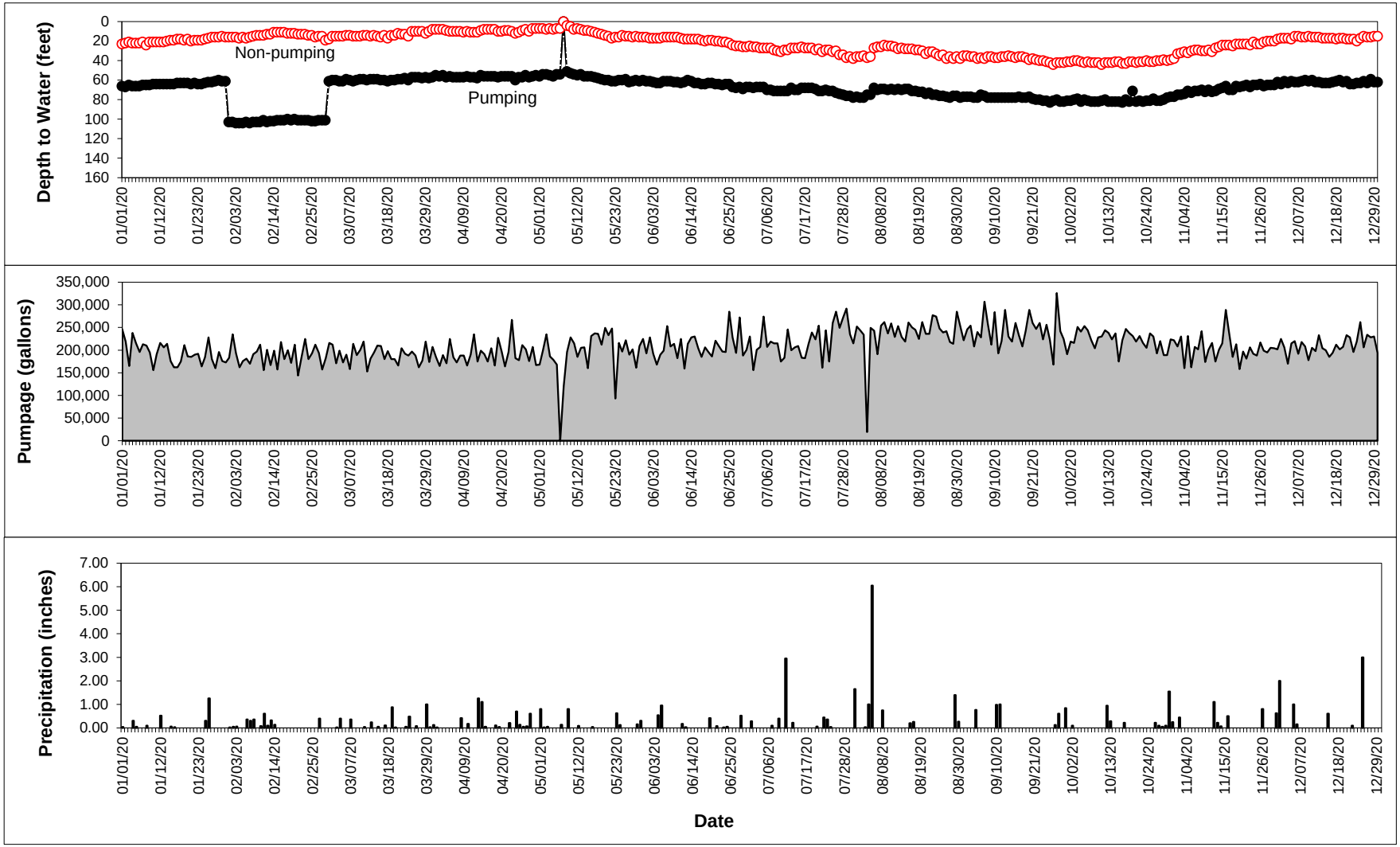
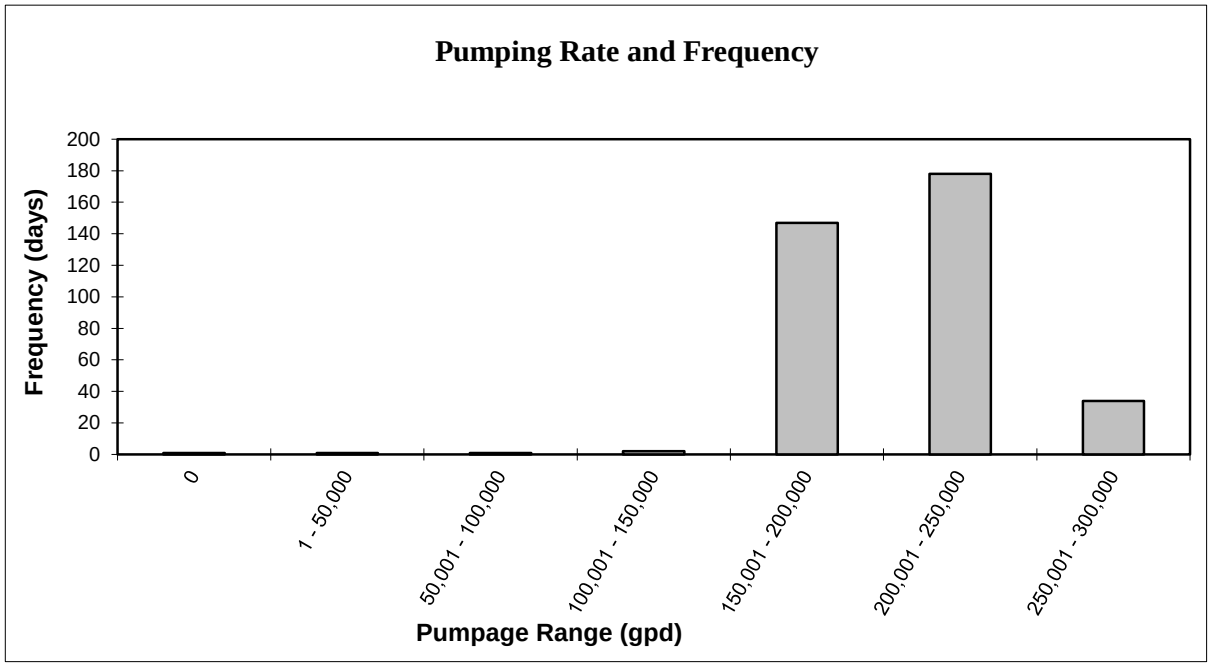


TABLE 5A

PRA Well No. 6
Statistical Summary of Pumpage and Water Levels from January to December 2020

	Pumpage (gal/day)	Water Level(pumping)*	Water Level(non pumping)*
Mean	208,413	69	22
Standard Deviation	34,992	13	11
Minimum (non-zero)	19,000	51	4
Maximum	326,000	104	44

* Feet below ground surface



Pumpage Range (gpd)	Frequency
0	1
1 - 50,000	1
50,001 - 100,000	1
100,001 - 150,000	2
150,001 - 200,000	147
200,001 - 250,000	178
250,001 - 300,000	34
300,001-350,000	2

FIGURE 7B

PRA Well No. 6
Water Level, Pumpage and Precipitation for the Period January 2016 - December 2020

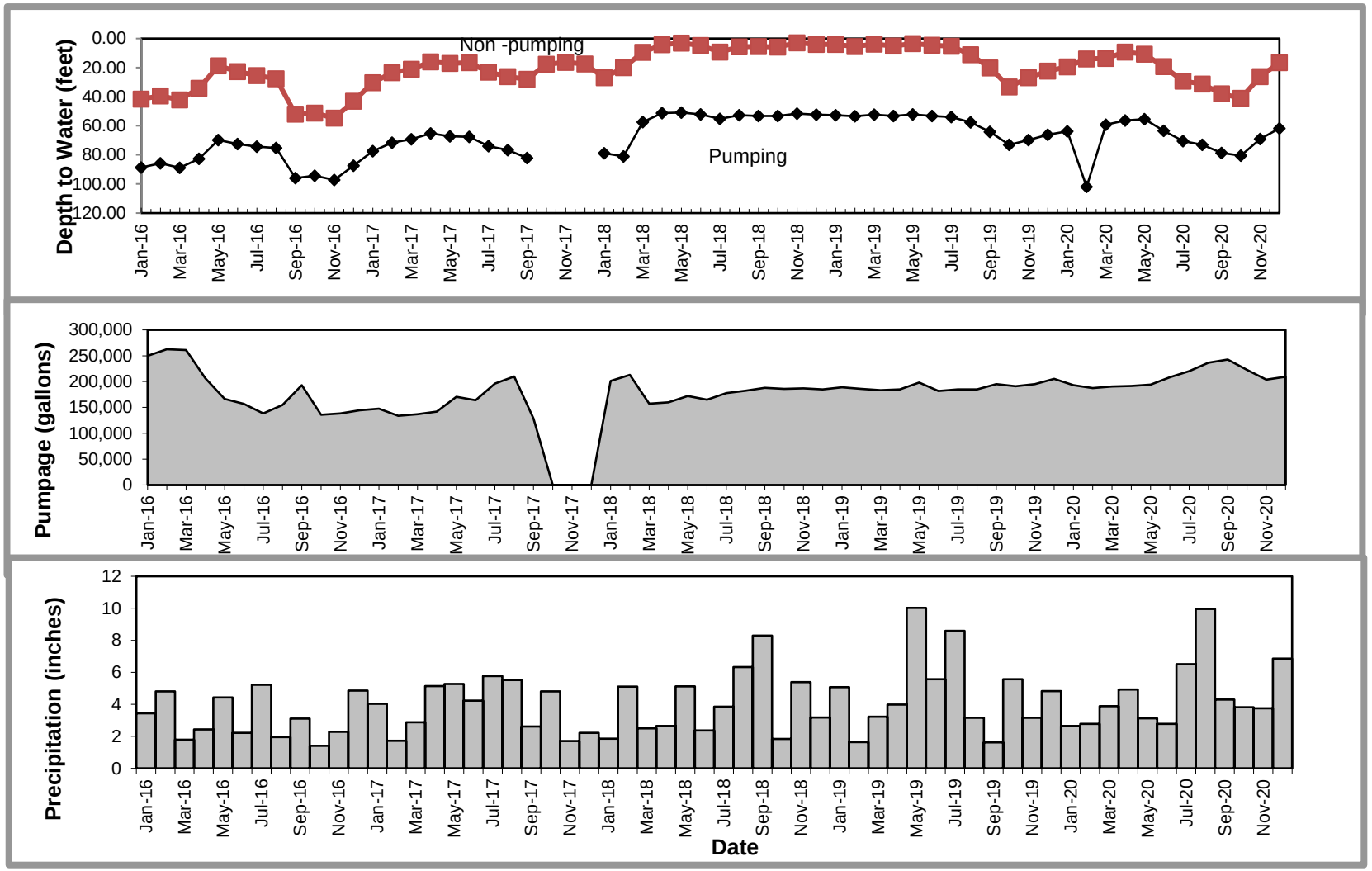
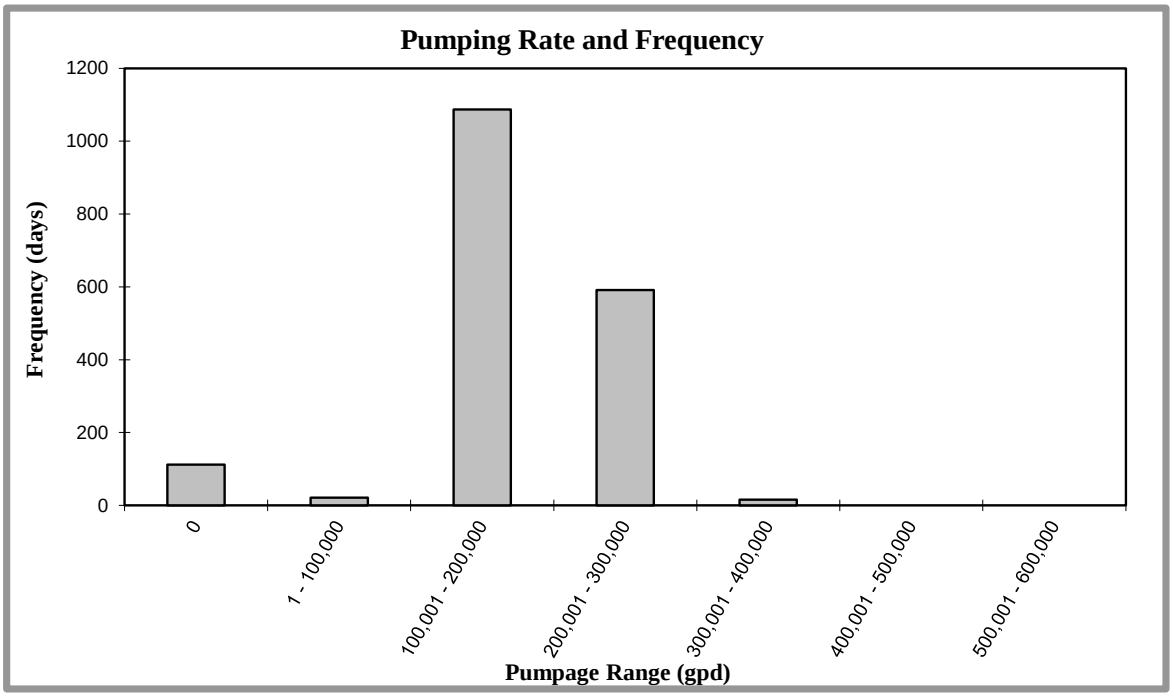


TABLE 5B

PRA Well No.6
Statistical Summary of Pumpage and Water Levels from January 2016 to December 2020

	Pumpage (gpd)	Water Level (pumping)*	Water Level (non-pumping)*
Mean	176,453	68	20
Standard Deviation	61,585	14	14
Minimum (non-zero)	6,000	48	1
Maximum	341,000	105	85

* Feet below ground level



Pumpage Range (gpd)	Frequency
0	112
1 - 100,000	21
100,001 - 200,000	1087
200,001 - 300,000	591
300,001 - 400,000	16
400,001 - 500,000	0
500,001 - 600,000	0

FIGURE 8A

PRA Well No. 9
Water Level, Pumpage and Precipitation for the Period January to December 2020

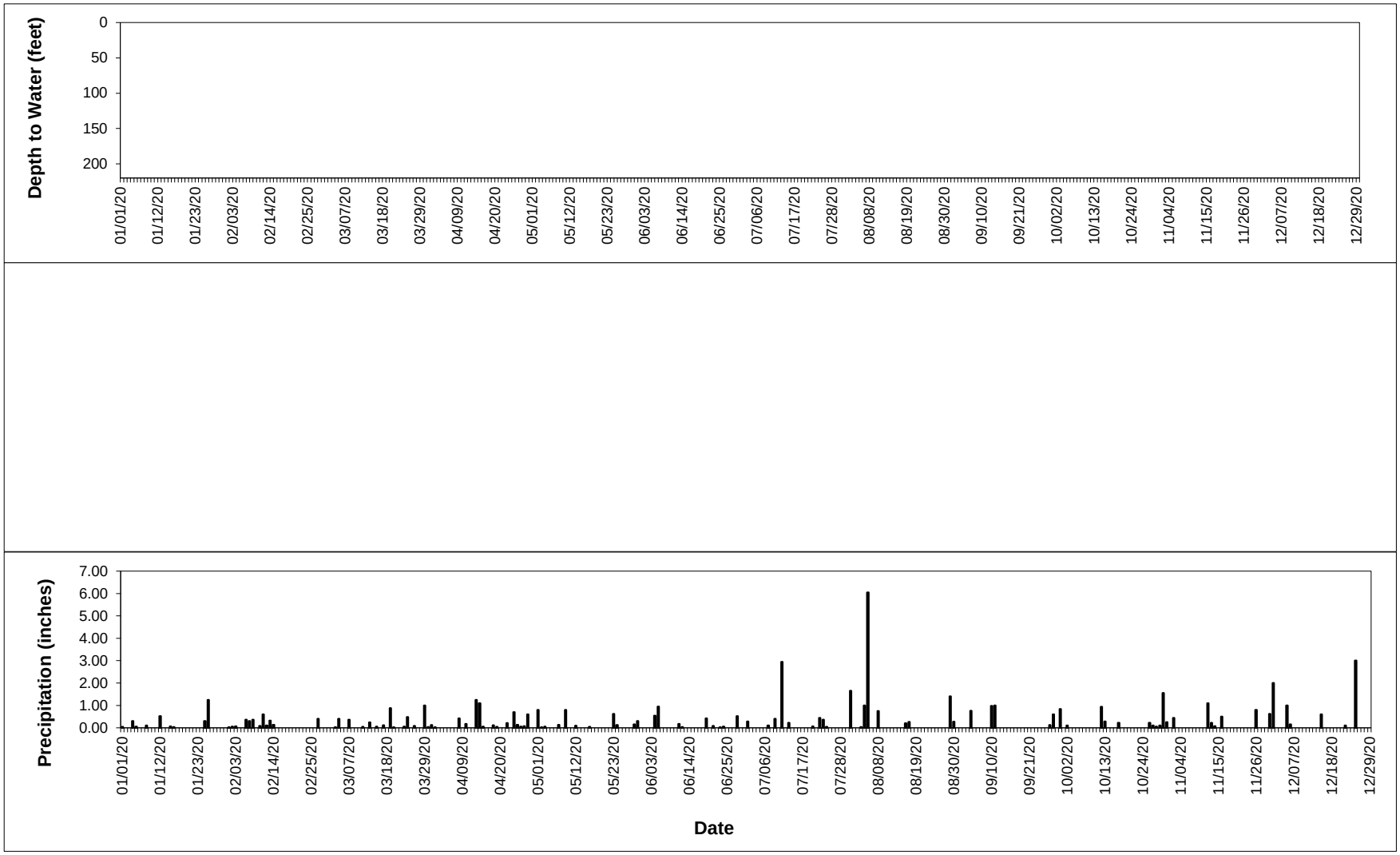
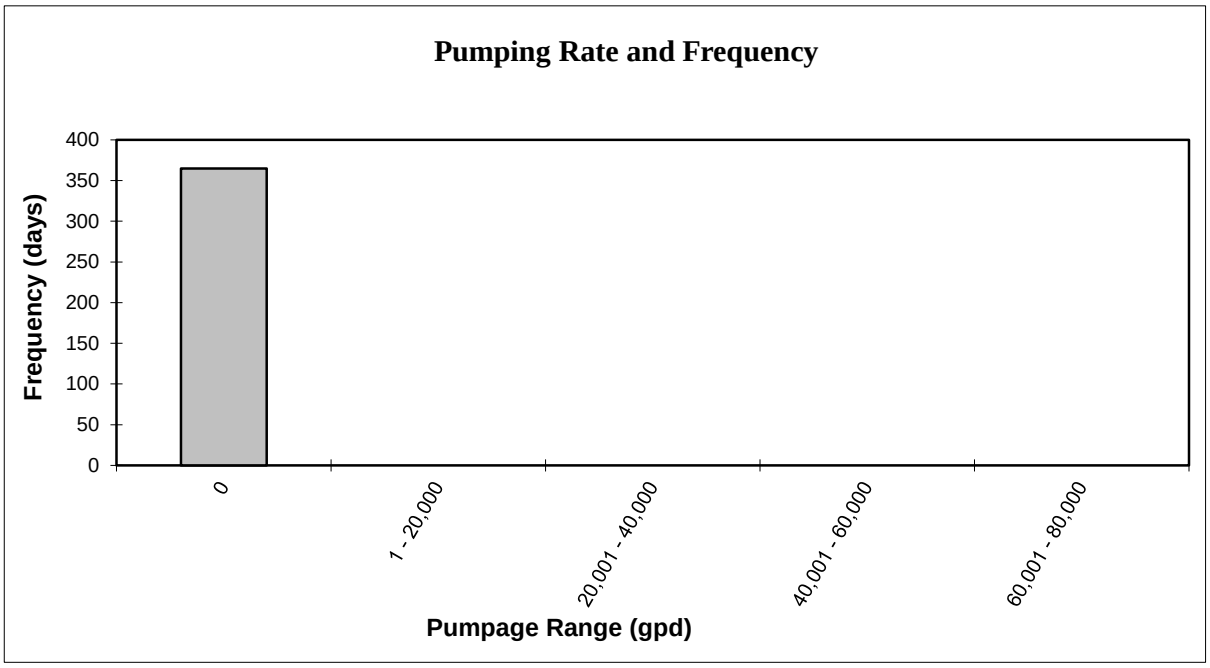


Table 6A

PRA Well No. 9
Statistical Summary of Pumpage and Water Levels from January to December 2020

	Pumpage (gal/day)	Water Level(pumping)*	Water Level(non pumping)*
Mean	0	N/A	N/A
Standard Deviation	0	N/A	N/A
Minimum (non-zero)	0	N/A	N/A
Maximum	0	N/A	N/A

* Feet below ground surface



Pumpage Range (gpd)	Frequency
0	365
1 - 20,000	0
20,001 - 40,000	0
40,001 - 60,000	0
60,001 - 80,000	0

FIGURE 8B

PRA Well No. 9
Water Level, Pumpage and Precipitation for the Period January 2016- December 2020

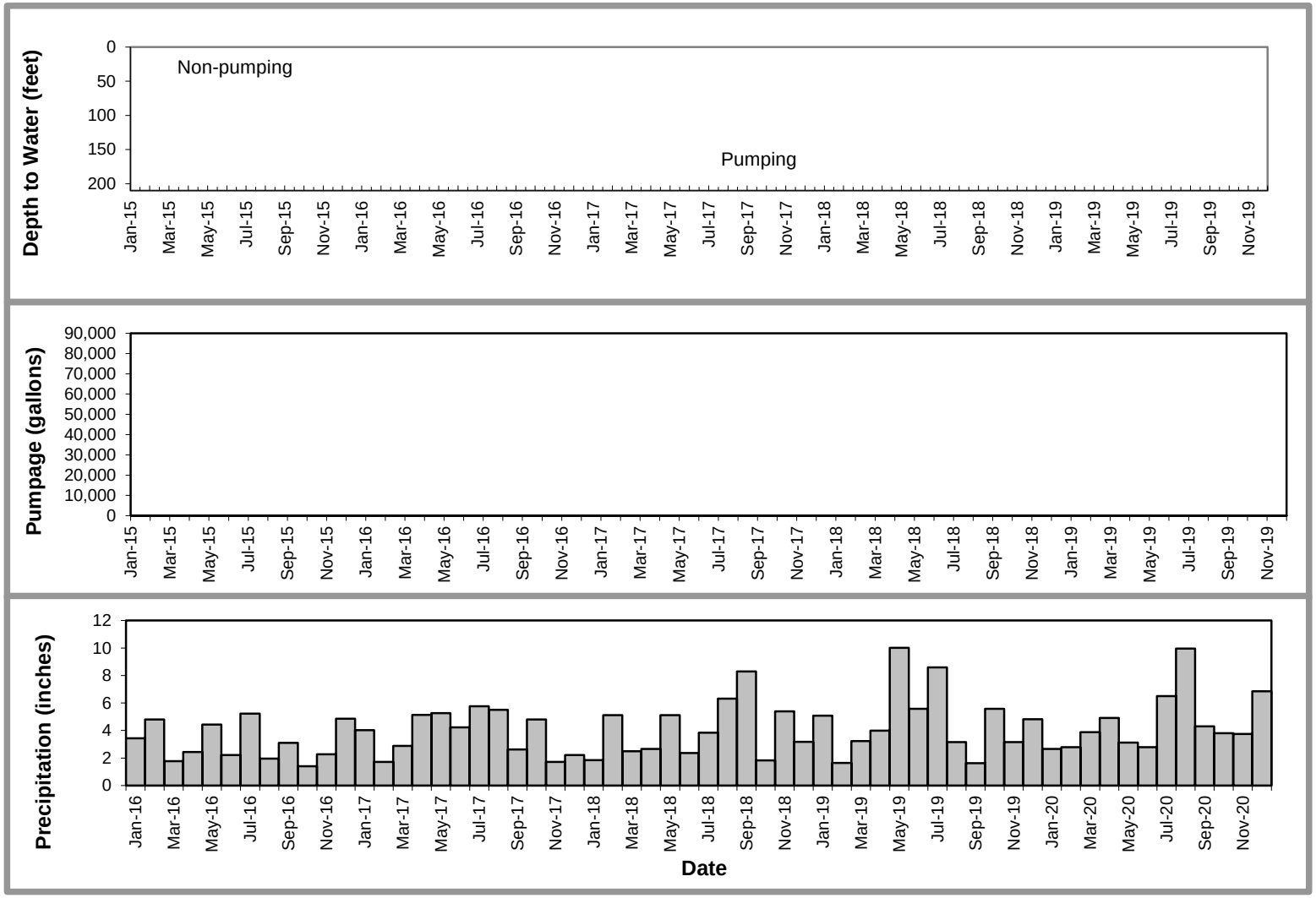
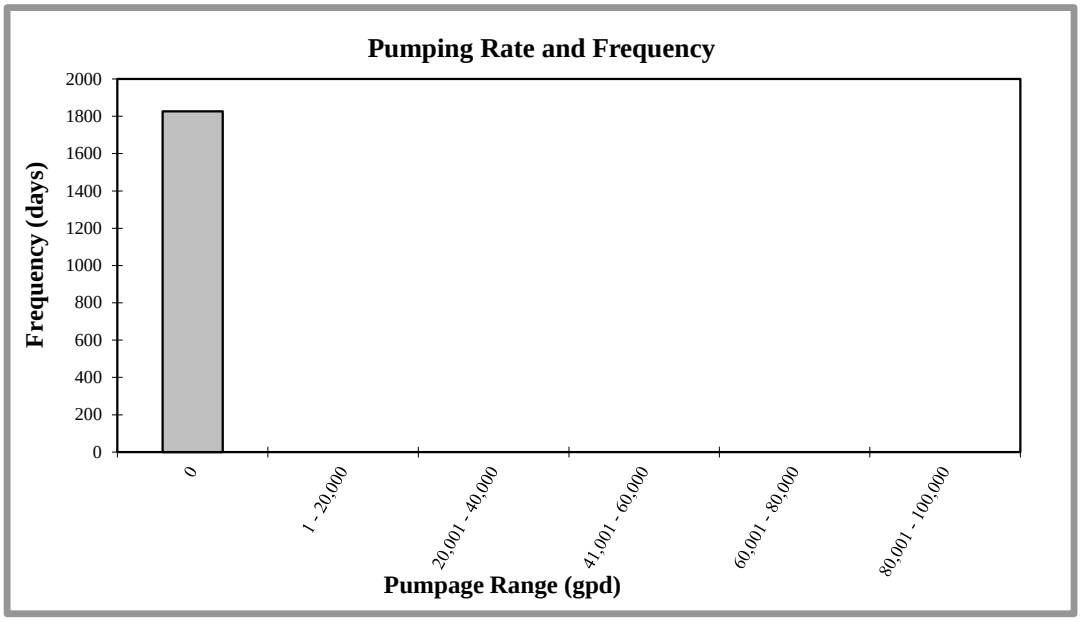


TABLE 6B

PRA Well No.9
Statistical Summary of Pumpage and Water Levels from January 2015 to December 2019

	Pumpage (gpd)	Water Level (pumping)*	Water Level (non-pumping)*
Mean	0	-	-
Standard Deviation	0	-	-
Minimum (non-zero)	0	-	-
Maximum	0	-	-

* Feet below ground level



Pumpage Range (gpd)	Frequency
0	1826
1 - 20,000	0
20,001 - 40,000	0
41,001 - 60,000	0
60,001 - 80,000	0
80,001 - 100,000	0

FIGURE 9A

PRA Well No. 7
Water Level, Pumpage and Precipitation for the Period January to December 2020

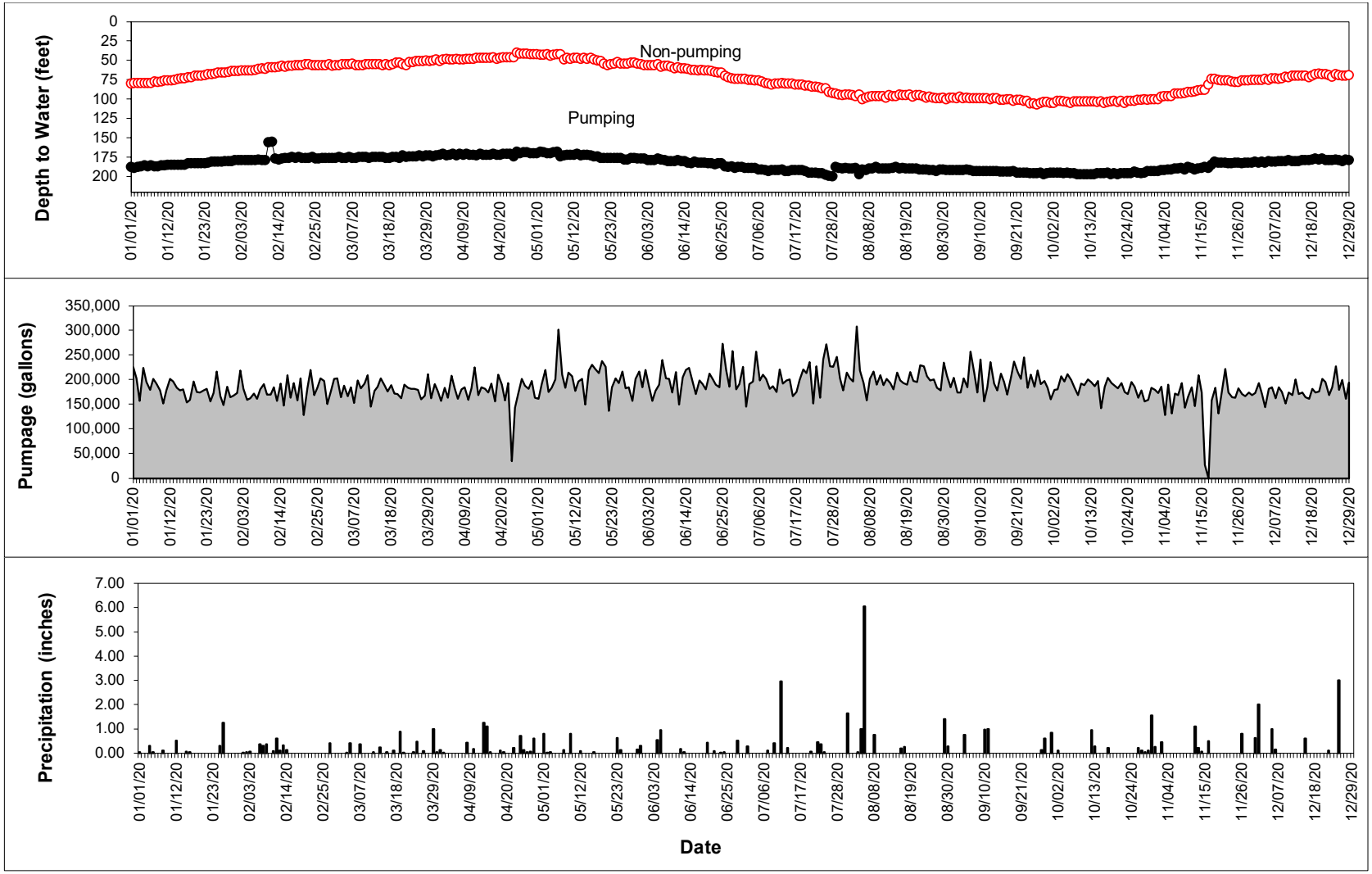
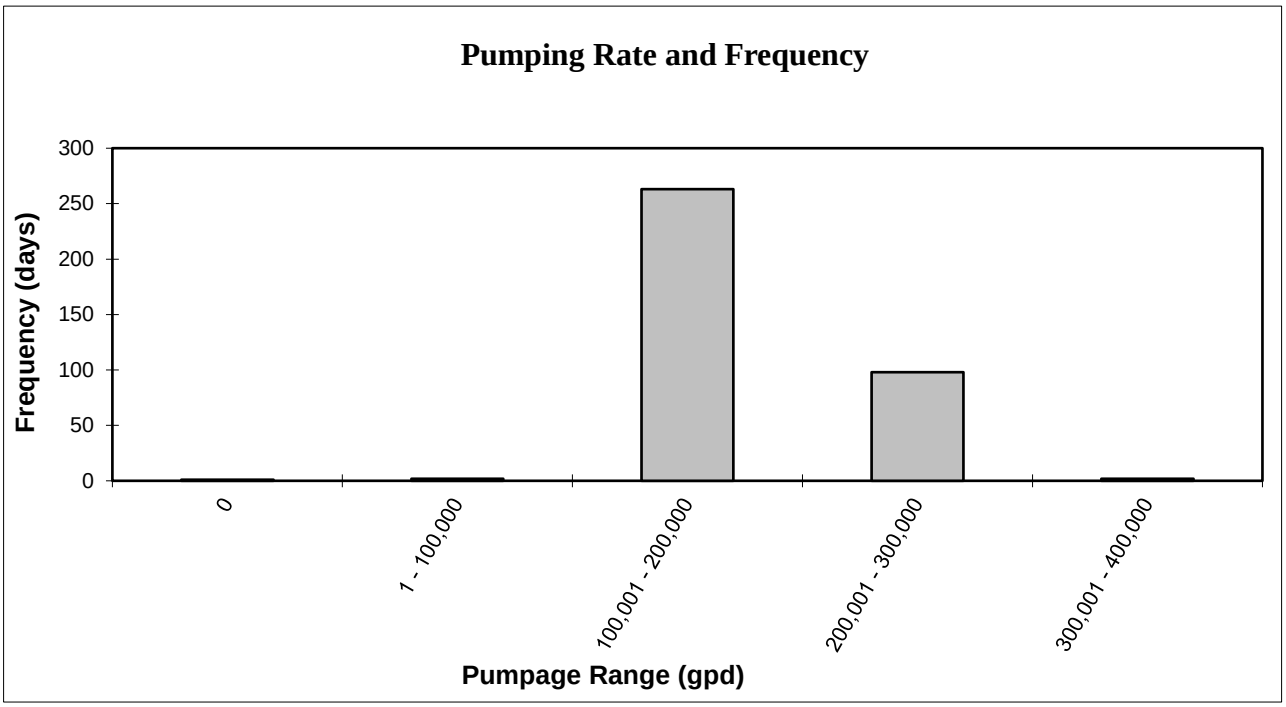


Table 7A

PRA Well No. 7
Statistical Summary of Pumpage and Water Levels from January to December 2020

	Pumpage (gal/day)	Water Level(pumping)*	Water Level(non pumping)*
Mean	187,068	174	74
Standard Deviation	29,523	35	20
Minimum (non-zero)	27,000	52	40
Maximum	308,000	200	107

* Feet below ground surface



Pumpage Range (gpd)	Frequency
0	1
1 - 100,000	2
100,001 - 200,000	263
200,001 - 300,000	98
300,001 - 400,000	2
400,001-500,000	0

FIGURE 9B

PRA Well No.7
Water Level, Pumpage and Precipitation for the Period January 2016 - December 2020

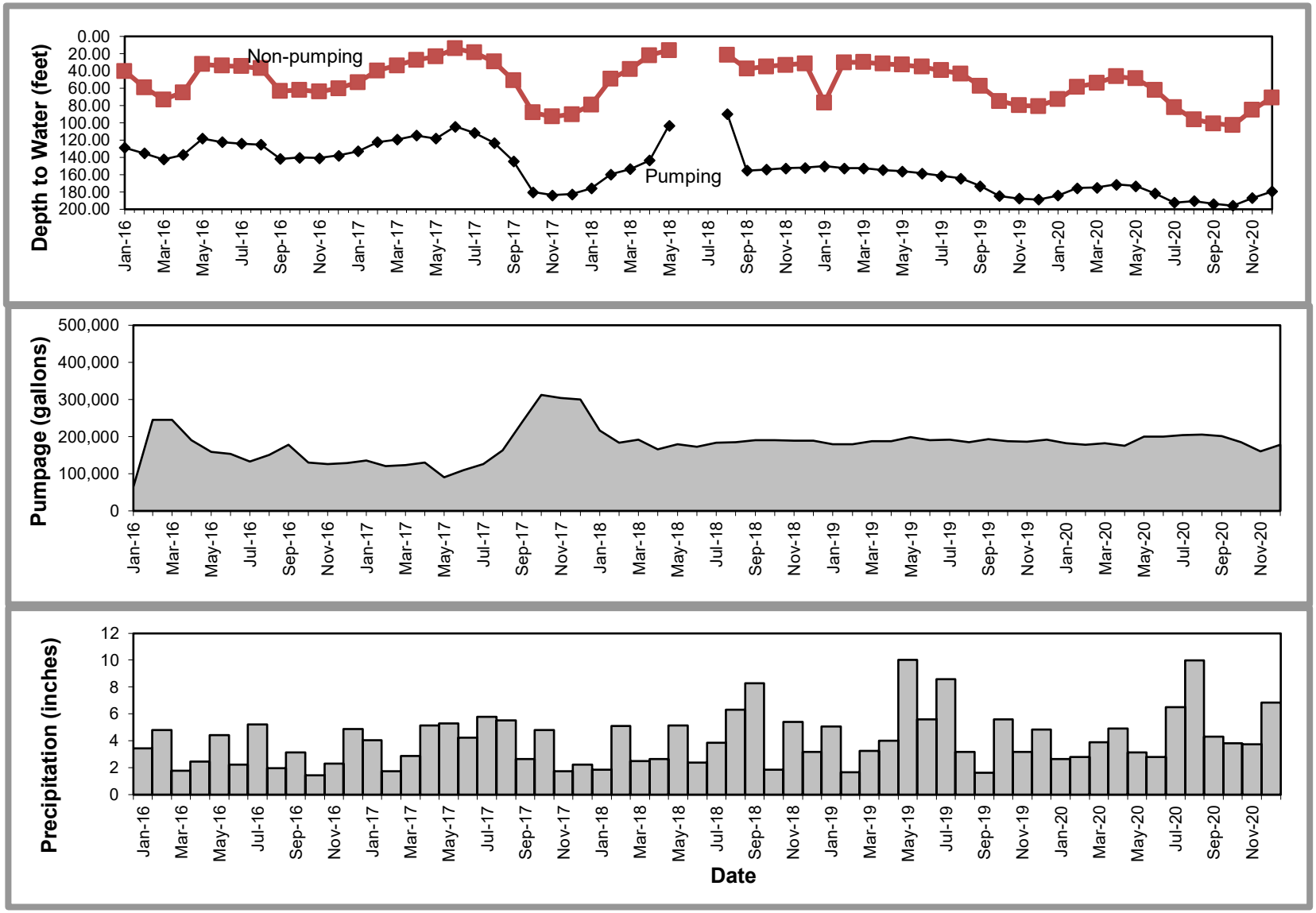
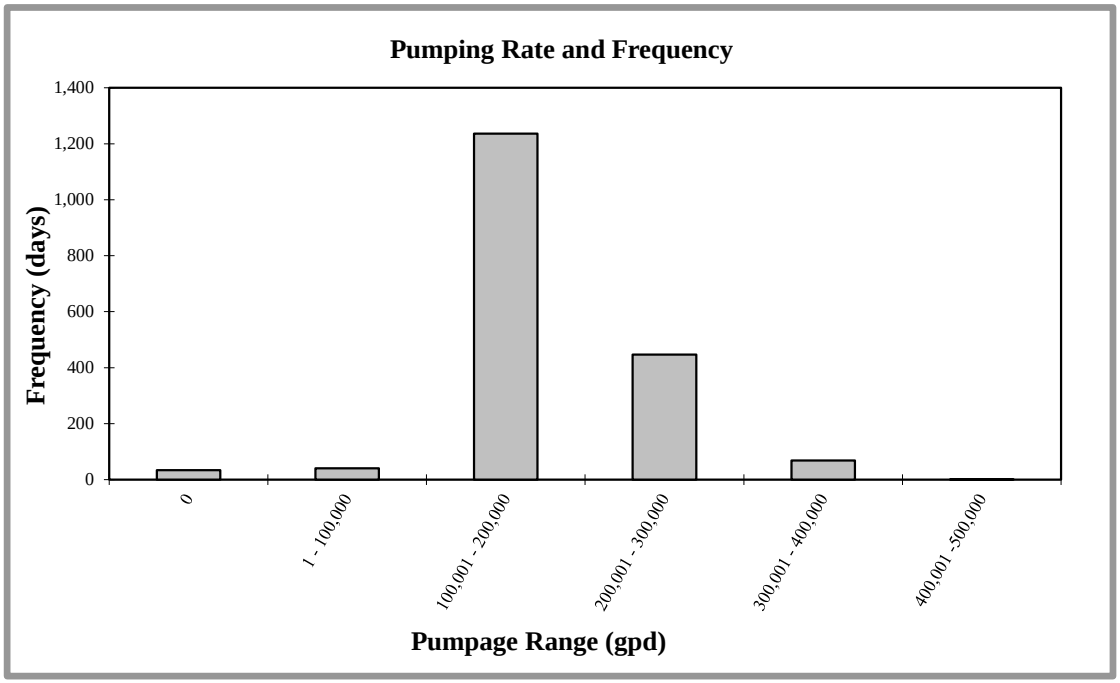


TABLE 7B

PRA Well No.7
Statistical Summary of Pumpage and Water Levels from January 2016 to December 2020

	Pumpage (gpd)	Water Level (pumping)*	Water Level (non-pumping)*
Mean	179,463	147	51
Standard Deviation	56,222	42	26
Minimum (non-zero)	3,000	52	9
Maximum	436,000	200	107

* Feet below ground level



Pumpage Range (gpd)	Frequency
0	34
1 - 100,000	41
100,001 - 200,000	1236
200,001 - 300,000	447
300,001 - 400,000	68
400,001 -500,000	1

FIGURE 10A

PRA Well No. 10
Water Level, Pumpage and Precipitation for the Period January to December 2020

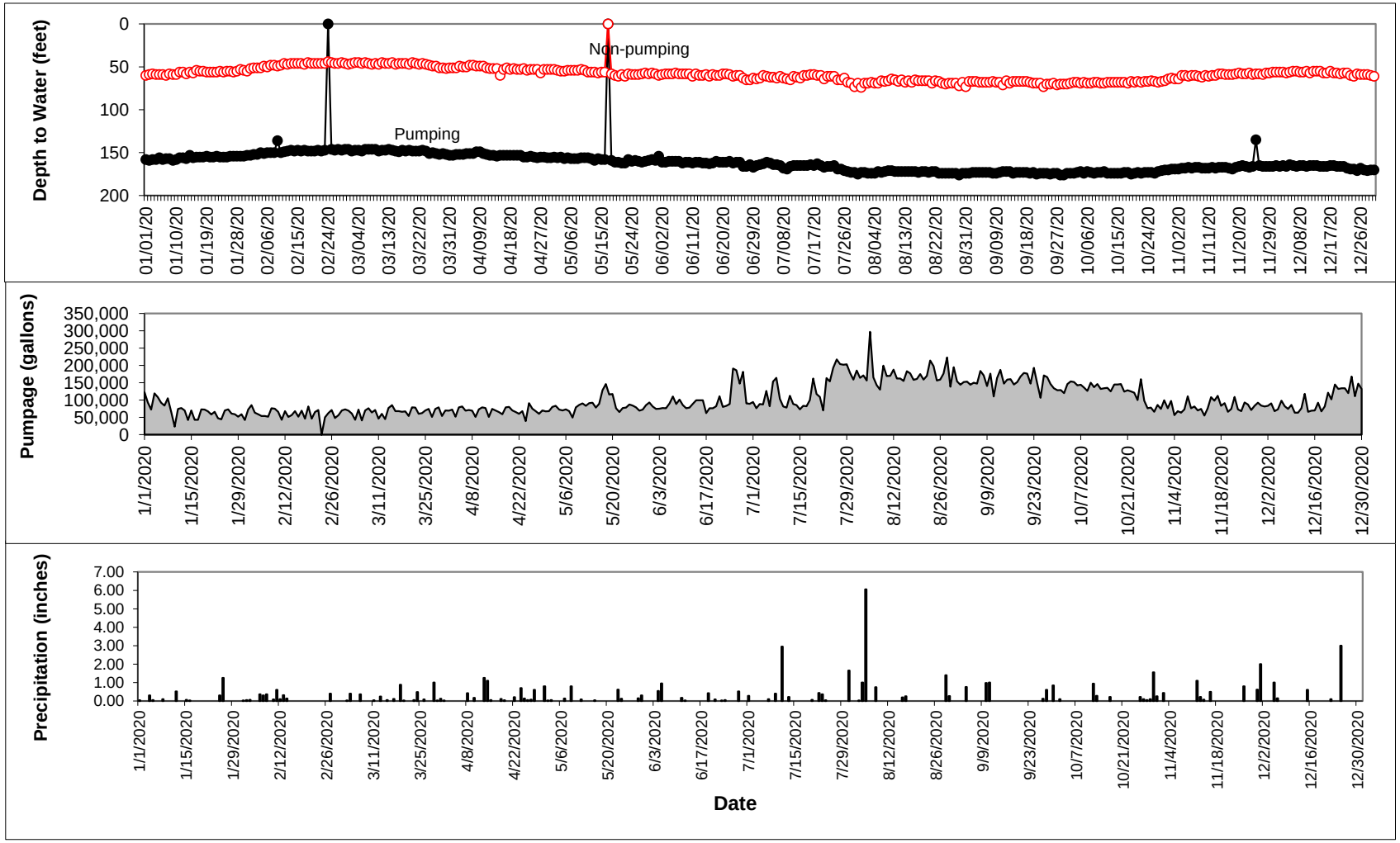
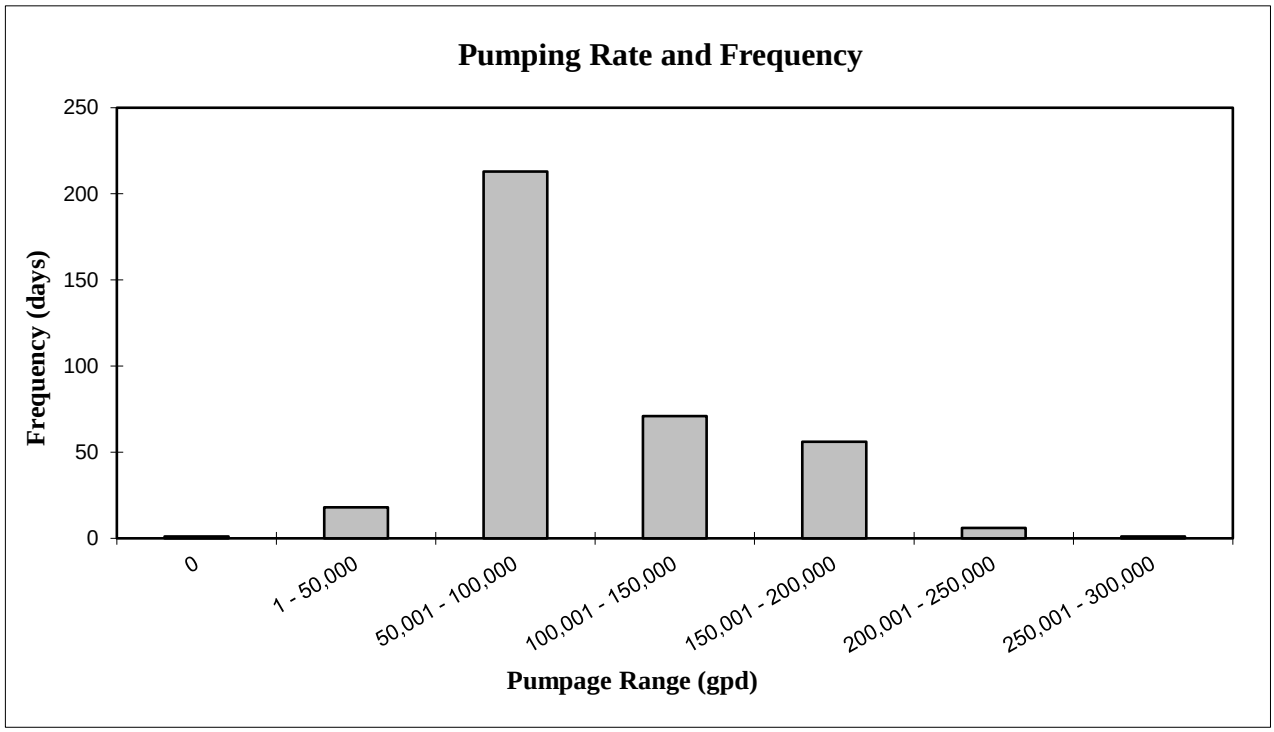


TABLE 8A

PRA Well No. 10
Statistical Summary of Pumpage and Water Levels from January to December 2020

	Pumpage (gal/day)	Water Level(pumping)*	Water Level(non pumping)*
Mean	100,699	161.64	58.44
Standard Deviation	43,769	12.57	8.02
Minimum (non-zero)	23,000	135	44
Maximum	297,000	176.00	74.00

* Feet below ground level



Pumpage Range (gpd)	Frequency
0	1
1 - 50,000	18
50,001 - 100,000	213
100,001 - 150,000	71
150,001 - 200,000	56
200,001 - 250,000	6
250,001 - 300,000	1

FIGURE 10B

PRA Well No.10
Water Level, Pumpage and Precipitation for the Period January 2016- December 2020

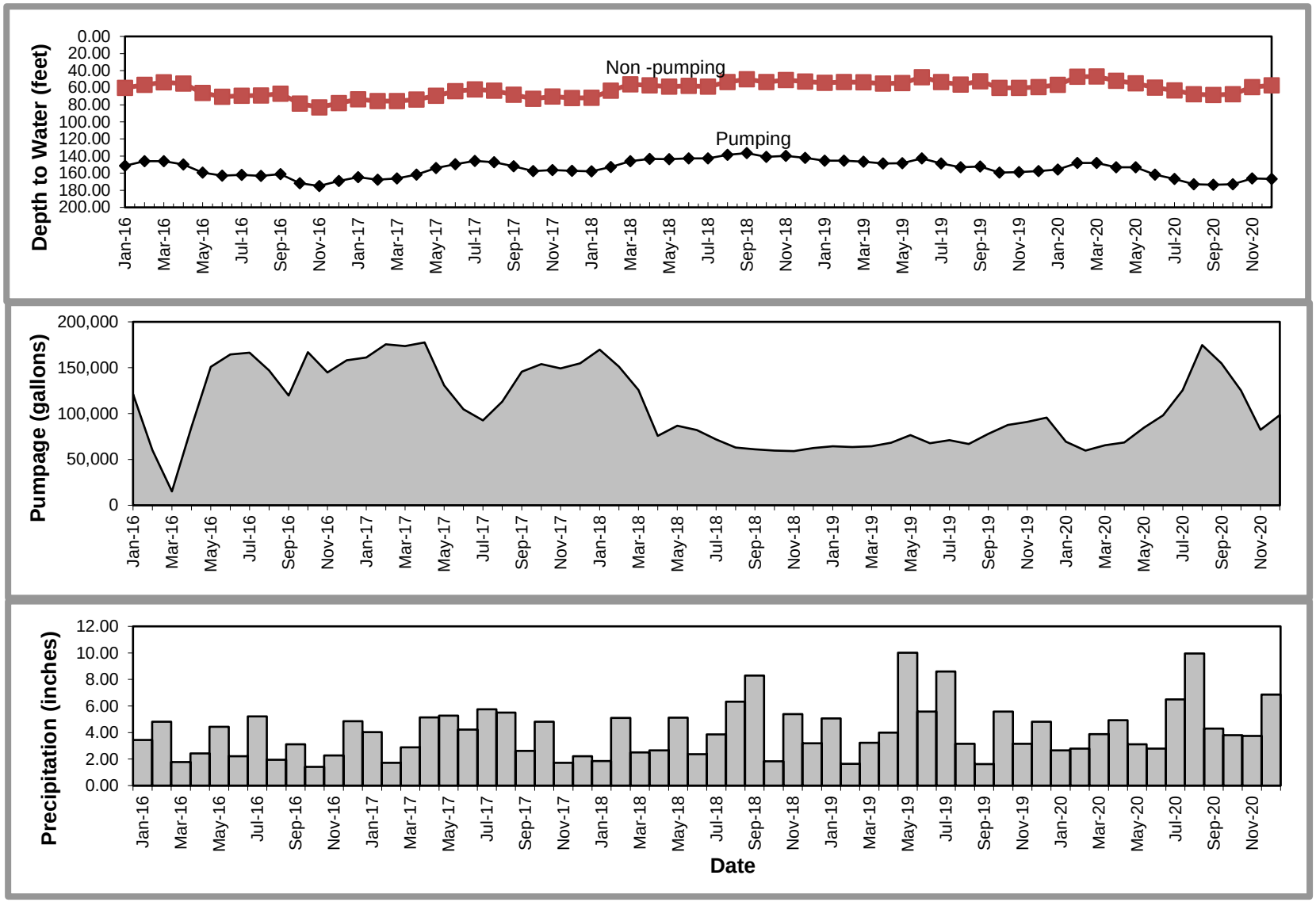
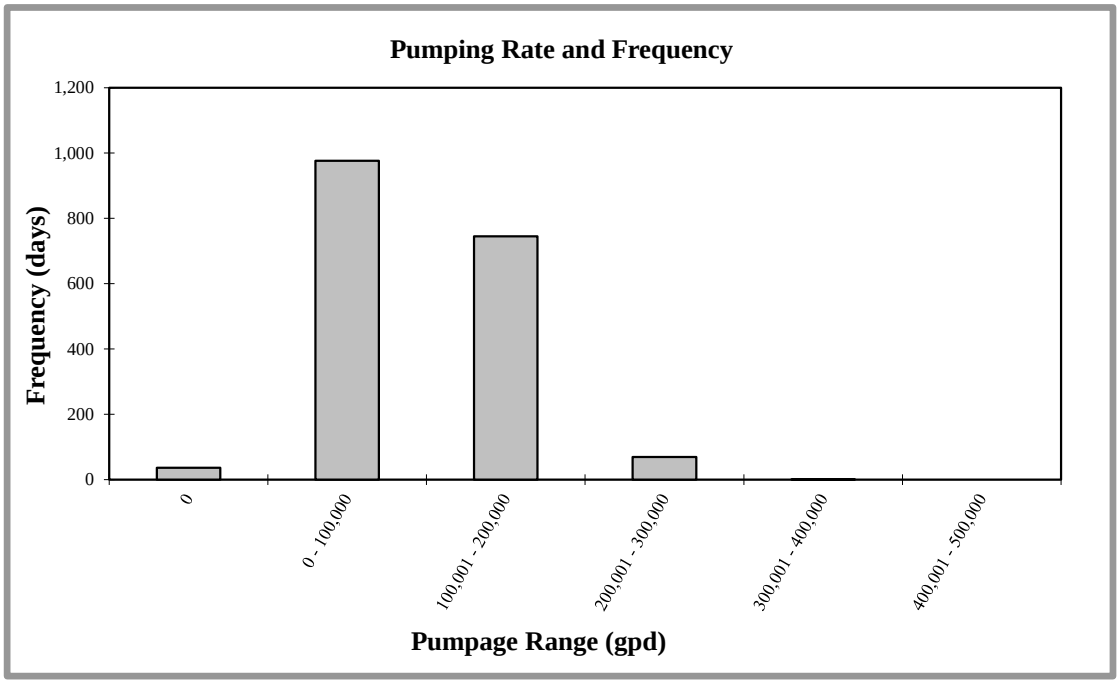


TABLE 8B

PRA Well No.10
Statistical Summary of Pumpage and Water Levels from January 2016 to December 2020

	Pumpage (gpd)	Water Level (pumping)*	Water Level (non-pumping)*
Mean	106,689	155	62
Standard Deviation	51,046	11	9
Minimum (non-zero)	4,000	60	2
Maximum	313,000	178	86

* Feet below ground level



Pumpage Range (gpd)	Frequency
0	36
0 - 100,000	976
100,001 - 200,000	745
200,001 - 300,000	69
300,001 - 400,000	1
400,001 - 500,000	0

FIGURE 11A

PRA Well No. 11
Water Level, Pumpage and Precipitation for the Period January to December 2020

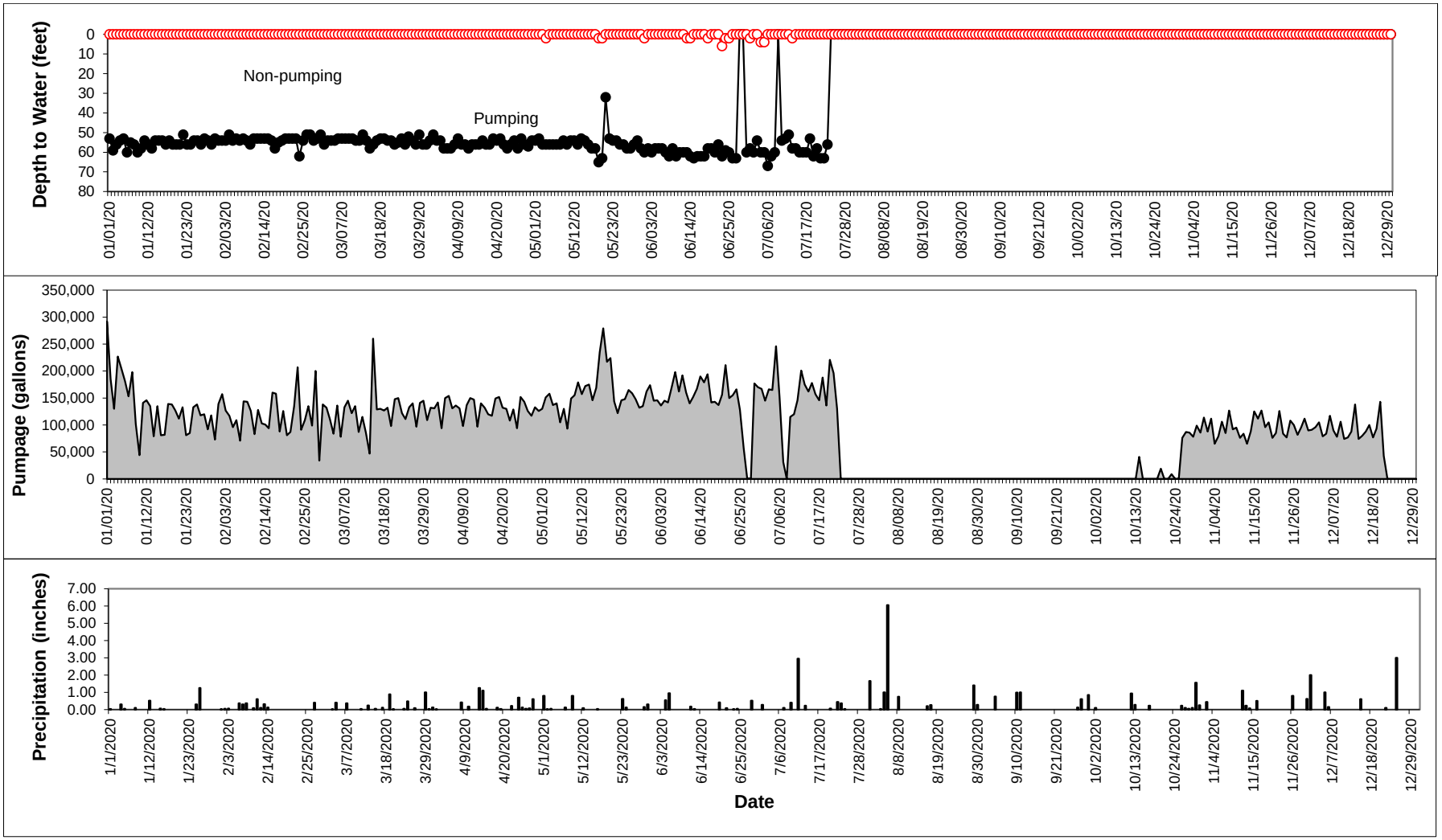
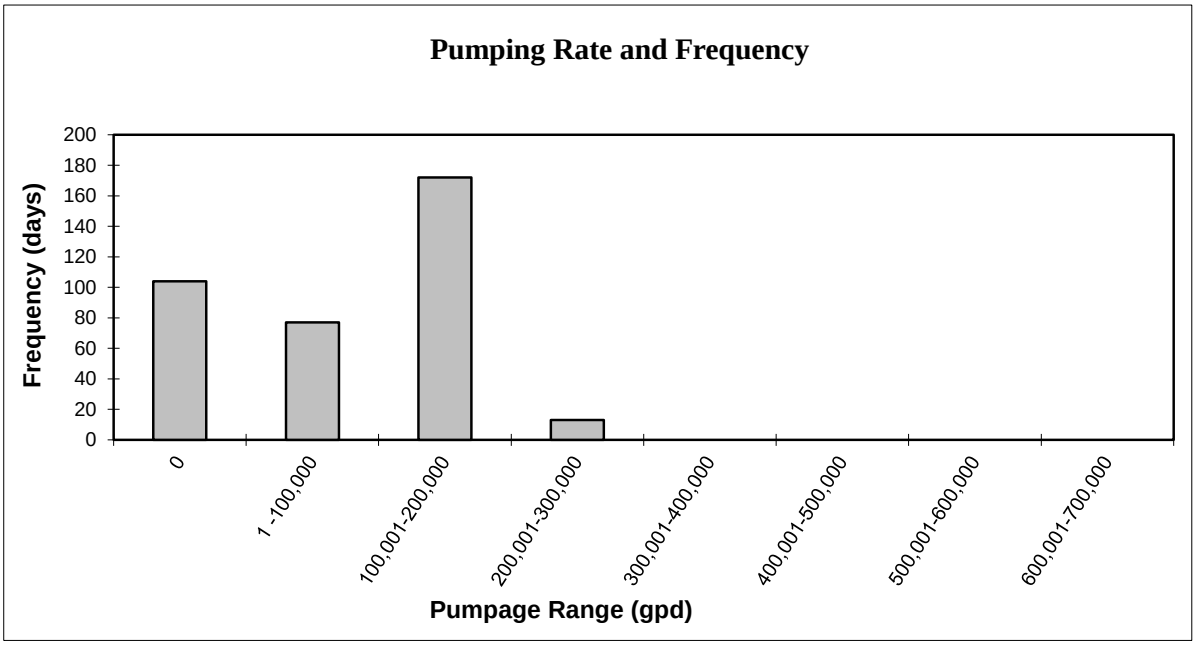


TABLE 9A

PRA Well No. 11
Statistical Summary of Pumpage and Water Levels from January to December 2020

	Pumpage (gal/day)	Water Level(pumping)*	Water Level(non pumping)*
Mean	91,227	31	0.10
Standard Deviation	68,094	28	0.55
Minimum (non-zero)	1,000	32	2
Maximum	292,000	67	6

* Feet below ground level



Pumpage Range (gpd)	Frequency
0	104
1 -100,000	77
100,001-200,000	172
200,001-300,000	13
300,001-400,000	0
400,001-500,000	0
500,001-600,000	0
600,001-700,000	0

FIGURE 11B

PRA Well No.11
Water Level, Pumpage and Precipitation for the Period January 2016 - December 2020

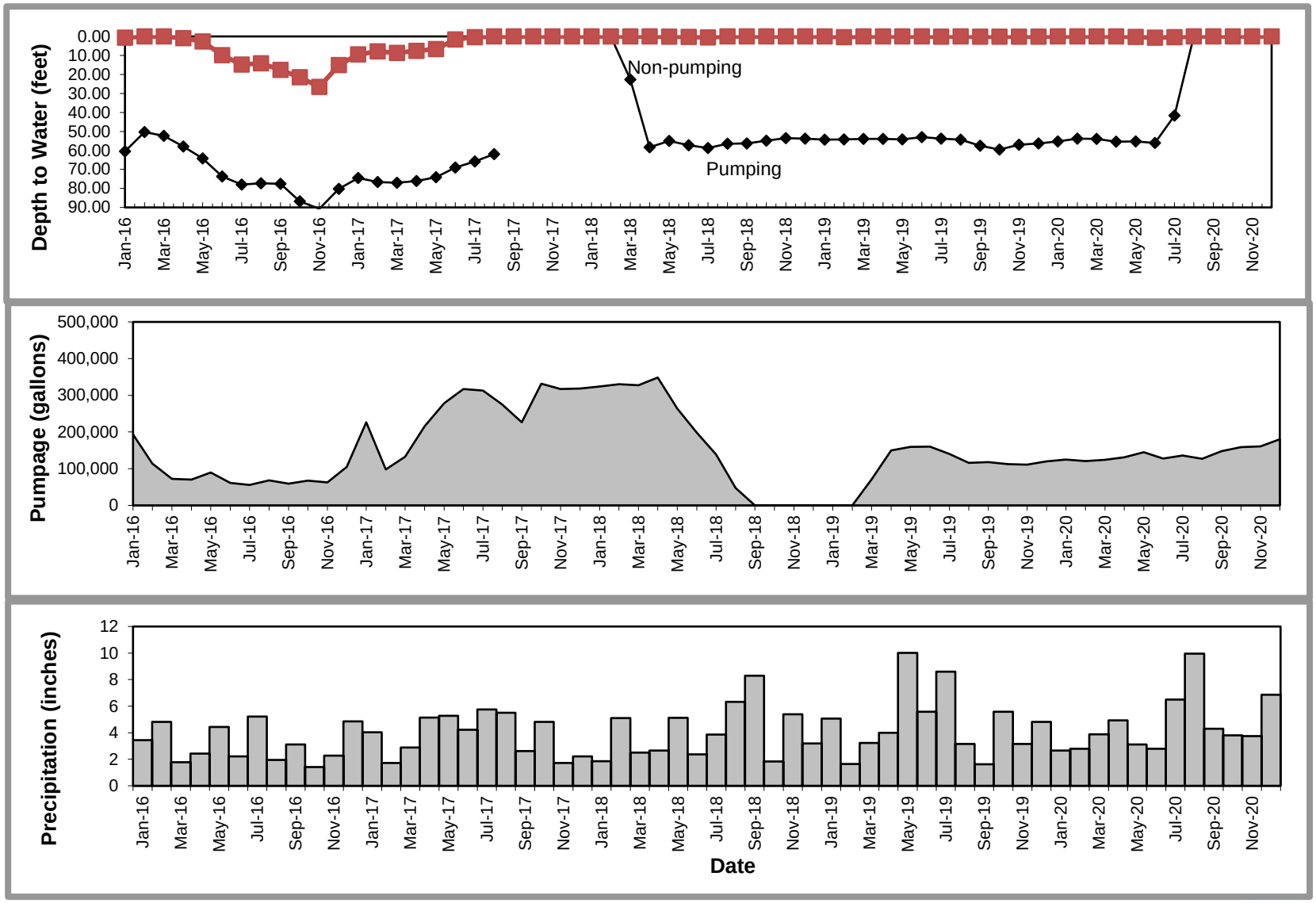
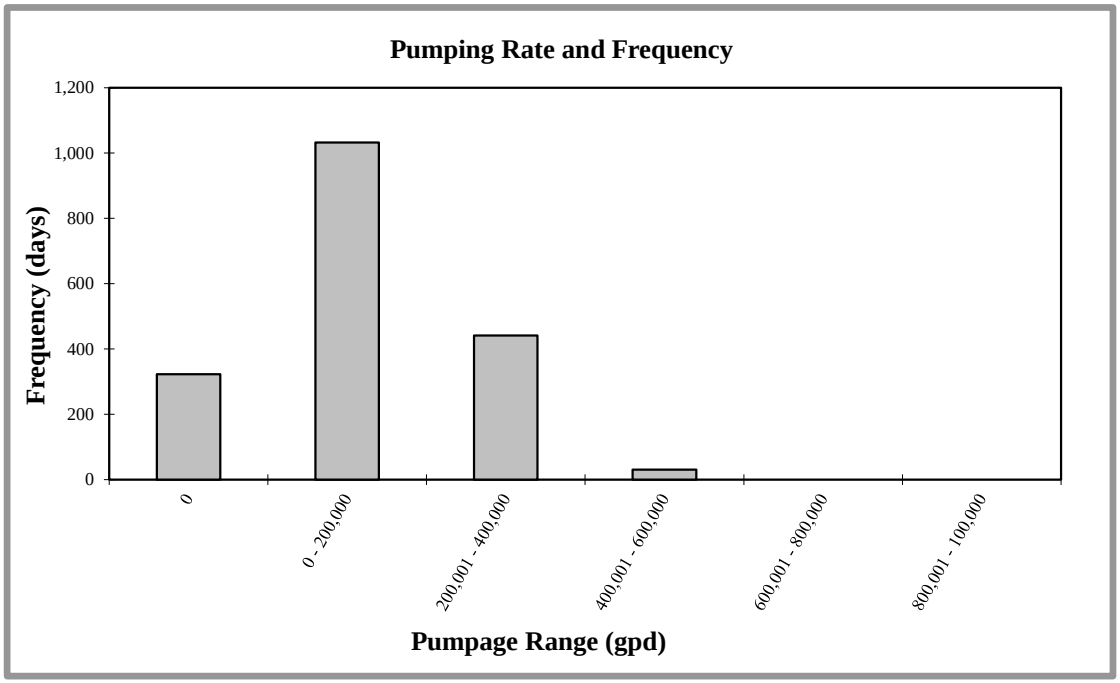


TABLE 9B

PRA Well No.11
Statistical Summary of Pumpage and Water Levels from January 2016 to December 2020

	Pumpage (gpd)	Water Level (pumping)*	Water Level (non-pumping)*
Mean	151,116	53	3
Standard Deviation	108,135	24	6
Minimum (non-zero)	1,000	32	1
Maximum	529,000	160	69

* Feet below ground level



Pumpage Range (gpd)	Frequency
0	323
0 - 200,000	1032
200,001 - 400,000	441
400,001 - 600,000	31
600,001 - 800,000	0
800,001 - 100,000	0

MONITORING NETWORK

Introduction

There are a total of thirty-nine (39) wells comprising the PRA monitoring network. The designation of some of the monitoring wells has been revised since 2008. Twenty-eight (28) are non-municipal wells, two of which (CN-1 and No. 1) are commercial, and the remaining twenty-six (26) are domestic. Additionally, there are five (5) municipal production wells (PRA #5, PRA #6, PRA #7, PRA #10, and PRA #11) and seven (7) municipal monitoring wells included in the monitoring network. DRBC Docket No. D-97-12 CP-4 (Revision) includes thirty-seven (37) monitoring wells in the network.

PRA replaced six (6) shallow domestic wells located on Three Mile Run Road in anticipation of pumping at Well No. 7. Four (4) of the six (6) wells were included in the monitoring network in order to observe any water supply impact related to the pumping of Well No. 7. The remaining two (2) wells could not be included to the network due to accessibility problems. However, these two (2) wells were monitored indirectly by PRA personnel. No water supply issues were experienced by the wells located on Three Mile Run Road since Well No. 7 started production on May 25, 2009.

The monthly well hydrographs show the water level trends for 2020. The well water level data are collected once a month by PRA personnel. Monitoring well identification is summarized in Table 10 and their locations are shown on Figure 4. Water level data for the network are presented in Table 11.

Water level in wells can be affected by several factors. Water levels are lower during pumping and subsequent recovery than during an inactive period. Pumping at a well may also cause drawdown in other nearby wells if hydraulic interconnection exists.

Water levels can be influenced by precipitation events and may rise temporarily after heavy rainfall. Longer-term seasonal conditions also contribute to water level changes. Water levels

tend to rise during recharge seasons and decline during periods of low recharge and high evapotranspiration.

Monitoring Well Trends

Monitoring well hydrographs for 2020 are shown on Figures 12 to 53. The available data indicate, in general, no clear relationship between water level changes in monitoring wells and pumping activity at the PRA production wells.

The seasonal fluctuation of ground water during normal precipitation conditions is characterized by recharge during the fall and winter months and by a decline in water level due to evapotranspiration losses during the spring and summer months. Thus, seasonal ground water highs tend to be recorded in the spring, while water levels are typically deepest in late summer or early fall. The Perkasie monitoring wells have historically followed these seasonal trends.

In 2020, total recorded precipitation was 55.10 inches which is 5.06 inches above the long-term average of 50.04 inches. August had the highest precipitation, 9.36 inches. Precipitation was also above average in April, July, August, November and December. The lowest amount was recorded in February (2.74 inches) (Table 2). Precipitation was below average for January, February, March, May, June, September and October. In the previous recording period (2019), May was the month that registered the highest amount of precipitation while September registered the lowest.

The effects of the precipitation distribution that occurred in 2020 on ground water levels are as follows: an increase in ground water recharge in mid-winter. Precipitation values were low in late winter and early spring. The system then has a decrease in ground water recharge in the spring season, continuing through April. The recharge escalates in August due to the high precipitation value. The recharge rate stays high due to the large influx of precipitation in July and August. These effects, especially the wet spell during summer produced higher than normal water levels that are apparent in most of the monitoring well hydrographs for the year 2020.

TABLE 10
PRA Monitoring Well Network

Well No.	Well Owner	Owner Address	
CN1	Young/Creekside Nursery	728	East Walnut Street
1	Landis	702	East Walnut Street
7	Snyder	212	South Perkasie Road
14	Barndt	321	East Market Street
17	Newfield	738	East Walnut Street
20	Bennington	926	East Walnut Street
21	Sarnese	922	East Walnut Street
24	Roman	611	Meadowcreek Lane
41	Furlan	1211	Telegraph Road
44	Wilhem	313	Summit Avenue
46	Bergey	1211	Park Avenue
51	Gehman	1231	Branch Road
53	Hogan	1336	Meadow Lane
55	Lapp	1828	Old Bethlehem Pike
56	Jervis	2379	Hill Road
57	Stephenson	2228	Hill Road
58	Francis	2136	Hill Road
60	Herndon	2028	Rockhill Road
61	Deeble	1827	Rockhill Road
62	Deeble	1803	Rockhill Road
63	Harris	1434	Schoolhouse Road
64	Knoll	1406	Schoolhouse Road
65	Indelicato	801	Branch Road
66	Cressman	1320	Branch Road
67	Van Leer	1000	Branch Road
68	Seiger	521	Branch Road
69	White	1737	Seven Corner Road
70	Silver	1401	Three Mile Run Road
71	McAnally	1407	Three Mile Run Road
72	O'Connor	1423	Three Mile Run Road
73	Eberle (New Sept. 2018)	2002	West Rock Road
74	Texter	409	Blooming Glen Road
PRA #5	PRA	Rockhill Road	
PRA #6	PRA	Rockhill Road	
PRA #7	PRA	Three Mile Run Road	
PRA#8	PRA	Three Mile Run Road	
PRA#9	PRA	Rockhill Road	
PRA#10	PRA	Spring Lane	
PRA#11	PRA	East Walnut Lane	
PRA Weidner (14)	PRA	Blooming Glen Road (near covered bridge)	

Table 11
Long Term Monitoring Well Network

2020 Water Levels

Well Identification[1]	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Cuilwick - Gehman MW-51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Snyder, MW-7	30.6	30.8	31.4	30.8	32.2	33.1	32.4	32.0	32.0	36.1	30.0	30.3
Furlan, MW-41	46.0	45.6	46.0	46.4	50.0	50.4	51.8	48.0	49.4	48.6	45.8	45.2
Landis, MW-1	12.2	13.7	12.5	12.2	12.8	13.9	12.9	12.4	12.8	12.6	11.8	12.2
Creekside Nursery, CN1	10.0	10.0	10.0	10.0	9.8	9.8	9.8	9.9	9.9	9.8	10.0	10.0
Newfield, MW-17	20.0	19.8	19.7	20.1	22.0	23.0	22.8	21.2	22.2	20.8	19.2	18.7
Bennington, MW-20	68.2	67.7	68.2	68.4	75.0	70.6	72.3	71.0	70.6	72.8	68.2	67.7
Sarnese, MW-21	73.1	73.2	73.5	74.0	76.8	76.7	82.1	76.0	76.1	75.4	75.0	73.2
Roman, MW-24	13.4	13.6	20.4	17.0	36.0	15.4	15.2	14.2	14.7	14.3	13.2	13.2
Wilhem, MW-44	51.3	41.3	46.2	50.6	53.1	54.7	62.2	63.2	62.8	61.5	53.0	55.4
Barndt, MW-14	0.0	0.2	0.0	0.0	0.0	2.0	2.5	11.0	2.0	2.1	0.0	0.0
Bergey, MW-46	71.2	70.4	69.7	69.8	70.0	71.0	72.8	71.4	71.0	71.4	69.8	69.2
Hogan, MW-53	56.0	55.7	52.4	52.8	55.2	58.2	62.6	61.7	61.0	64.0	57.7	55.6
Lapp, MW-55	47.0	45.6	43.6	43.3	55.1	51.7	62.9	56.0	57.4	60.5	52.5	49.2
Jervis, MW-56	9.6	10.7	9.4	19.0	12.0	12.2	14.0	12.7	13.6	14.6	11.6	10.0
Stephenson, MW-57	56.6	54.7	52.2	51.2	55.8	52.8	65.5	67.6	69.2	71.2	63.0	57.8
Francis, MW-58	23.4	23.6	22.8	22.2	24.4	27.7	28.8	27.8	28.5	28.8	23.7	24.0
Herndon, MW-60	14.8	15.6	14.8	14.6	15.9	17.7	20.4	19.0	19.2	19.6	18.0	14.8
Deeble, MW-61	50.5	47.8	44.2	42.8	48.8	54.7	68.0	64.8	64.8	61.2	61.5	54.2
Deeble, MW-62	42.4	40.8	36.5	34.5	42.3	50.0	61.2	66.4	70.1	73.8	55.5	47.0
Harris, MW-63	30.4	30.6	30.6	30.6	30.6	30.4	30.3	30.4	30.5	30.4	30.5	30.5
Knoll, MW-64	64.4	60.8	57.2	55.1	55.9	58.6	66.8	69.4	71.0	74.0	69.7	64.8
Cressman, (MW-6)*66	16.2	16.7	16.2	16.1	16.9	17.0	17.4	17.4	17.2	17.2	15.8	16.4
White (MW-5)*69	26.1	29.0	25.2	25.2	27.3	28.0	28.8	28.6	28.3	28.1	25.5	25.4
Van Leer, (MW-3)*67	17.2	17.9	17.1	17.1	17.9	18.2	18.2	18.2	18.0	18.0	16.8	17.3
Indelicato (MW-4)*65	16.9	17.2	16.7	16.2	18.0	21.5	19.0	18.2	18.2	17.8	15.5	15.8
Seiger (MW-2)*68	9.6	9.8	18.7	19.1	10.6	11.4	11.7	11.4	11.6	11.2	19.0	9.4
Eberle(New Sept. 2018)*73	71.9	71.4	70.8	71	72.6	74.1	74.8	74.3	75.4	75.5	71.5	71.2
PRA #4	-	-	-	-	-	-	-	-	-	-	-	-
PRA #5	69.0	75.0	71.0	70.0	75.0	80.0	88.0	92.0	94.0	97.0	86.0	79.0
PRA #6	4.0	16.0	8.0	7.0	16.0	21.0		35.0	40.0	41.0	20.0	15.0
PRA #7	31.0	56.0	49.0	42.0	54.0	66.0	92.0	98.0	102.0	102.0	75.0	68.0
PRA#8	15.4	18.4	14.6	12.6	15.8	16.2	32.2	36.0	38.1	37.8	22.8	21.5
PRA#9												
PRA#10	55.0	46.0	49.0	55.0	57.0	60.0	69.0	67.0	73.0	68.0	56.0	60.0
PRA#11	0.0	0.0	0.0	2.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
PRA Weidner (WD-14)	13.2	13.6	13.0	12.8	13.6	13.6	13.9	13.9	14.0	14.0	12.8	13.2
1401 3 Mile Run Rd	32.3	30.2	27.0	25.2	29.4	33.8	39.0	39.7	41.6	42.8	34.0	32.0
1407 3 Mile Run Rd	58.0	51.6	47.0	42.4	48.3	54.7	66.8	69.7	71.6	75.3	62.2	55.7
1423 3 Mile Run Rd	26.6	23.0	19.4	19.0	17.6	20.4	28.6	31.1	32.6	35.8	31.8	27.0
1425 3 Mile Run Rd	-	-	-	-	-	-	-	-	-	-	-	-
1429 3 Mile Run Rd	-	-	-	-	-	-	-	-	-	-	-	-
409 Blooming Glen Rd.	14.4	14.7	14.4	13.8	15.2	15.6	16.2	16.2	16.6	16.1	14.0	14.0

CN-1, Creekside Nursery

The Creekside Nursery well is pumped for commercial use and the hydrograph is shown on Figure 12. The shallowest water level of the year was 9.8 feet. The deepest water level of the year was 10.00 feet. The water level recorded during 2020 was very similar to the 5-year previous average water level. Although the levels were slightly lower than average, the seasonal trends are similar to the previous years.

No. 1, Landis

The Landis No. 1 well serves a commercial establishment. The hydrograph is shown on Figure 13. The shallowest water level was 11.80 feet in November. The deepest water level was 13.90 feet, recorded in June. Water level and seasonal trends in 2020 were slightly higher than those that were averaged from the previous years.

MW-7, Snyder

The Snyder well is a domestic well and the hydrograph is shown on Figure 14. The shallowest water level was recorded in November (30.00 feet) and the deepest water level was recorded in October (36.10 feet). Water level and seasonal trends in 2020 were similar to those that were averaged from the previous years.

MW- 14, Barndt

The Barndt well is used for domestic purposes. Figure 15 depicts the fluctuations in water level for 2020. The shallowest water level of the year was recorded in January, March, April, May, November and December (0.0 feet). The deepest water level was recorded in August (11.00 feet). Water levels were much shallower for the whole year than the 5-year average water levels except for August and October.

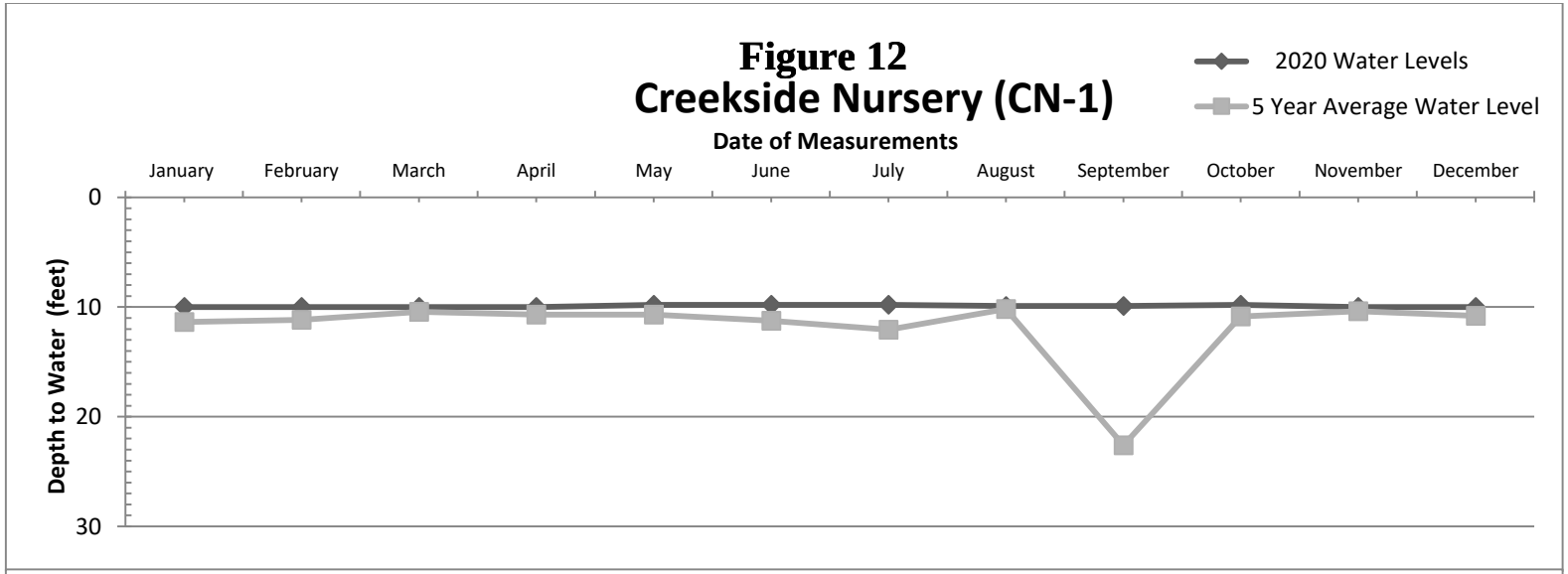


Figure 12
Creekside Nursery (CN-1)
2020 Water Levels
5 Year Average Water Level
Date of Measurements
January
February
March
April
May
June
July
August
September
October
November
December
0
10
20
30
Depth to Water (feet)

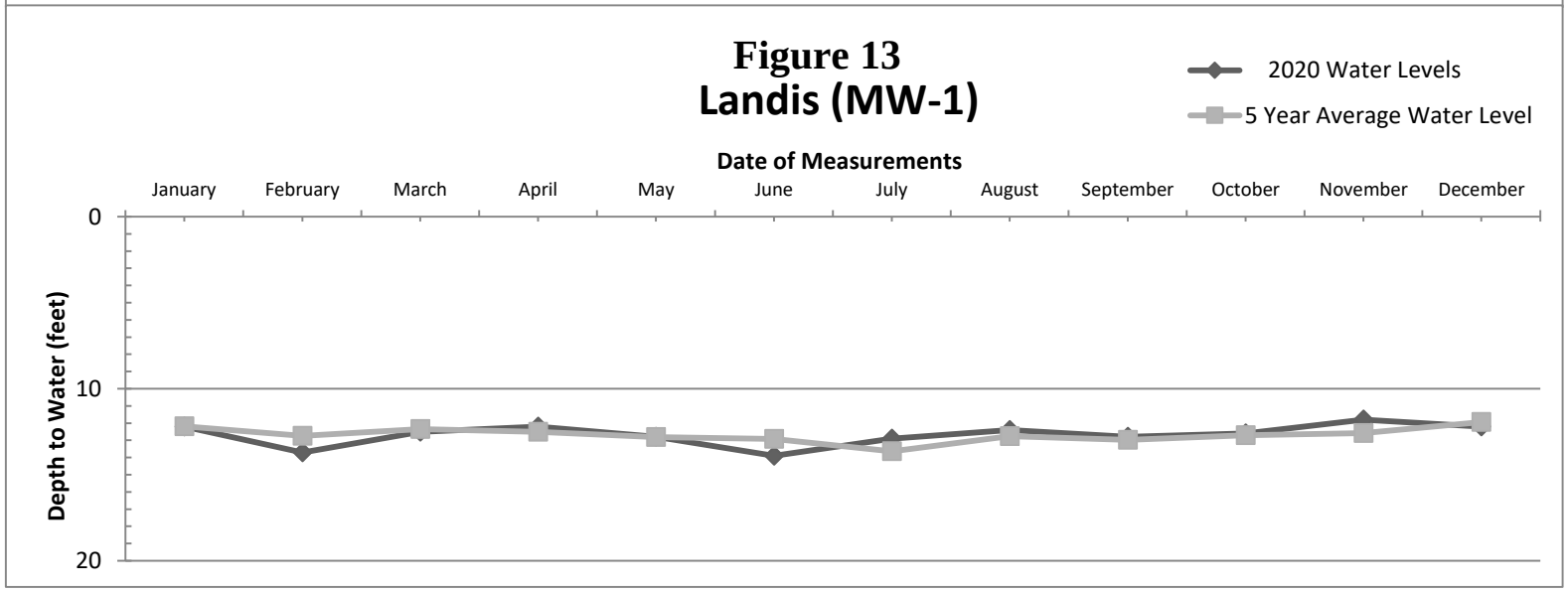


Figure 13
Landis (MW-1)
2020 Water Levels
5 Year Average Water Level
Date of Measurements
January
February
March
April
May
June
July
August
September
October
November
December
0
10
20
Depth to Water (feet)

Figure 14
Snyder (MW-7)

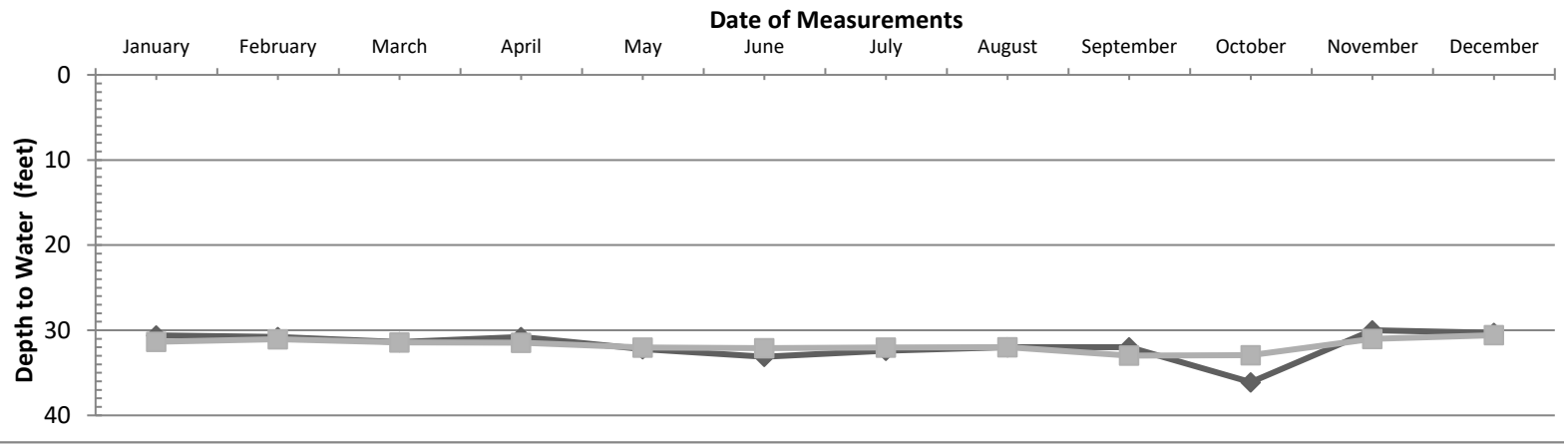
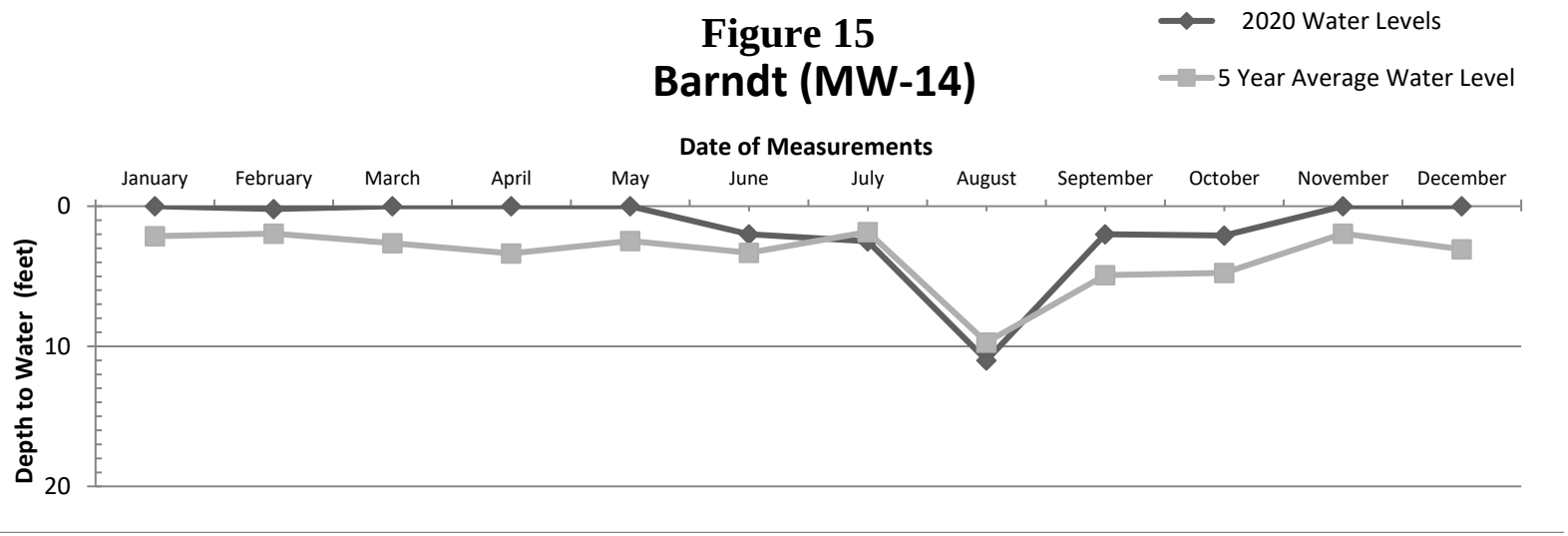


Figure 15
Barndt (MW-14)



MW-17, Newfield

The Newfield well is used for domestic purposes and the hydrograph is shown on Figure 16. The shallowest water level was recorded in December (18.70 feet) and the deepest water level was recorded in June (23.00 feet). Seasonal trends in 2020 were similar to those that were averaged from the previous years just slightly higher.

MW-20, Bennington

This well is a domestic well and the hydrograph appears on Figure 17. The shallowest water level were recorded in February (67.70 feet) and the deepest water level was recorded in May (75.00 feet). Water levels were slightly higher than the 5-year average water levels.

MW-21, Sarnese

The Sarnese well is used for domestic water supply. The 2020 hydrograph is depicted in Figure 18. The shallowest water level was recorded in January (73.10 feet) and the deepest water level was recorded in July (82.10 feet). Seasonal trends in 2020 were similar to those that were averaged from the previous years. Water levels were higher than the 5-year average water levels recorded at the Sarnese well.

MW- 24, Roman

The Roman well is a domestic well. The hydrograph appears on Figure 19. The shallowest water level was recorded in November and December (13.20 feet) and the deepest water level was recorded in May (36.00 feet). Seasonal trends in 2020 were similar to those that were averaged from the previous years. Water levels were shallower than the 5-year average water levels recorded from July to December at the Roman well.

Figure 16
Newfield (MW-17)

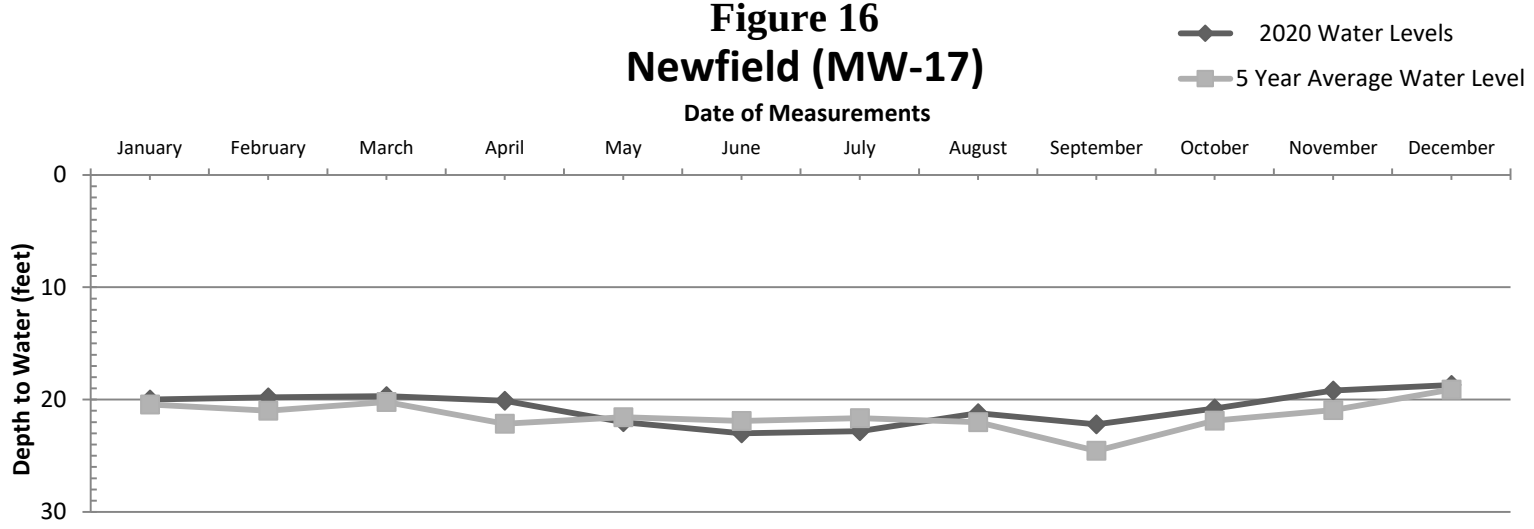


Figure 17
Bennington (MW-20)

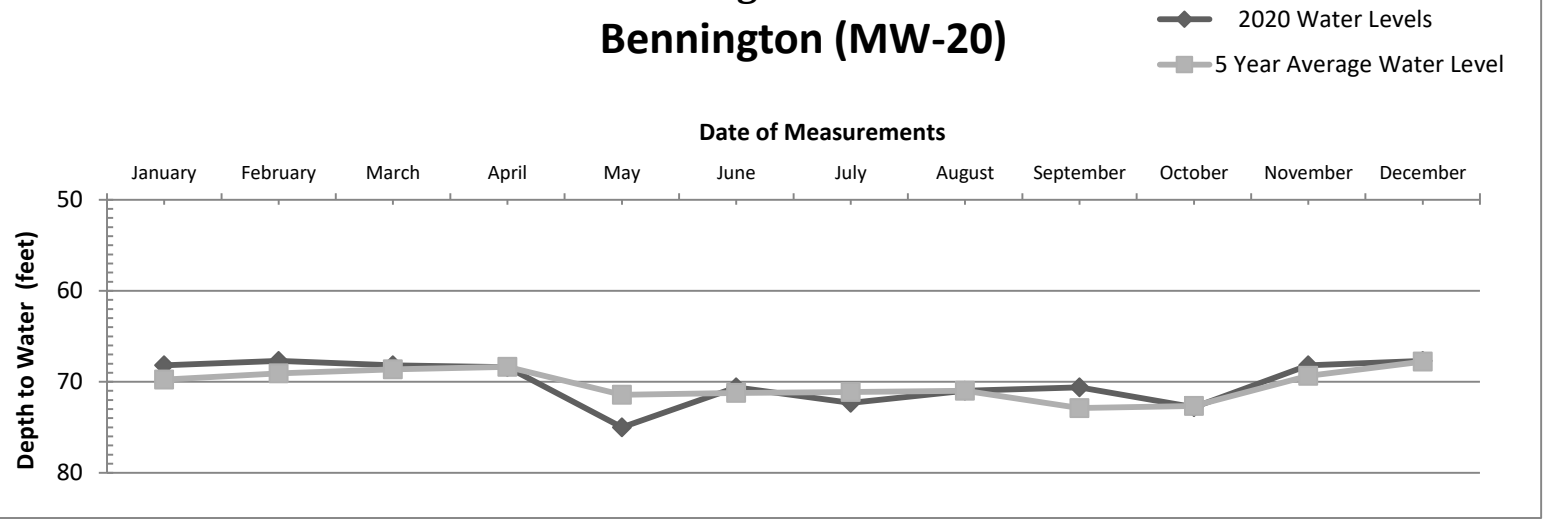


Figure 18
Sarnese (MW-21)

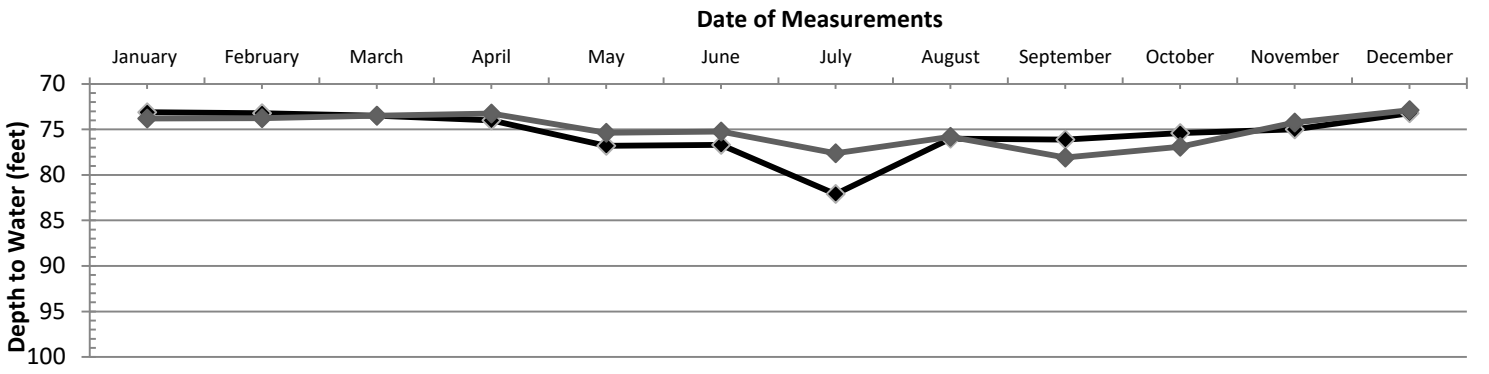
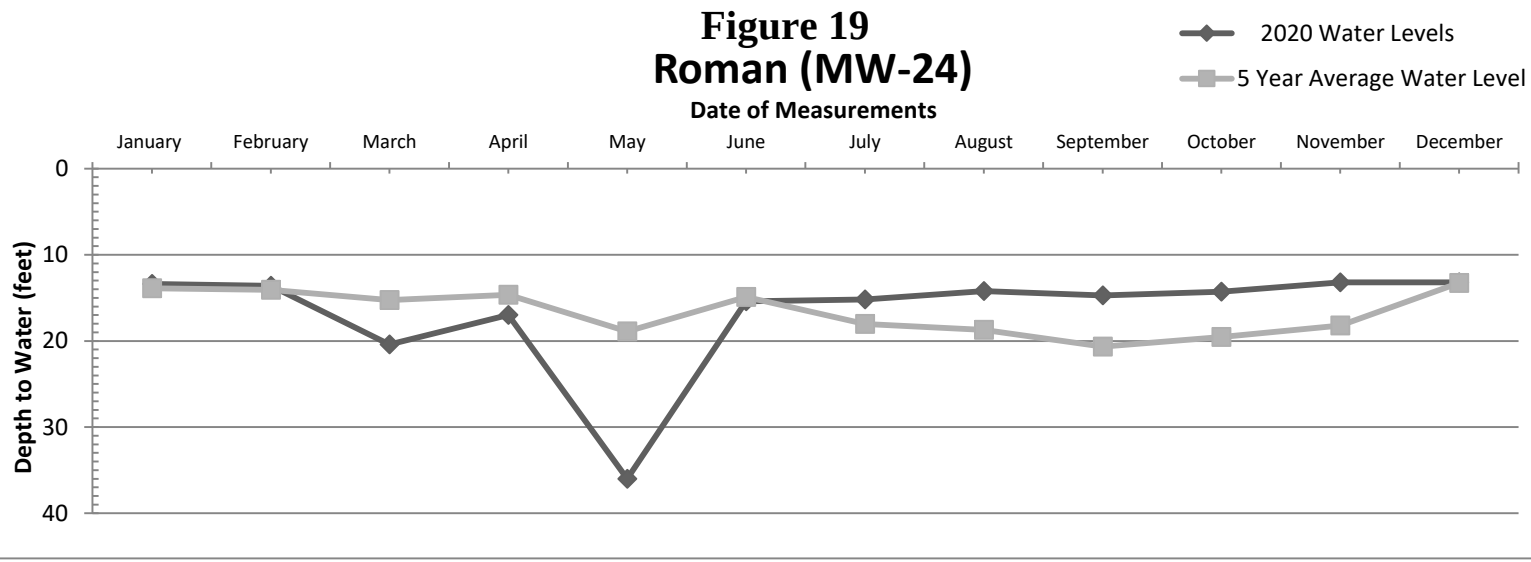


Figure 19
Roman (MW-24)



MW- 41, Furlan (previously Mart)

The Furlan well is a domestic well. The hydrograph appears on Figure 20. The shallowest water level was recorded in December (45.20 feet) and the deepest water level was recorded in July (51.80 feet). Seasonal trends in 2020 were similar to those that were averaged from the previous years at the Furlan well.

MW-44, Wilhelm

The Wilhelm well is a domestic well. The hydrograph appears on Figure 21. The shallowest water level was recorded in February (41.30 feet) and the deepest water level was recorded in August (63.20 feet). The water levels recorded during 2020 were slightly higher from than the 5-year previous average water level.

MW-46 Bergey

The Bergey well is a domestic well. The hydrograph is shown in Figure 22. The ground water fluctuations ranged between 69.20 feet in December and 72.80 feet in July. Water level readings and seasonal trends in 2020 were similar to those that were averaged from the previous years.

MW-51, Cuilwick-Gehman

This well is used for domestic purposes and the hydrograph appears on Figure 23. The well was inaccessible.

Figure 20
Furlan (MW-41)

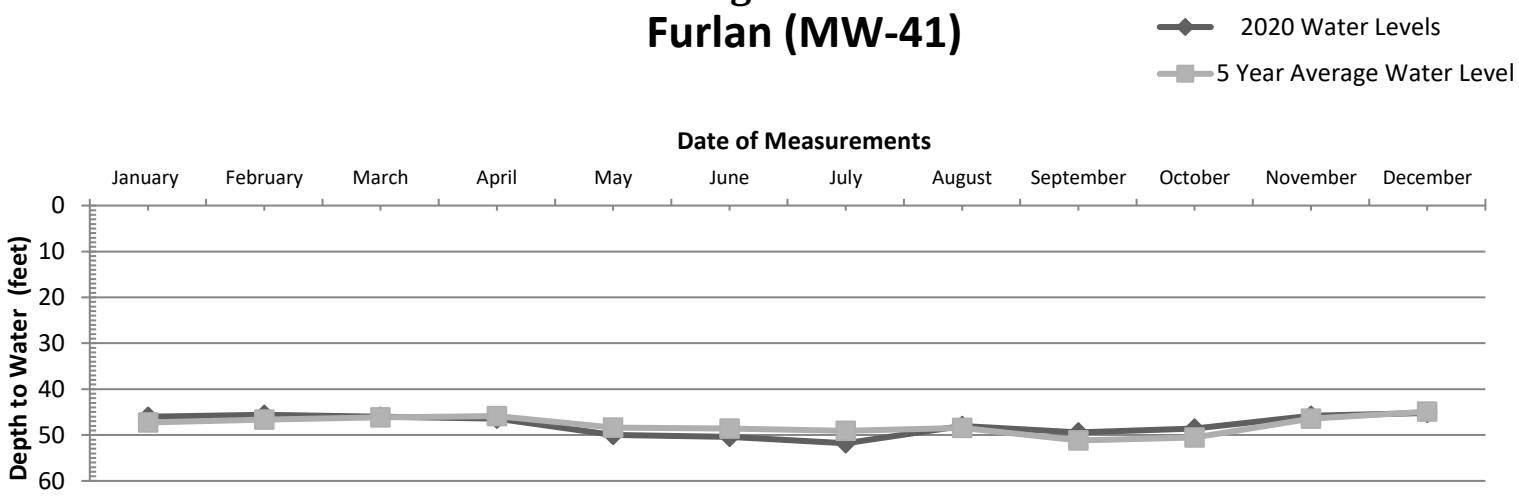


Figure 21
Wilhem (MW-44)

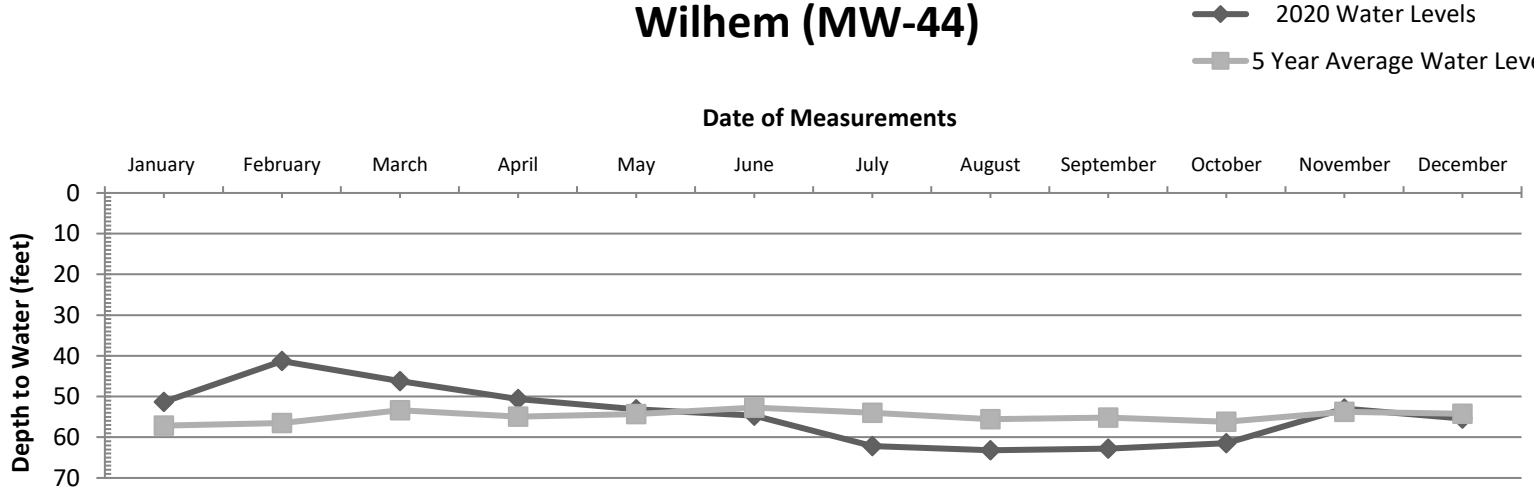


Figure 22
Bergey (MW-46)

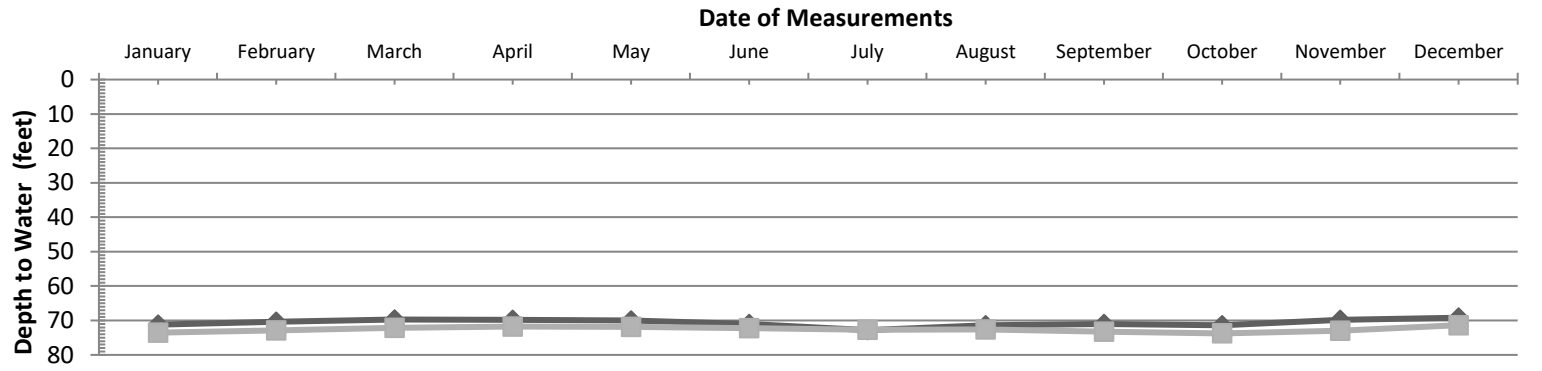
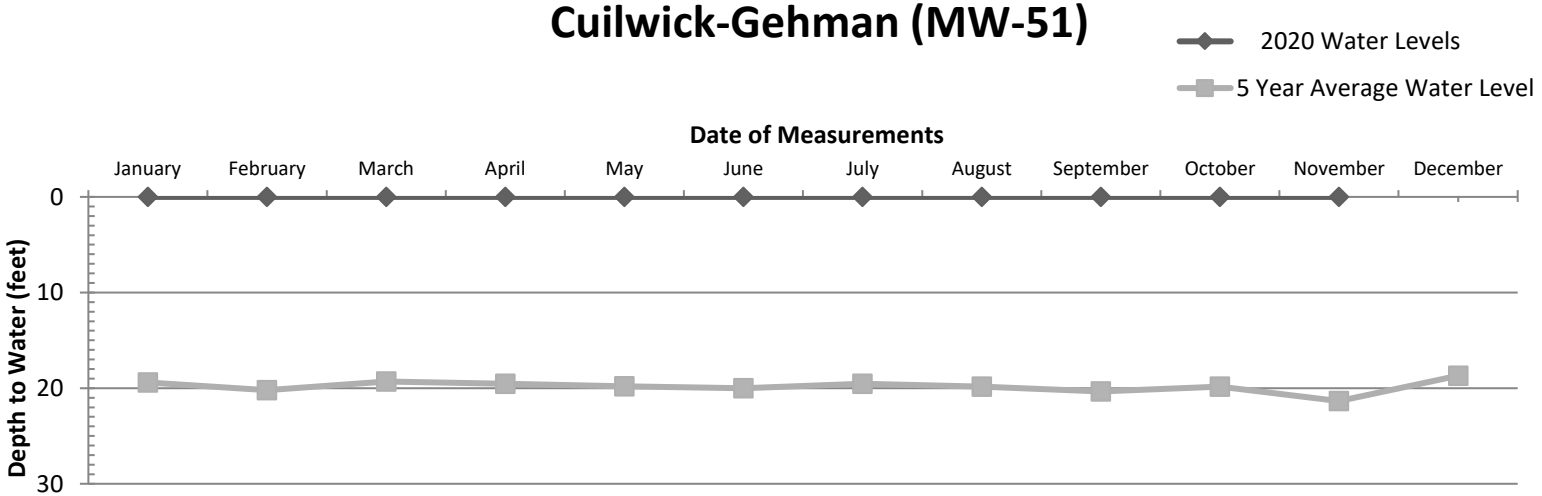


Figure 23
Cuilwick-Gehman (MW-51)



MW-52A, Berger

The Berger well was taken off of the Monitoring Well Network.

MW-53, Hogan

The Hogan well is used for domestic purposes and the hydrograph is shown on Figure 25. The shallowest water level was recorded in March (52.40 feet) and the deepest water level was recorded in October (64.00 feet). Water levels were higher than the 5-year average water levels recorded from August to December. Seasonal trends in 2020 were similar to those that were averaged from the previous years.

MW-55, Lapp

The Lapp well is used for domestic purposes and the hydrograph is shown in Figure 26. The shallowest water level was recorded in April (43.30 feet) and the deepest water level was recorded in July (62.90 feet). Seasonal trends in 2020 were similar to those that were averaged from the previous years. Water levels recorded were generally higher in 2020 than over the previous 5 years except during December.

MW-56, Jervis

The Jervis well is used for domestic purposes and the hydrograph can be seen on Figure 27. The shallowest water level was recorded in March (9.40 feet) and the deepest level was recorded in April (19.00 feet). Seasonal trends in 2020 were similar to those that were averaged from the previous years.

Figure 24
Berger (MW-52A)

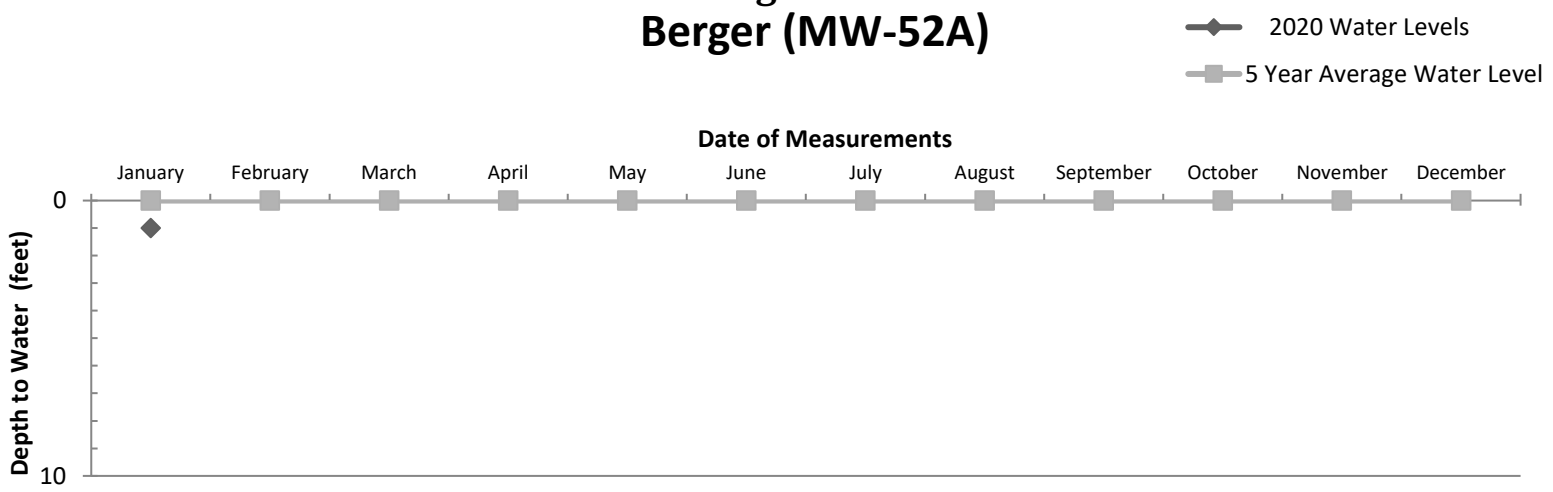


Figure 25
Hogan (MW-53)

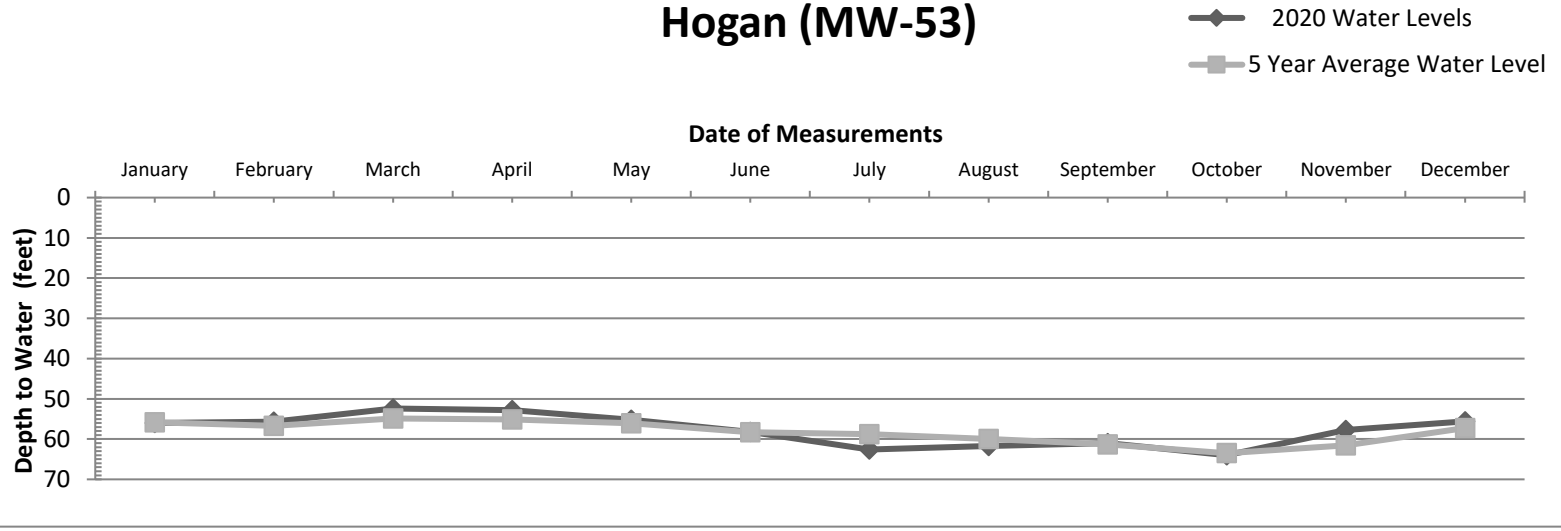


Figure 26
Lapp (MW-55)

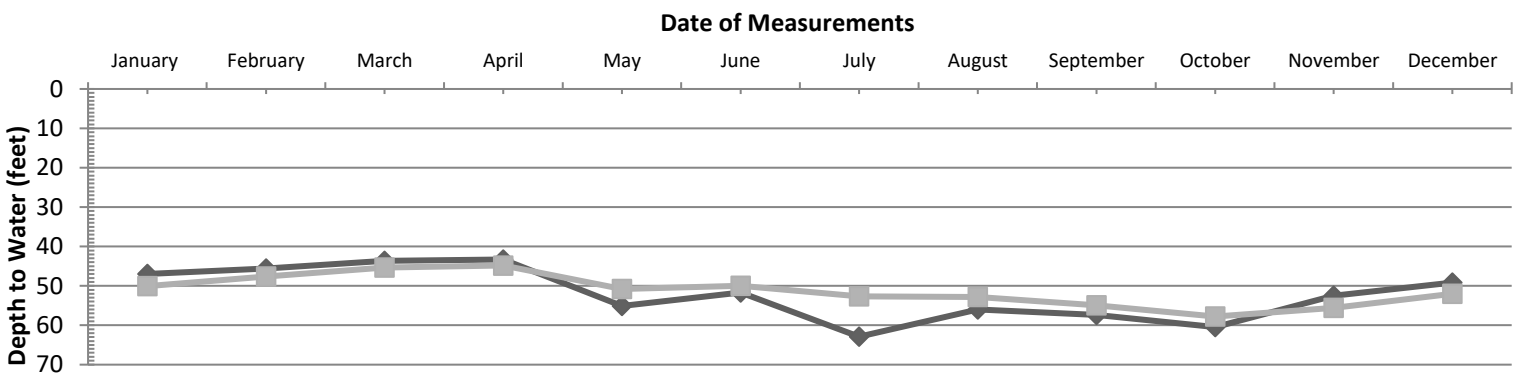
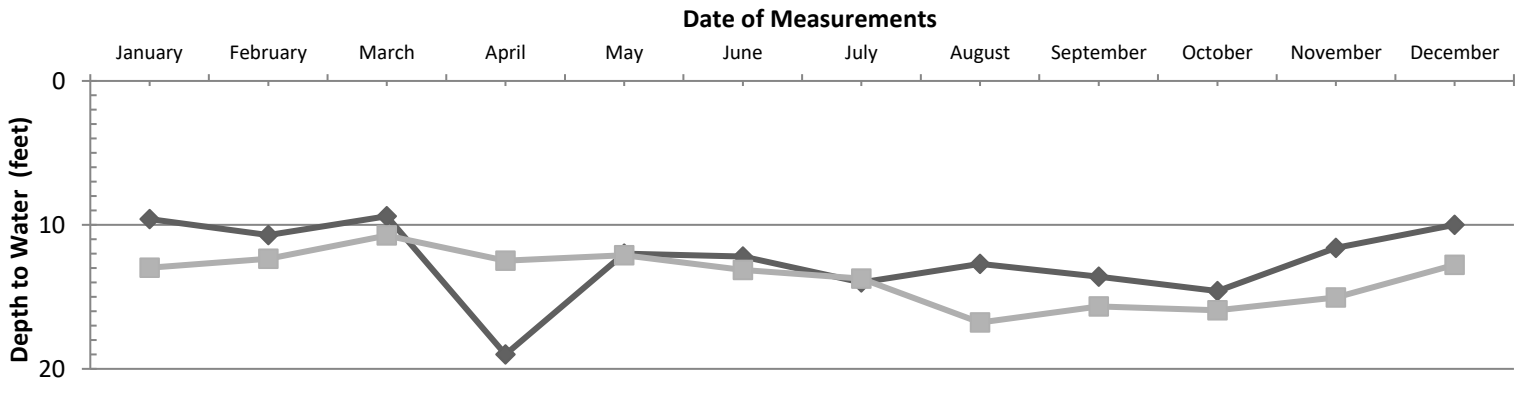


Figure 27
Jervis (MW-56)



MW-57, Stephenson

The Stephenson well is a domestic well and the hydrograph can be seen on Figure 28. The shallowest water level was recorded in April (51.20 feet) and the deepest water level was recorded in October (71.20 feet). Seasonal trends in 2020 were similar to those that were averaged from the previous years. Water levels recorded were generally higher in 2020 than over the previous 5 years except for January.

MW- 58, Francis

The hydrograph for the Francis domestic well is shown on Figure 29. The shallowest water level was recorded in April (22.20 feet) and the deepest water level was recorded in July and October (28.80 feet). Seasonal trends in 2020 were similar to those that were averaged from the previous years. Water levels recorded were slightly higher in 2020 than over the previous 5 years.

MW- 60, Herndon

The Herndon well is used for domestic purposes and the hydrograph appears on Figure 31. The shallowest water level was recorded in April (14.60 feet) and the deepest water level was recorded in July (20.40 feet). Seasonal trends in 2020 were similar to those that were averaged from the previous years. Water levels were higher than the 5-year average water levels recorded.

Figure 28
Stephenson (MW-57)

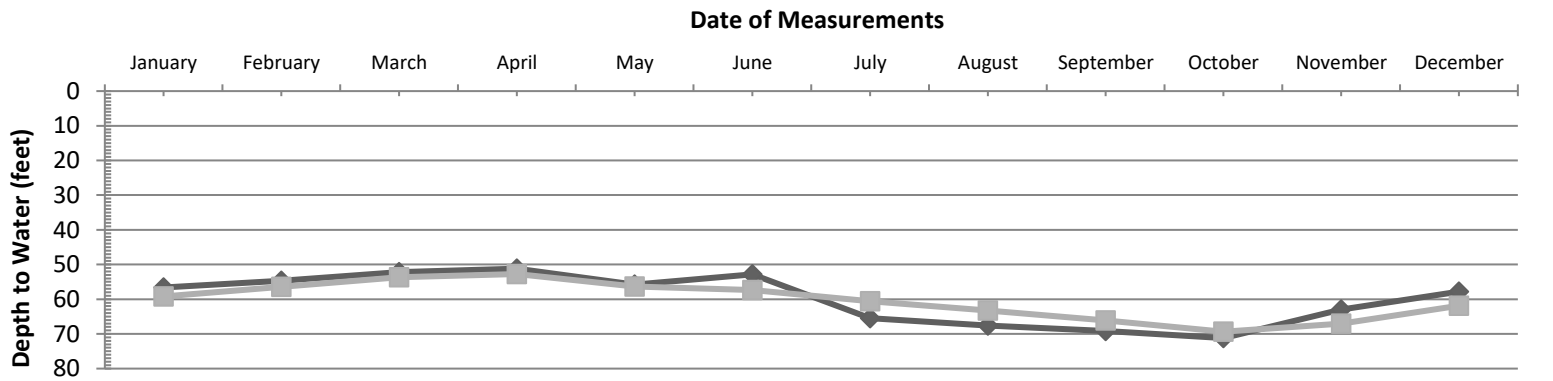


Figure 29
Francis (MW-58)

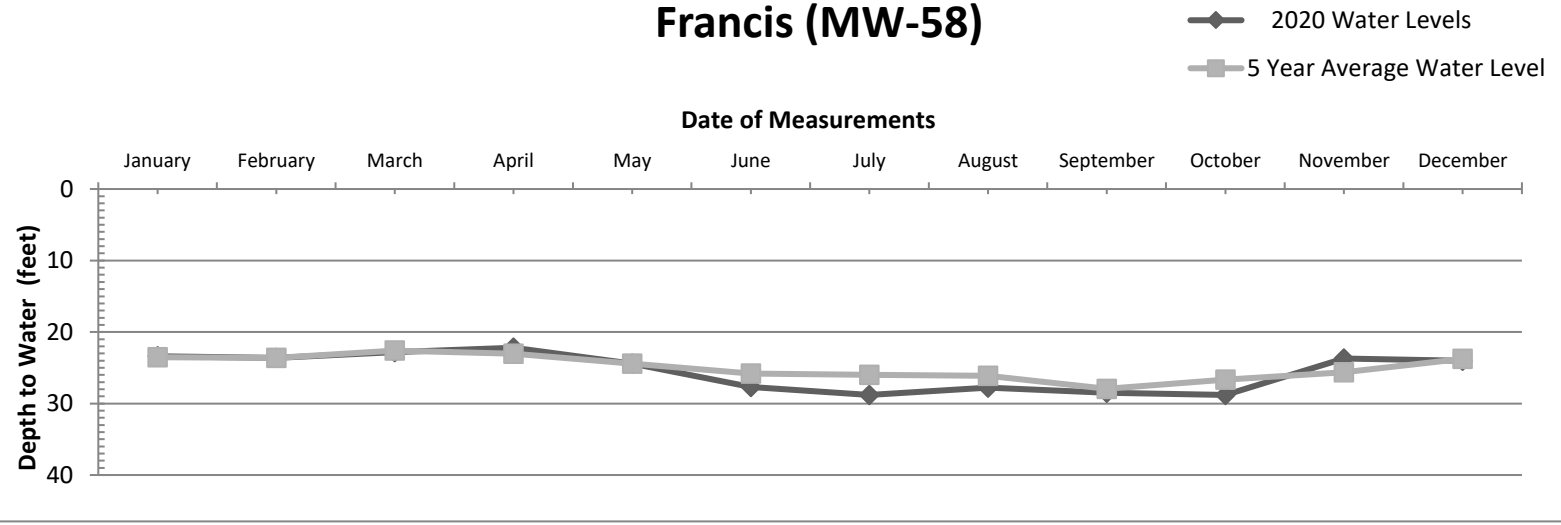


Figure 30
Brooks MW-59

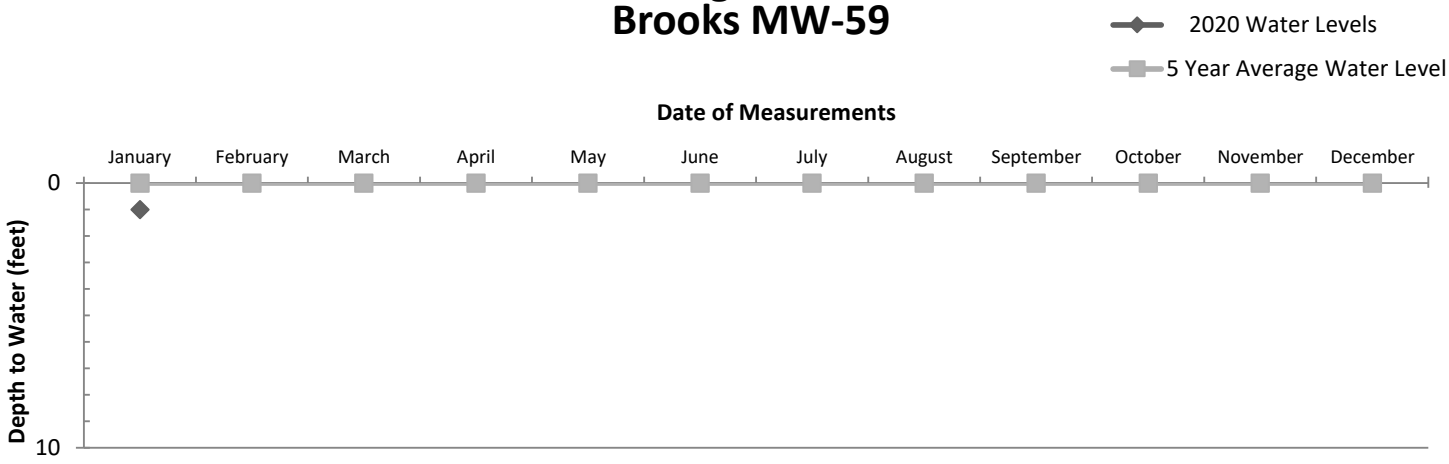
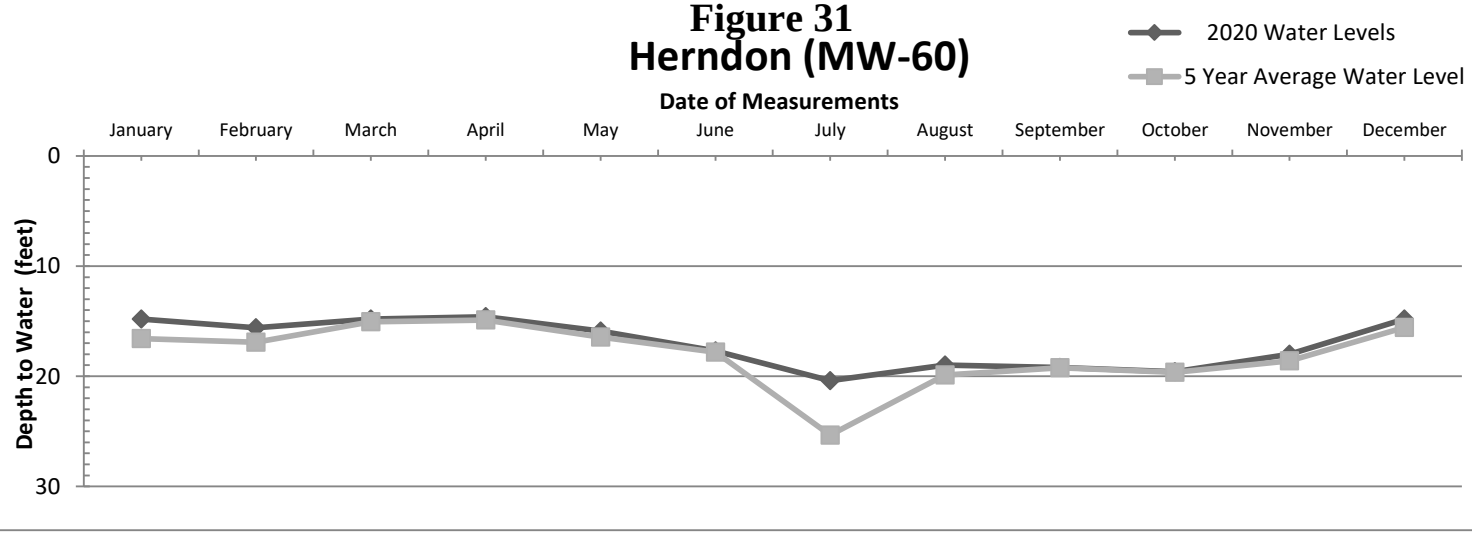


Figure 31
Herndon (MW-60)



MW-61, Deeble (formerly Renner)

The MW-61 is used for domestic purposes and its hydrograph appears on Figure 32. The shallowest water level was recorded in April (42.80 feet) and the deepest was recorded in July (68.00 feet). Seasonal trends in 2020 were similar to those that were averaged from the previous years. Water levels recorded were generally higher in 2020 than over the previous 5 years.

MW- 62, Deeble

The MW-62 and its hydrograph are shown in Figure 33. The shallowest water level was recorded in April (34.50 feet) and the deepest water level was recorded in October (73.80 feet). Seasonal trends in 2020 were similar to those that were averaged from the previous years. Water levels recorded were higher in 2020 than over the previous 5 years except January.

MW- 63, Harris

The hydrograph of the Harris domestic well is depicted in Figure 34. The shallowest water level was recorded in July (30.30 feet). The deepest water level was recorded in February, March, April and May (30.60 feet). Seasonal trends in 2020 were similar to those that were averaged from the previous years. The water levels recorded were similar to the 5-year average water level at the Harris.

MW- 64, Knoll

The Knoll well is used for domestic purposes and the hydrograph can be seen on Figure 35. The shallowest water level was recorded in April (55.10 feet) and the deepest water level was recorded in October (74.00 feet). Seasonal trends in 2020 were similar to those that were averaged from the previous years. Water levels recorded were lower in 2020 than recorded over the previous 5 years.

Figure 32
Deeble (MW-61)

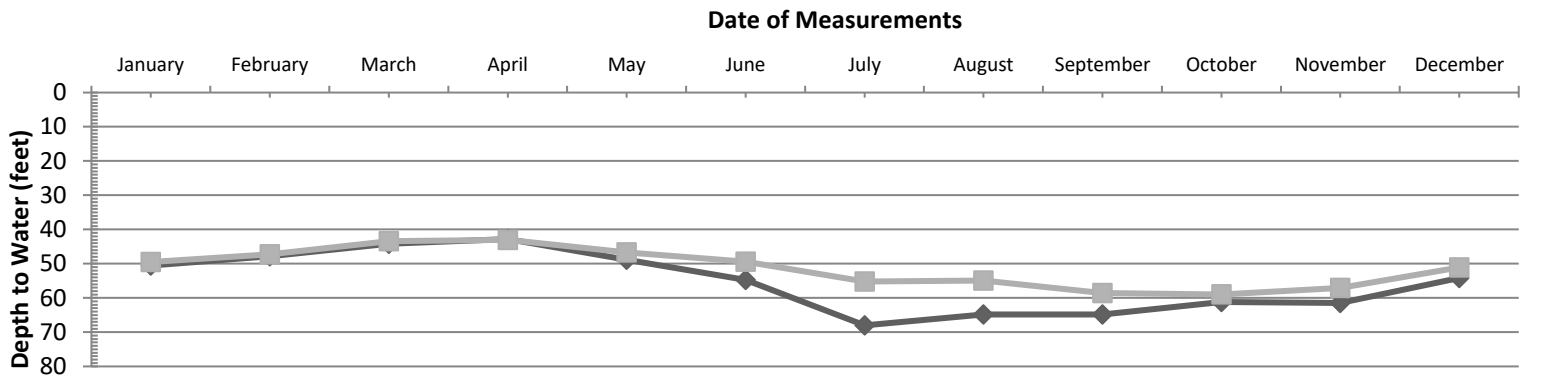


Figure 33
Deeble (MW-62)

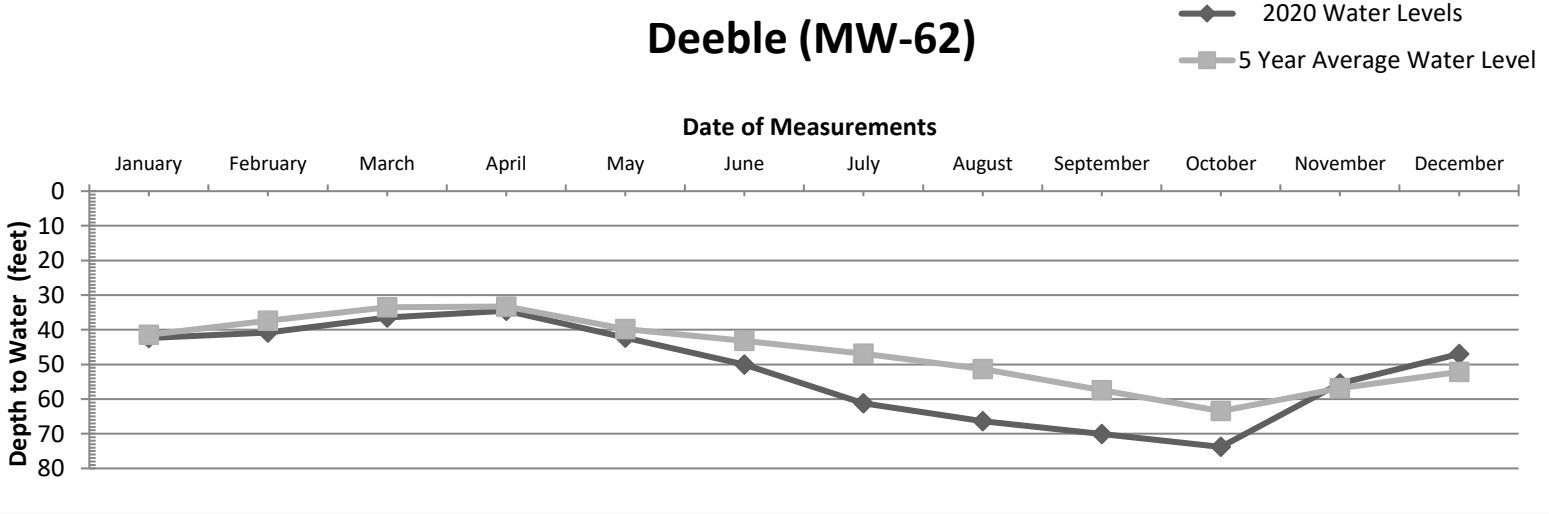


Figure 34
Harris (MW-63)

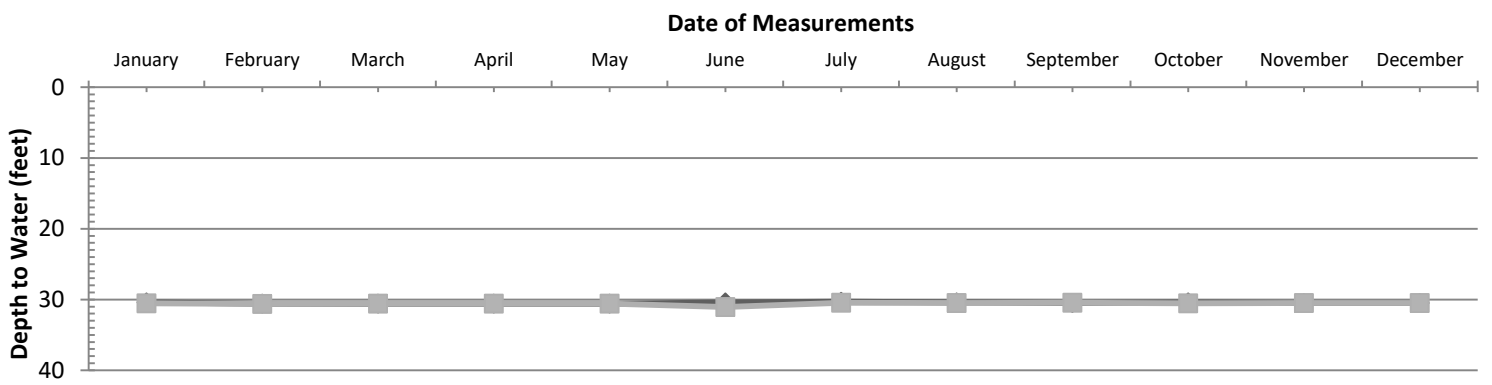
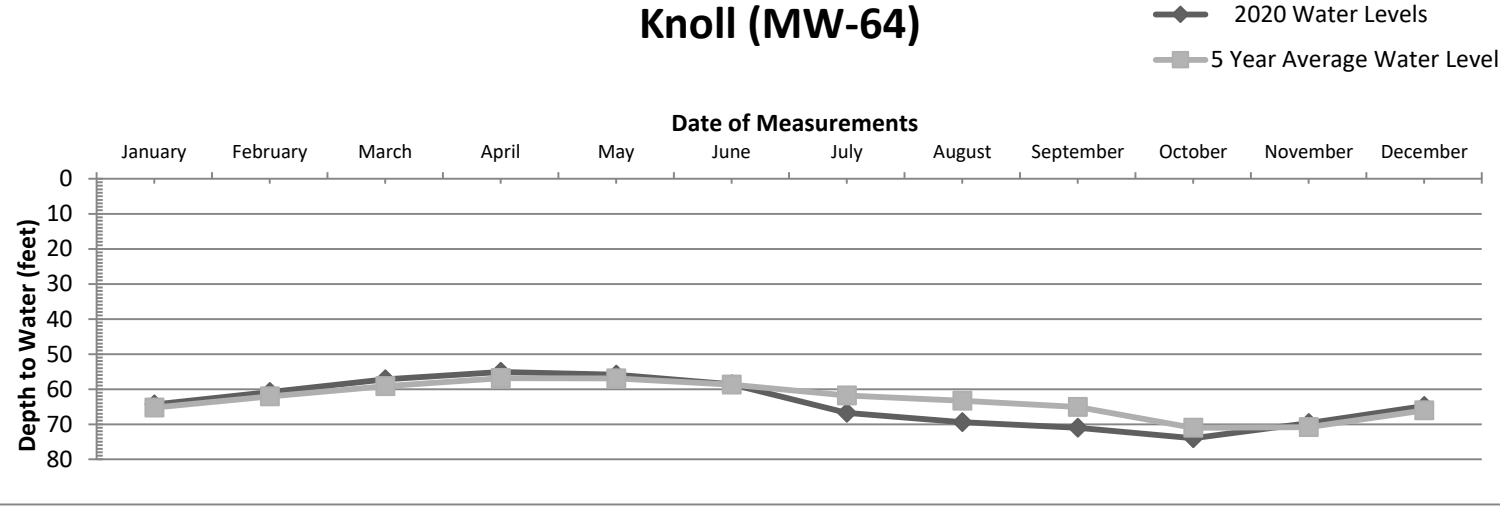


Figure 35
Knoll (MW-64)



MW- 65, Indelicato

The Indelicato well is used for domestic purposes and its hydrograph is shown in Figure 36. The shallowest water level was recorded in November (15.50 feet) and the deepest water level was recorded in June (21.50 feet). In 2020, the water levels are similar to the five-year average. Seasonal trends were similar to previous years.

MW- 66, Cressman

The Cressman well is a domestic well and its hydrograph is shown on Figure 37. The ground water fluctuations range from 15.80 feet (November) to 17.40 feet (July and August). Water levels in 2020 were similar to those that were averaged from the previous five years. Seasonal trends were similar to the past 5 years.

MW-67, Van Leer

The Van Leer well is a domestic well and its hydrograph can be seen on Figure 38. The shallowest water level was recorded in November (16.80 feet) and the deepest water level was recorded in June, July and August (18.20 feet). Water level and seasonal trends in 2020 were similar to those that were averaged from the previous five years.

MW- 68, Seiger

The Seiger well is a domestic well and its hydrograph is shown on Figure 39. The shallowest water level was recorded in December (9.40 feet) and the deepest water level was recorded in April (19.10 feet). Seasonal trends in 2020 were similar to those that were averaged from the previous years. Water levels were higher than the 5-year average water levels recorded.

MW- 69, White

This is a domestic well and its hydrograph is shown on Figure 40. The shallowest water level was recorded in March and April (25.20 feet) and the deepest water level was recorded in February (29.00 feet). Seasonal trends in 2020 were similar to those that were averaged from the previous years. Water levels were slightly higher than the 5-year average water levels throughout the year.

Figure 36
Indelicato (MW-4)*65

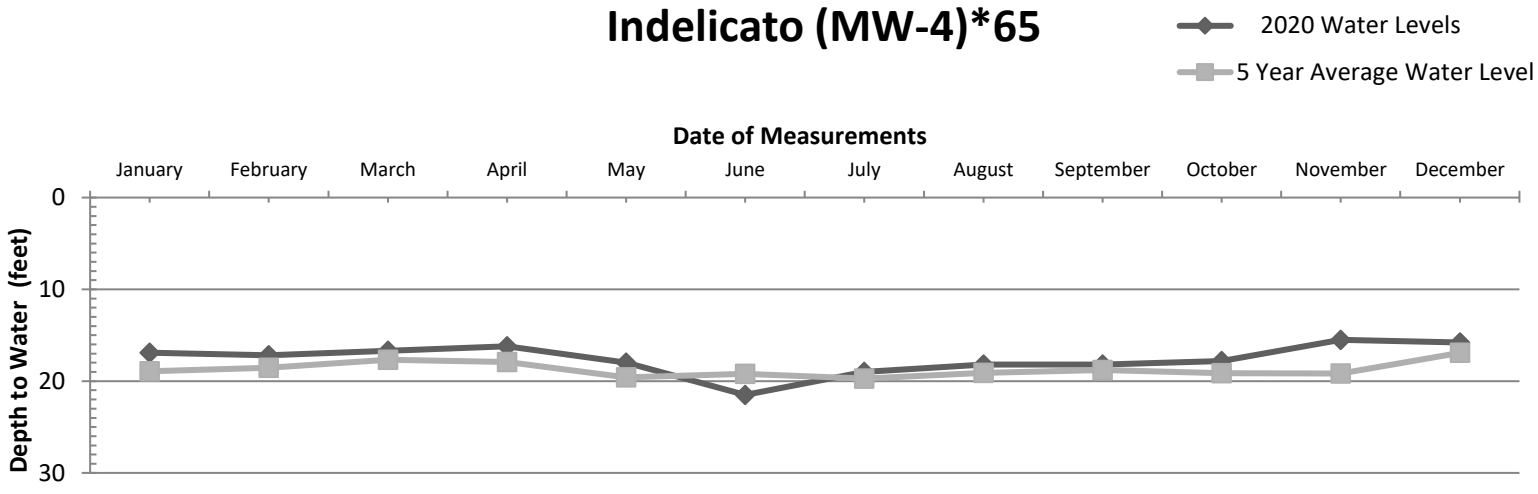


Figure 37
Cressman (MW-6)*66

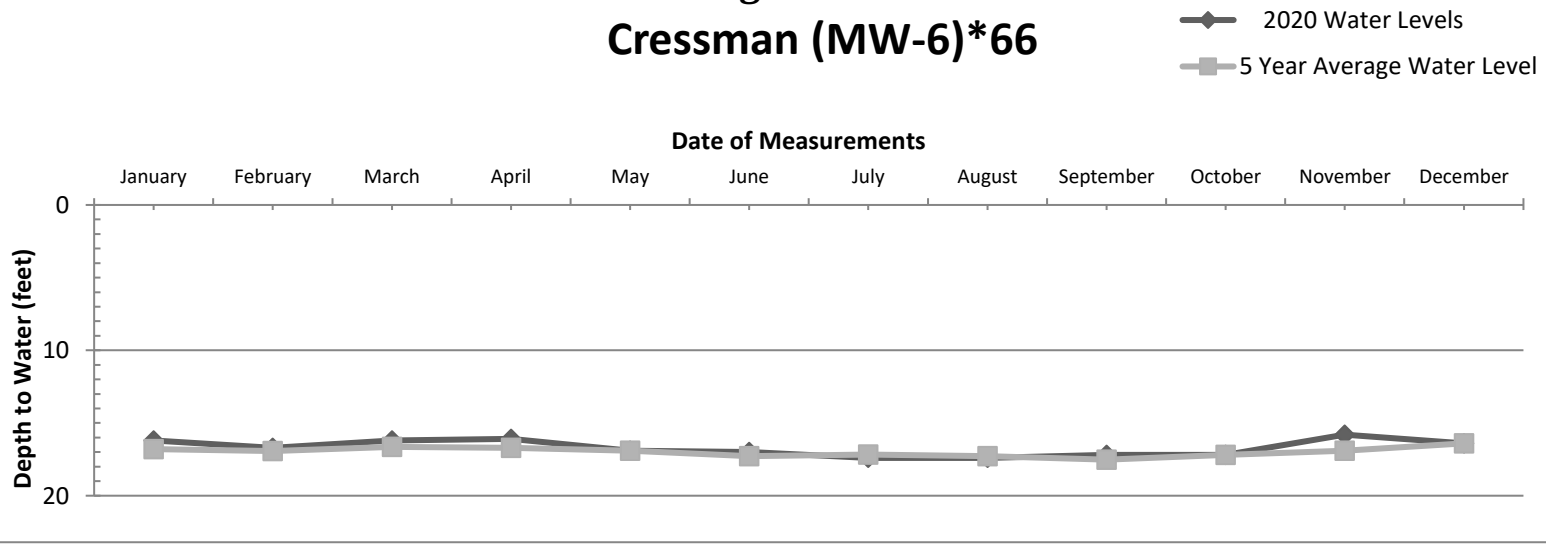


Figure 38
Van Leer (MW-3)*67

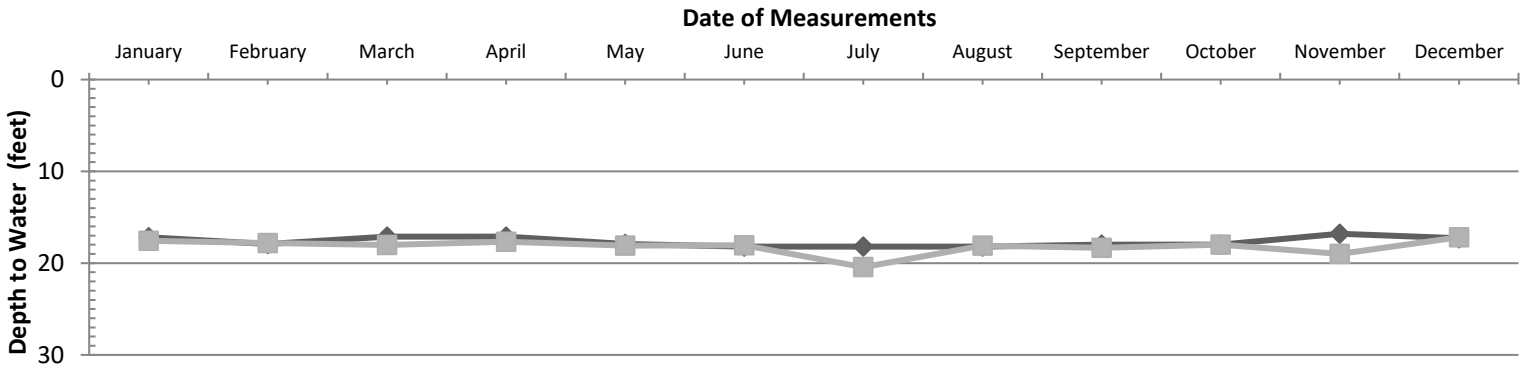
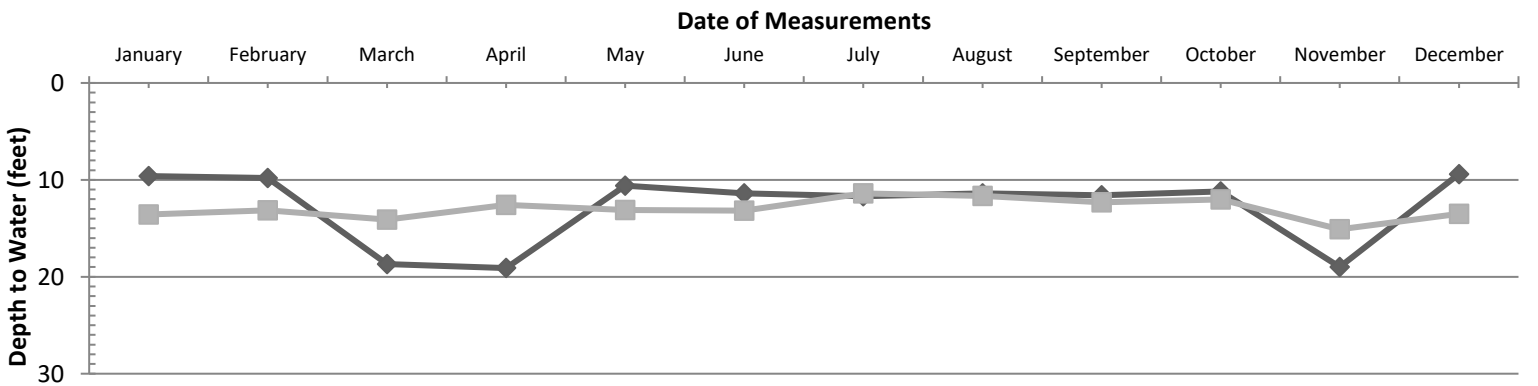


Figure 39
Seiger (MW-2)*68



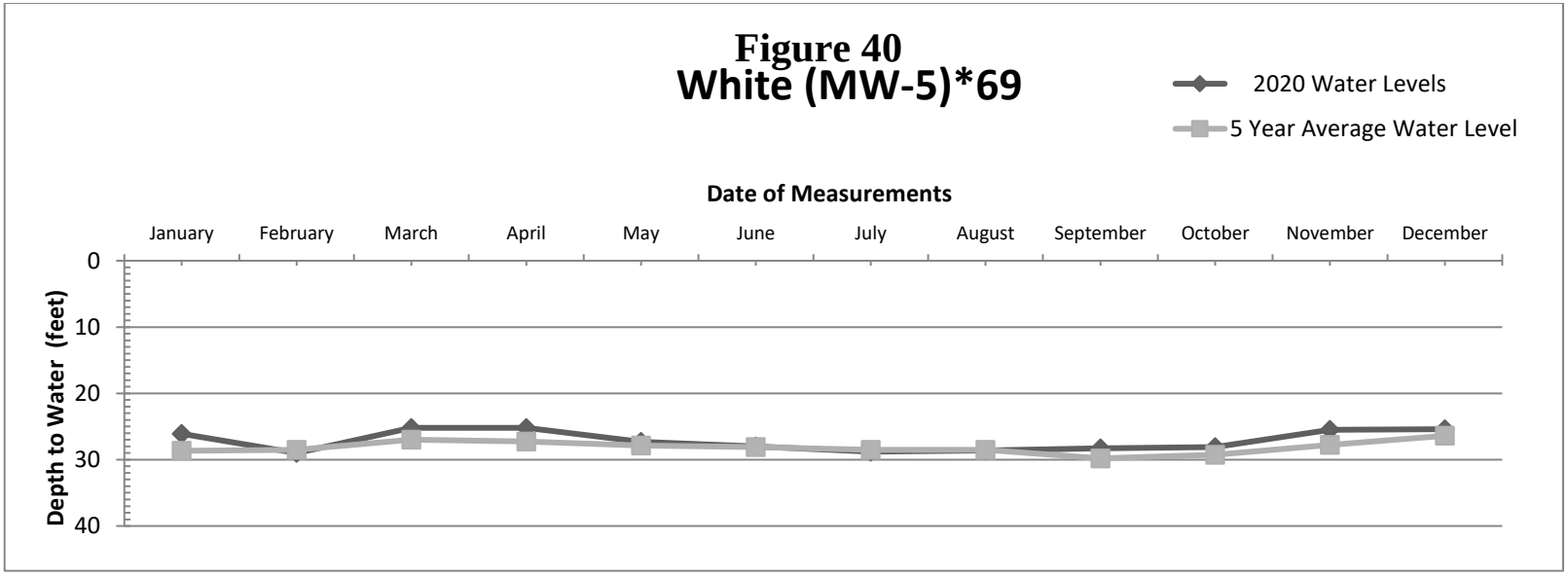


Figure 40
White (MW-5)*69
2020 Water Levels
5 Year Average Water Level
Date of Measurements
January
February
March
April
May
June
July
August
September
October
November
December
Depth to Water (feet)
0
10
20
30
40

PRA Well No. 5

PRA Well No. 5 is a municipal well and the hydrograph is shown on Figure 41. The water level fluctuated between 69.0 feet (January) and 97.0 feet (October).

PRA Well No. 6

PRA Well No. 6 is a municipal well and the hydrograph is shown on Figure 42. The water level fluctuated between 4.00 feet (January) and 41.0 feet (October).

PRA Well No. 7

PRA Well No. 7 is a municipal well and the hydrograph is shown on Figure 43. The water level fluctuated between 31.0 feet (January) and 102.0 feet (September and October).

PRA Well No. 8

PRA Well No. 8 is an unused municipal well and its hydrograph is shown on Figure 44. The shallowest water level was recorded in April (12.60 feet) and the deepest water level was recorded in September (38.10 feet).

PRA Well No. 10

PRA Well No. 10 is a municipal well and the hydrograph is shown on Figure 46. The water level fluctuated between 46.0 feet (February) and 73.00 feet (September).

PRA Well No. 12

PRA Well No. 12 is a municipal well and its hydrograph is shown on Figure 47. PRA No. 12 was not monitored during 2020.

Figure 41
PRA Well No. 5

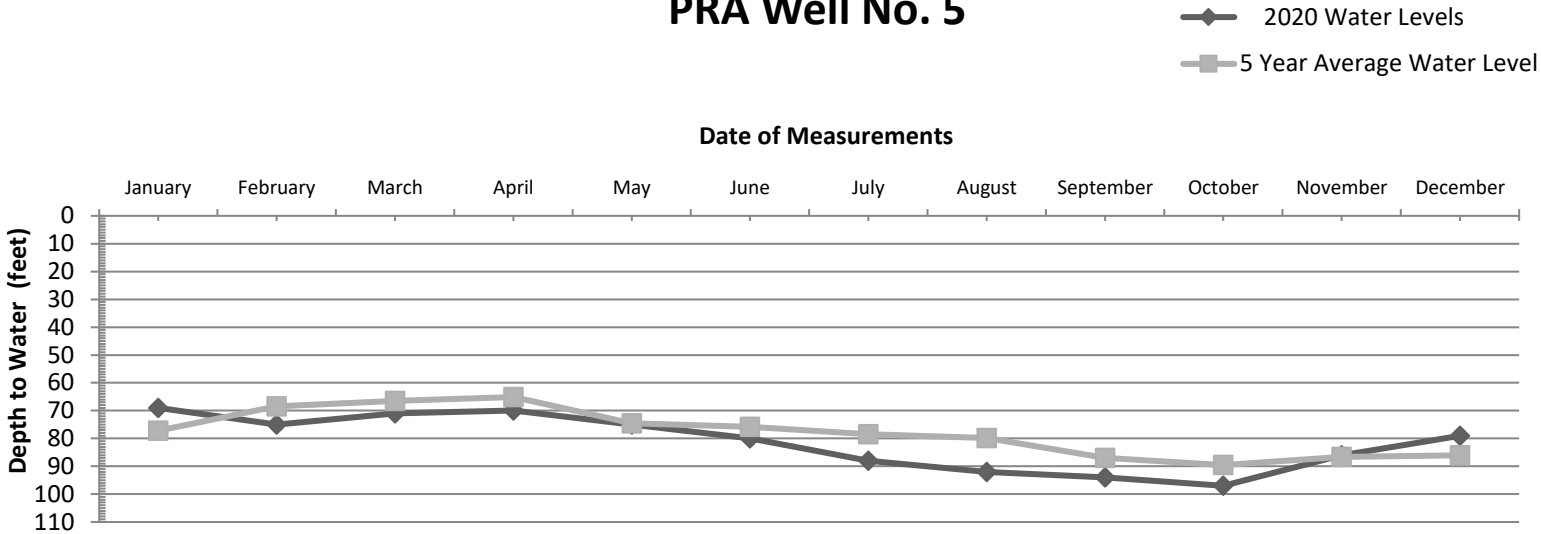


Figure 42
PRA Well No. 6

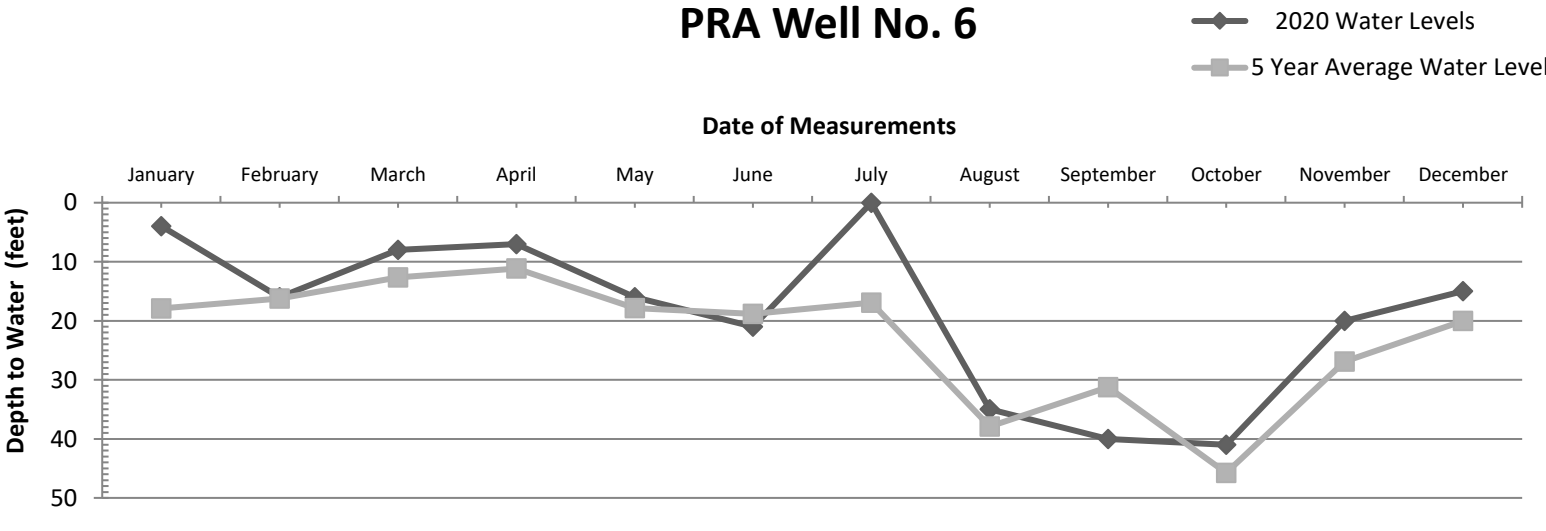


Figure 43

PRA Well No. 7

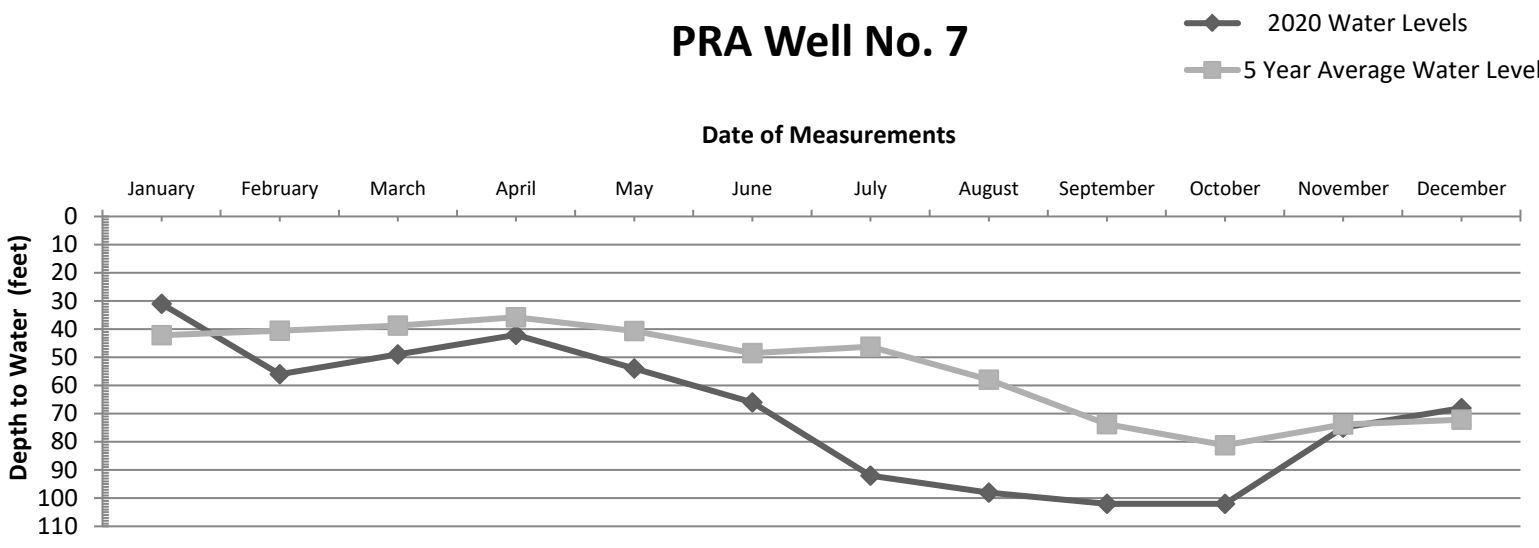


Figure 44

PRA Well No. 8

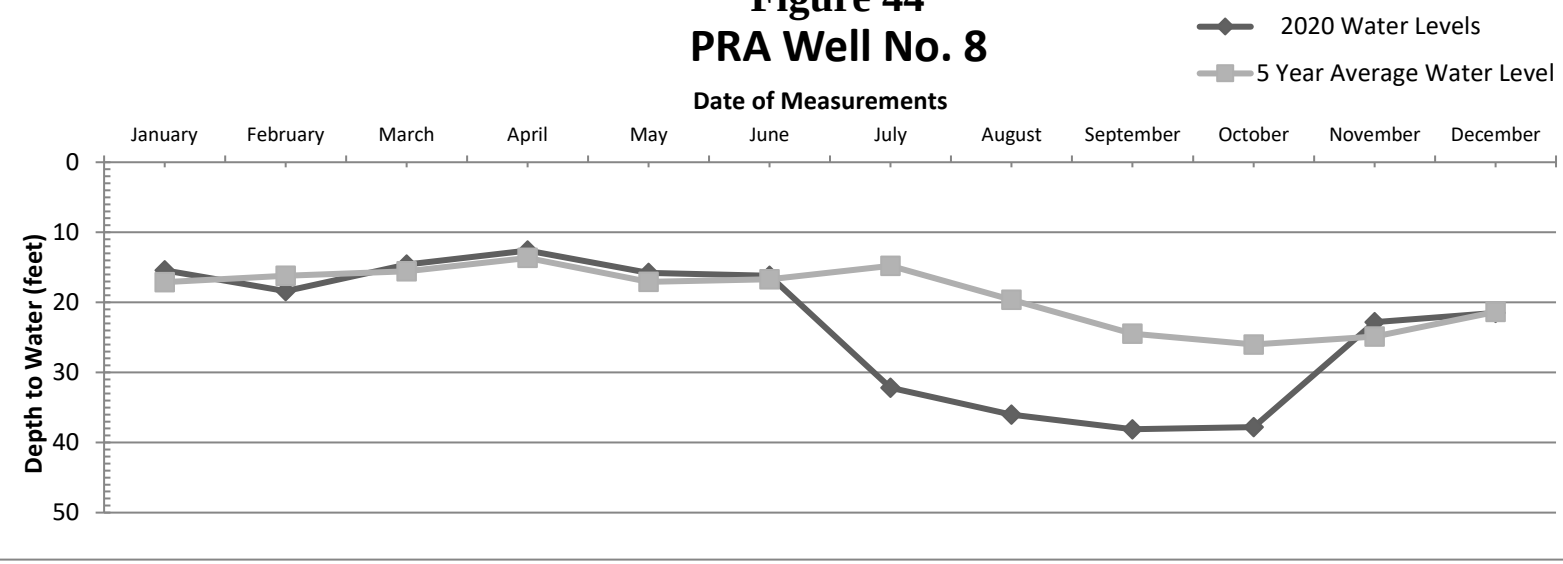


Figure 45
PRA Well No. 9

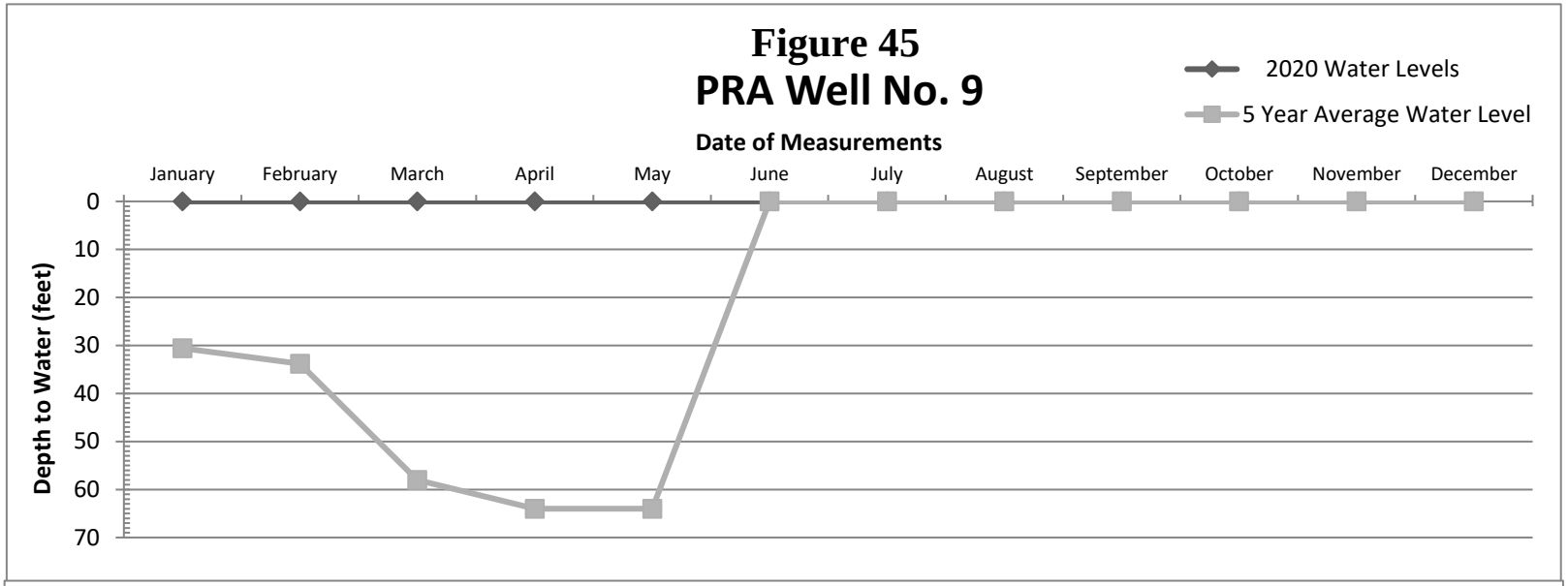
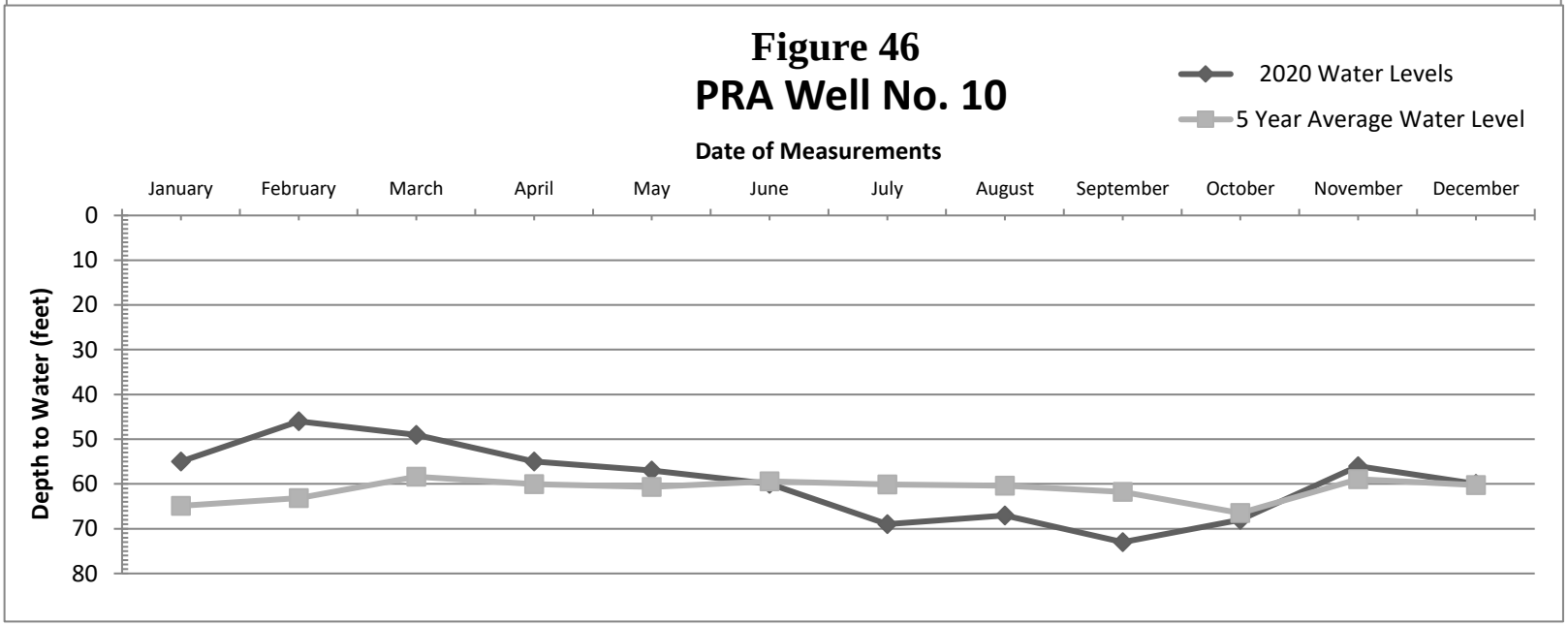


Figure 46
PRA Well No. 10



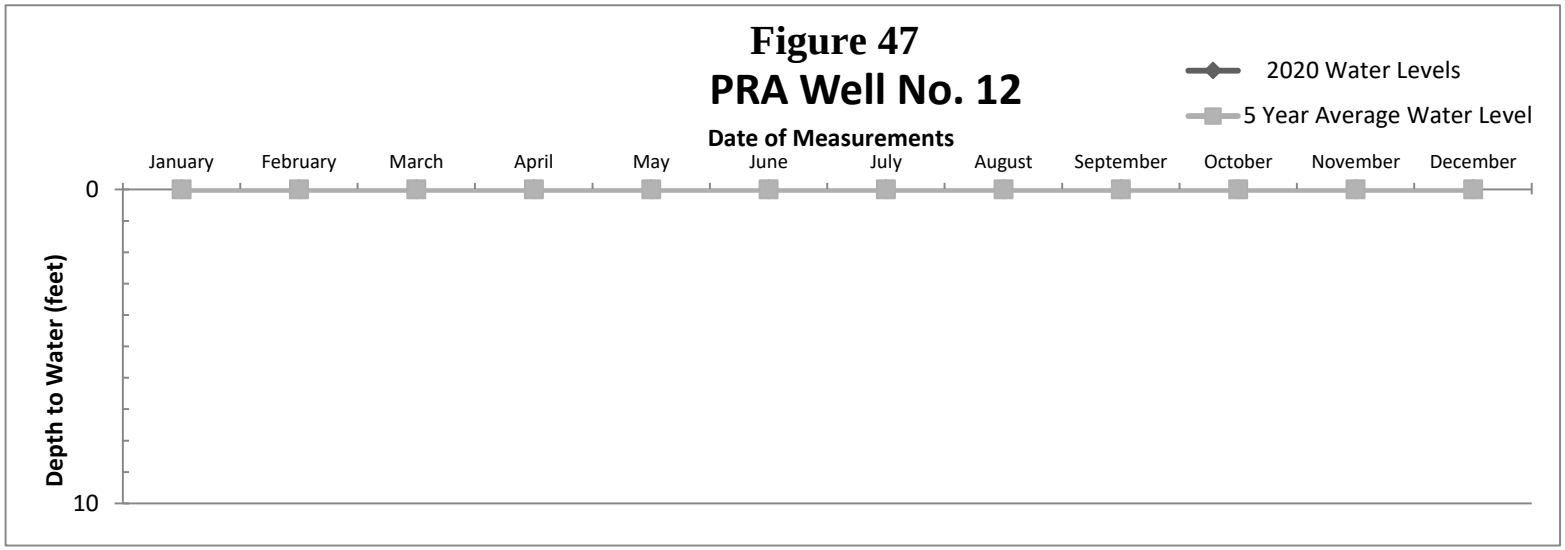


Figure 47
PRA Well No. 12
2020 Water Levels
5 Year Average Water Level
Date of Measurements
January
February
March
April
May
June
July
August
September
October
November
December
Depth to Water (feet)
0
10

PRA Well No. 14 (PRA Weidner (WD-14)

PRA Well No. 14 is an unused municipal well and its hydrograph is shown on Figure 48. The shallowest water level was recorded in April (12.80 feet) and the deepest water level was recorded in September and October (14.00 feet). Water levels were slightly lower in 2020 than the 5-year average. Seasonal trends in 2020 were higher to those that were averaged from the previous 5 years throughout the year.

1401 Three Mile Run Road (MW-70)

This is a municipal monitoring well and its hydrograph is shown on Figure 49. The shallowest water level was recorded in April (25.20 feet) and the deepest water level was recorded in October (42.80 feet). Water levels in 2020 were similar to the 5-year average. Seasonal trends follow a similar pattern as the five-year average.

1407 Three Mile Run Road (MW-71)

The hydrograph of this municipal monitoring well is shown on Figure 50. The shallowest water level was recorded in April (42.40 feet) and the deepest water level was recorded in October (75.30 feet). Water levels in 2020 were similar to the 5-year average. Seasonal trends follow the same pattern as the five-year average.

1423 Three Mile Run Road (MW-72)

The hydrograph of this municipal monitoring well is shown on Figure 51. The shallowest water level was recorded in May (17.60 feet) and the deepest water level was recorded in October (35.80 feet). Seasonal trends in 2020 were similar to those that were averaged from the previous years. Water levels were similar in 2020 than the 5-year average from June to December.

MW- 73, Eberle

The Eberle well is a domestic well. This well was added to the network in September 2018. The well is located at 2002 West Rock Road. The hydrograph appears on Figure 52. The shallowest water level was recorded in March (70.80 feet) and the deepest water level was recorded in October (75.50 feet). The well appears to be consistent in the 70-foot range.

409 Blooming Glen Rd. (MW-74)

The hydrograph of this municipal monitoring well is shown on Figure 53. The shallowest water level was recorded in April (13.80 feet) and the deepest water level was recorded in September (16.60 feet). Water levels and seasonal trends in 2020 were similar to those that were averaged from the previous 5 years.

Figure 48
PRA Weidner (WD -14)

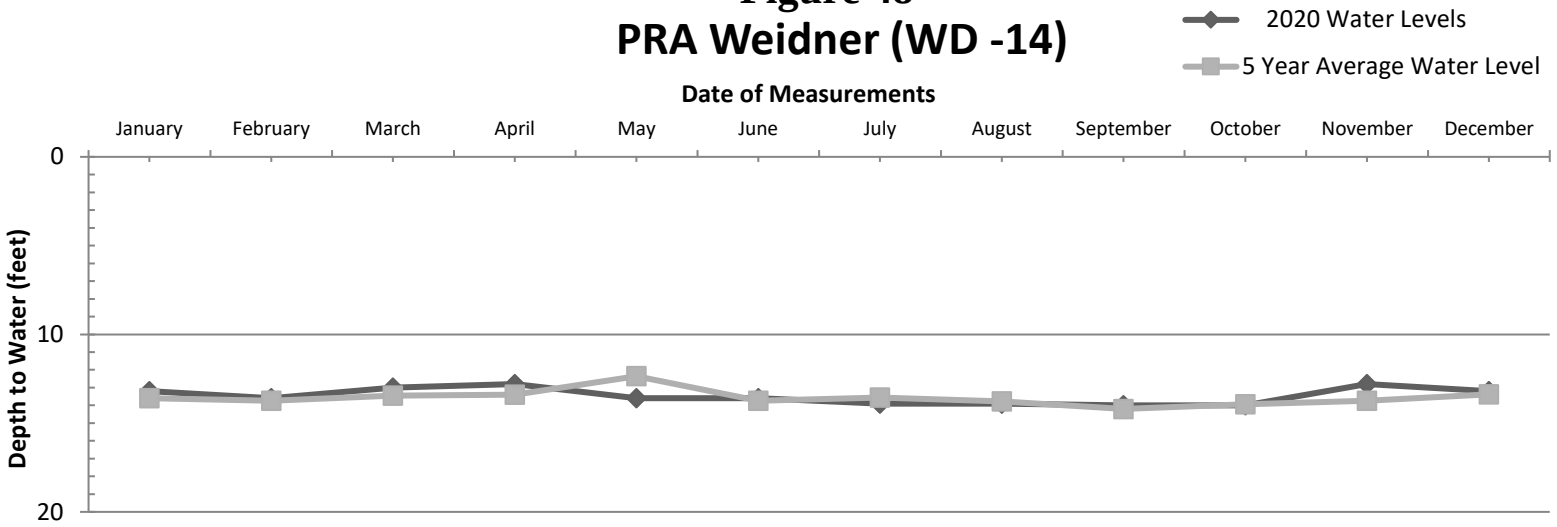


Figure 49
1401 3 Mile Run Rd (MW-70)

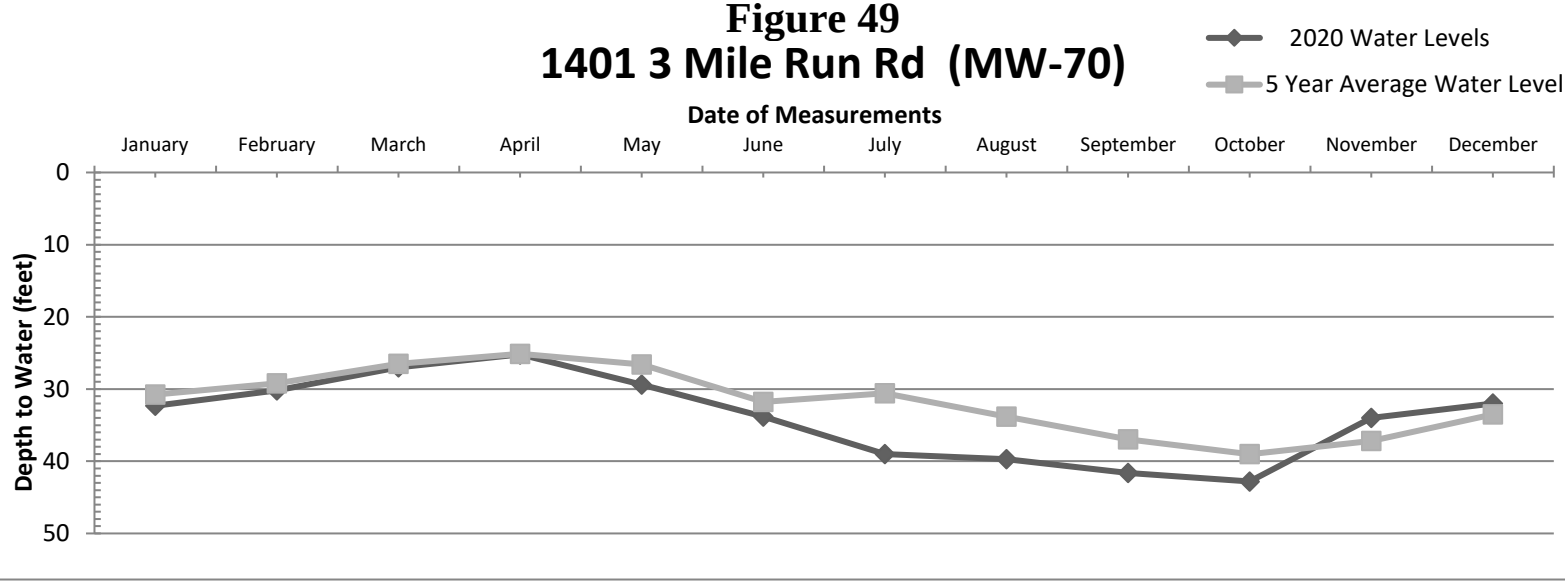


Figure 50
1407 3 Mile Run Rd (MW-71)

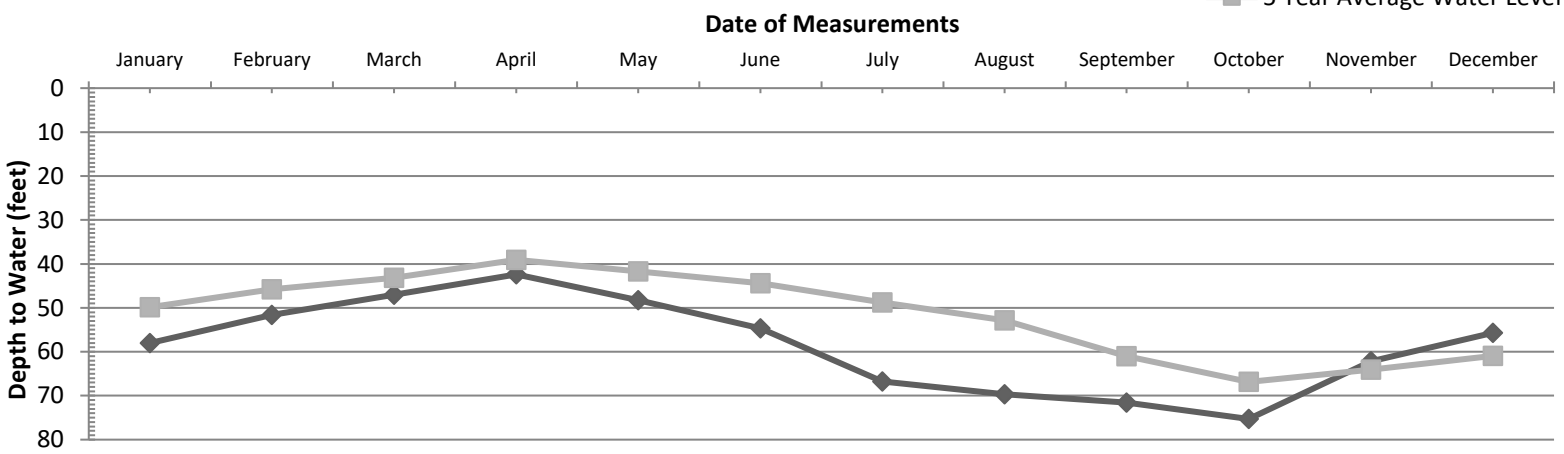


Figure 51
1423 3 Mile Run Rd (MW-72)

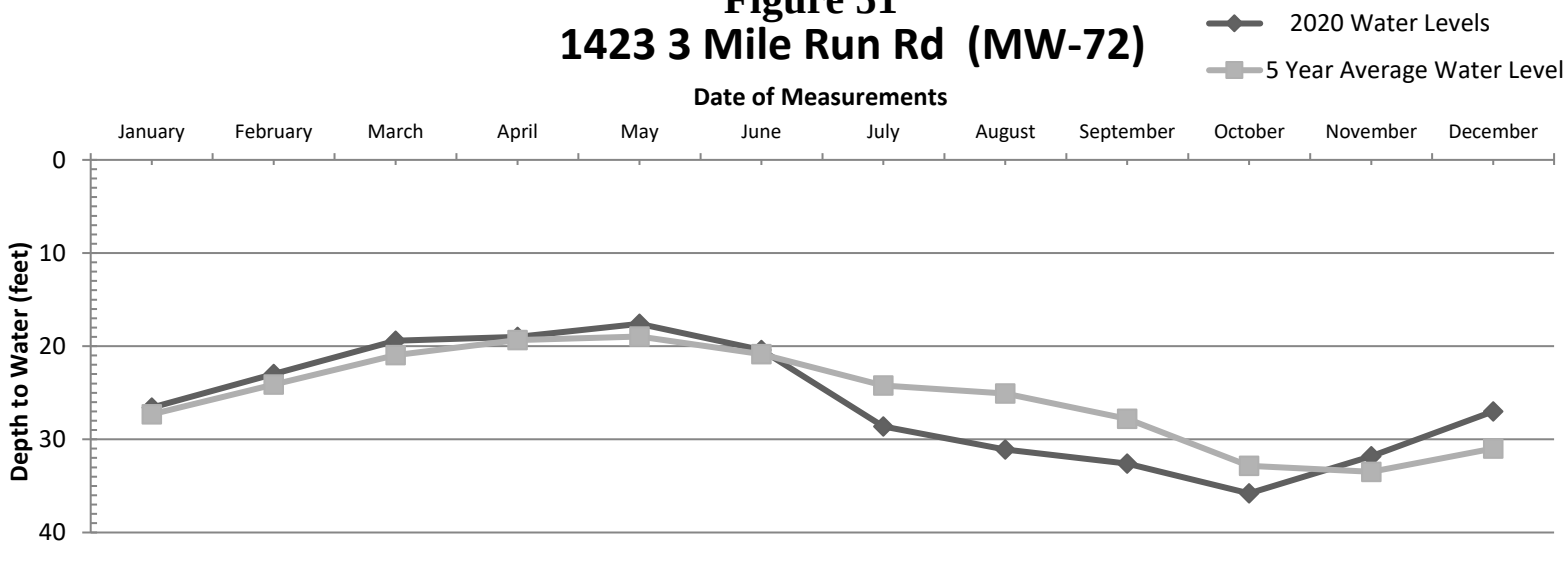


Figure 52
Eberle (MW-73)

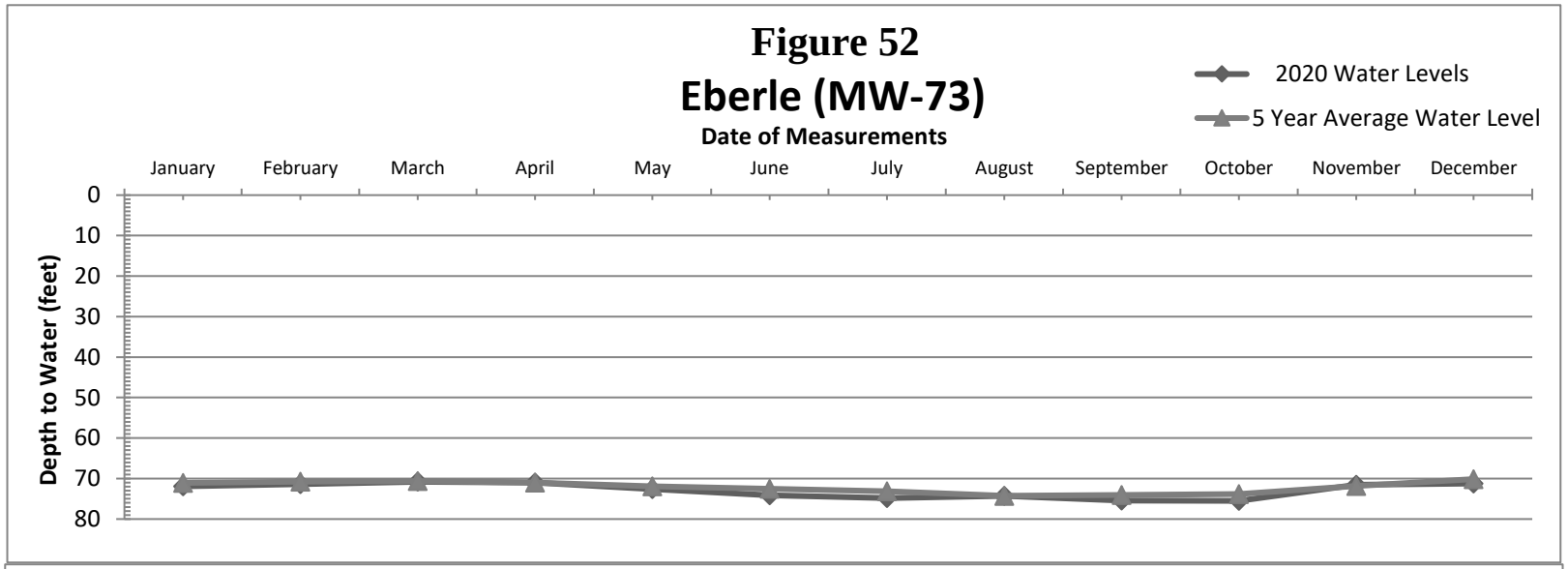
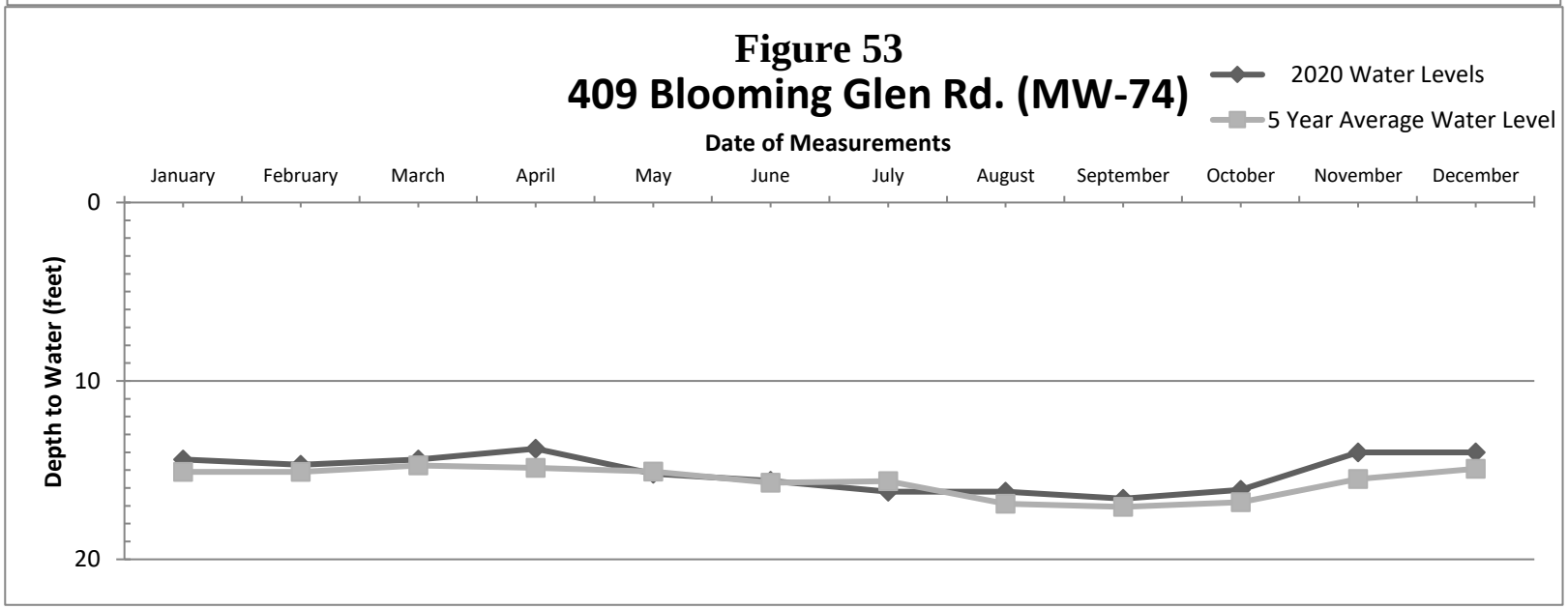


Figure 53
409 Blooming Glen Rd. (MW-74)



WASTEWATER TREATMENT

The ground water pumped from the PRA wells, minus any consumptive use, after distribution to the customers, is conveyed to the Pennridge Wastewater Treatment Plant (WWTP) for treatment. The plant is located in West Rockhill Township near the boundary with Sellersville and about one mile southwest of Perkasie. The plant services the area municipalities of Perkasie, Sellersville, Silverdale, Hilltown Township, East Rockhill Township, and Telford. After treatment, the effluent is discharged into the East Branch of Perkiomen Creek, increasing flow downstream of the WWTP.

Monthly wastewater flows for the PWTA sewer collection system are reported in Table 12. An error in metering at Meter 7 in January 2020 indicated a negative inflow of 89.255 mg skewing the numbers for the remainder of 2020. 2021 data will be compared to 2019 data when it becomes available.

TABLE 12

PWTA vs. PRA

Flow Totals for the Year 2020

PWTA

(data from monthly flow reports) **Monthly**

	Meter #1	Meter #5	Meter #7	Meter #8	TOTALS
January	63,384,100	20,256,900	(89,255,500)	15,896,000	**10,281,500**
February	63,055,000	18,802,300	159,700	16,519,300	**98,536,300**
March	61,640,400	17,648,300	157,700	15,021,800	**94,468,200**
April	67,547,100	-	185,500	15,664,100	**83,396,700**
May	50,465,400	15,852,500	127,600	10,106,500	**76,552,000**
June	37,578,600	12,018,100	83,700	6,938,200	**56,618,600**
July	41,809,000	10,855,600	97,200	8,512,300	**61,274,100**
August	47,443,400	2,658,100	133,300	14,359,500	**64,594,300**
September	35,498,700	12,086,200	97,800	8,647,900	**56,330,600**
October	42,286,400	1,452,100	121,600	10,194,300	**54,054,400**
November	53,556,100	18,880,100	137,100	11,988,600	**84,561,900**
December	-	-	-	-	**-**
THE YEAR	**564,264,200**	**130,510,200**	**(87,954,300)**	**133,848,500**	**740,668,600**
AVERAGE PWTA FLOW PER DAY	**1,545,929**	**357,562**	**(240,971)**	**366,708**	**2,029,229**
(total usage/365 days)					
PER DAY	**919**	**222**	**(803)**	**1,594**	**503**

PRA

(data from CUSI-Yearly)

	Meter #1	Meter #5	Meter #7	Meter #8	Sellersville	TOTALS
TOTAL EDUs	**1683**	**1613**	**300**	**230**	**211**	**4037**
TOTAL USAGE FOR PRA (4 Qtrs)						**-**
AVERAGE PRA FLOW PER DAY	**-**	**-**	**-**	**-**	**-**	**-**
(total usage/365 days)						
PER DAY	**-**	**-**	**-**	**-**	**-**	**-**

WATER CONSERVATION AND LEAK DETECTION

Since 1992, more than 29,000 linear feet of water mains have been repaired. The major result of the repairs has been a decline in the average daily ground water production over recent years, bottoming out in 2000 at 0.686 mgd, until 2012 when production was decreased to .660 mgd. In 2020, Well Production increased from 0.712 mgd in 2019 to 0.722 mgd, a increase of 0.010 mgd (Table 13).

The average daily pumping from PRA production wells per EDU peaked in 1997 at 210.2 gpd/EDU (Figure 54). This reporting period showed a continued decrease in gpd/EDU from the unordinary increase the system experienced in 2016. The sharpest increase in gpd/EDU was the 2016 reporting period. Reporting year 2020 showed a decrease (-0.7 gpd/EDU) from 2019. Reporting year 2020 had the second lowest gpd/EDU (142.8) recorded in the last 23 years. Water supply accounting data generated by PRA are included in Appendix B.

In 2020, water lost (reported as water unaccounted for), Appendix B, amounted to 24.22 mg, or 9.19% of the total production. In 2019, water lost was 19.38 mg, therefore, in 2020 water lost increased by 4.84 mg. Prior to implementation of the conservation and leak detection program, water loss was estimated at 50% of production. PRA is continuing its leak detection program in order to reduce water losses further.

TABLE 13
PRA Monthly Well Production Per EDU

Perkasie Regional Authority Average Daily Well Production By Year/Month

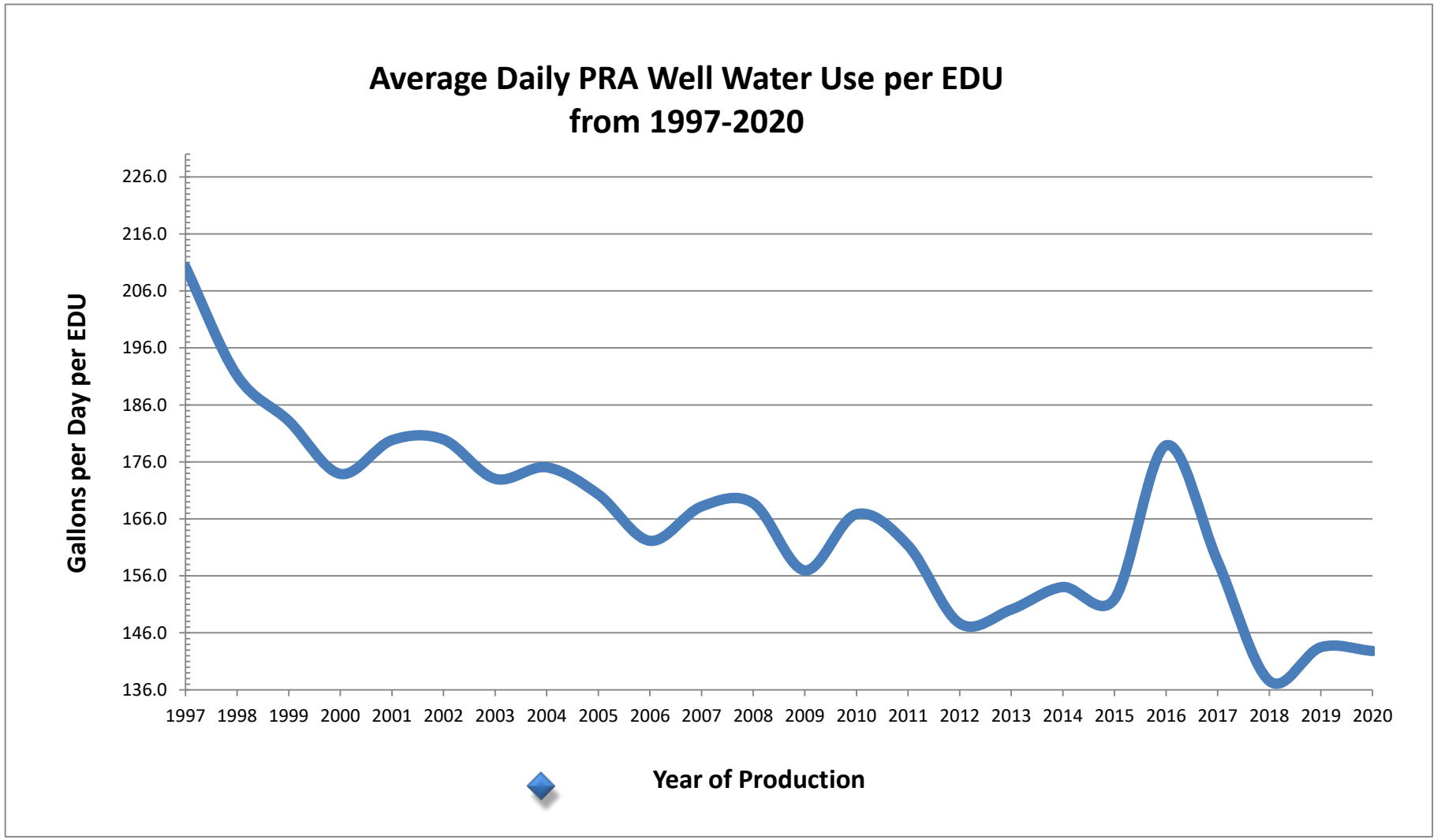
	Average Gallons per Day																							
Month	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
January	753,935	660,613	677,484	693,968	708,323	743,613	686,290	721,516	661,129	674,710	676,548	716,032	702,871	625,290	677,581	665,581	601,006	714,645	674,739	804,323	851,774	724,097	672,806	698,613
February	751,536	679,250	665,500	711,393	714,357	749,000	684,357	752,276	686,857	655,214	727,393	696,069	697,786	674,500	684,250	668,828	666,857	721,426	683,571	816,207	836,000	655,536	664,250	661,138
March	773,065	703,355	669,065	696,387	713,355	734,968	702,621	706,516	648,129	657,484	700,194	684,935	711,258	698,839	684,968	661,581	676,452	689,193	720,807	811,323	839,161	662,742	670,613	680,097
April	779,967	724,800	680,767	693,167	744,667	730,900	703,533	726,663	658,767	688,833	727,567	732,567	706,600	751,633	701,400	655,833	696,867	680,400	707,134	817,100	878,667	645,833	685,100	683,400
May	821,097	778,032	793,258	724,290	810,645	729,000	755,419	822,839	777,581	788,323	812,516	785,226	813,935	841,710	819,903	743,419	766,710	739,687	799,774	845,452	749,806	700,613	738,677	767,742
June	838,367	756,733	844,833	697,833	765,200	731,333	748,100	797,133	829,700	734,000	795,700	842,400	734,633	802,133	778,300	709,300	742,467	720,424	707,633	880,733	667,633	679,433	688,200	786,233
July	836,194	782,548	797,774	717,000	723,516	853,645	766,355	740,161	739,774	739,968	786,000	784,548	692,452	816,161	793,161	712,226	730,323	686,678	667,678	826,774	662,161	682,194	695,903	802,452
August	710,419	758,806	647,161	641,065	715,516	780,903	681,452	693,968	734,129	752,387	759,032	800,677	684,032	811,194	707,903	636,290	698,742	675,130	700,195	814,452	659,129	657,000	677,645	770,677
September	651,867	672,167	647,467	670,867	728,033	719,567	691,500	730,933	732,300	687,800	739,633	746,067	678,567	735,800	706,267	629,067	645,824	759,467	695,500	830,667	679,033	669,800	736,133	758,567
October	647,129	661,839	658,387	664,645	709,968	699,323	687,323	693,097	688,387	699,839	700,032	719,839	672,414	746,230	694,742	606,484	648,419	655,904	645,807	846,774	669,484	661,290	748,677	699,806
November	642,667	665,500	666,767	660,100	696,333	690,500	706,833	649,600	655,433	698,267	679,900	715,733	656,409	781,100	692,133	614,633	649,667	674,100	634,133	807,567	652,733	659,333	757,667	674,133
December	640,161	676,290	665,323	662,161	669,645	687,968	720,161	661,161	669,903	659,097	718,258	714,129	666,685	678,097	673,323	617,194	649,710	676,484	732,549	833,452	650,129	669,226	802,677	680,387
Daily Avg.	**737,200**	**709,994**	**701,149**	**686,073**	**724,963**	**737,560**	**711,162**	**724,655**	**706,841**	**702,994**	**735,231**	**744,852**	**701,470**	**746,891**	**717,828**	**660,036**	**681,087**	**699,462**	**697,460**	**827,902**	**732,976**	**672,258**	**711,529**	**721,937**

Perkasie Regional Authority Average Daily Well Production per EDU by Year/Month

	Average Gallons per Day per EDU[1]																							
EDUs[2]	**3,462**	**3,648**	**3,777**	**3,883**	**3,980**	**4,046**	**4,056**	**4,088**	**4,097**	**4,277**	**4,315**	**4,343**	**4,411**	**4,417**	**4,449**	**4,442**	**4,479**	**4,484**	**4,530**	**4,568**	**4,772**	**4,822**	**4,959**	**4,972**
Month	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
January	210.7	175.2	173.6	173.0	172.2	177.9	163.7	170.8	156.2	152.7	151.7	159.6	154.2	137.0	152.3	148.9	129.9	154.2	144.1	170.4	180.5	145.3	135.7	136.0
February	232.6	199.5	188.8	189.5	192.3	198.3	180.8	197.2	179.6	164.1	180.6	165.8	169.5	163.6	153.8	149.6	159.5	172.4	161.7	191.4	196.1	145.7	133.9	137.6
March	216.1	186.6	171.4	173.6	173.5	175.8	167.6	167.3	153.1	148.8	157.0	152.6	156.0	153.1	154.0	148.0	146.2	148.7	154.0	171.9	177.8	133.0	135.2	132.4
April	225.3	198.7	180.2	178.5	187.1	180.6	173.5	177.8	160.8	161.1	168.6	168.7	160.2	170.2	157.7	146.7	155.6	151.7	156.1	178.9	192.4	133.9	138.2	137.4
May	229.5	206.4	203.2	180.5	197.1	174.4	180.2	194.8	183.7	178.4	182.2	175.0	178.6	184.4	184.3	166.3	165.7	159.6	170.9	179.1	158.8	140.6	149.0	149.4
June	242.2	207.4	223.7	179.7	192.3	180.8	184.4	195.0	202.5	171.6	184.4	194.0	166.5	181.6	174.9	158.7	165.8	160.7	156.2	192.8	146.2	140.9	138.8	158.1
July	233.7	207.6	204.4	178.7	175.9	204.2	182.8	175.2	174.7	167.4	176.3	174.8	151.9	178.8	178.3	159.3	157.8	148.2	142.6	175.2	140.3	136.9	140.3	156.2
August	198.6	201.3	165.8	159.8	174.0	186.8	162.6	164.3	173.4	170.2	170.2	178.4	150.1	177.7	159.1	142.3	151.0	145.7	149.6	172.5	139.6	131.9	136.6	150.0
September	188.3	184.3	171.4	172.8	182.9	177.8	170.5	178.8	178.7	160.8	171.4	171.8	153.8	166.6	158.7	140.7	144.2	169.4	153.5	181.8	148.7	138.9	148.4	152.6
October	180.9	175.6	168.7	165.6	172.6	167.3	164.0	164.1	162.6	158.4	157.0	160.4	147.5	163.5	156.2	135.7	140.1	141.6	138.0	179.4	141.8	132.7	151.0	136.2
November	185.6	182.4	176.5	170.0	175.0	170.7	174.3	158.9	160.0	163.3	157.6	164.8	148.8	176.8	155.6	137.5	145.0	150.3	140.0	176.8	142.9	136.7	152.8	135.6
December	178.9	168.5	170.5	165.0	162.8	164.6	171.8	156.5	158.2	149.1	161.1	159.1	146.3	148.6	151.3	138.1	140.4	146.0	156.5	176.6	137.7	134.3	161.9	132.4
Daily Avg./ EDU	**210.2**	**191.1**	**183.2**	**173.9**	**179.8**	**179.9**	**173.0**	**175.0**	**170.3**	**162.2**	**168.2**	**168.7**	**157.0**	**166.8**	**161.3**	**147.7**	**150.1**	**154.0**	**151.9**	**178.9**	**158.6**	**137.6**	**143.5**	**142.8**

1. Each month is normalized to 30-days
2. Based on EDUs installed by December of the Recording Year

FIGURE 54

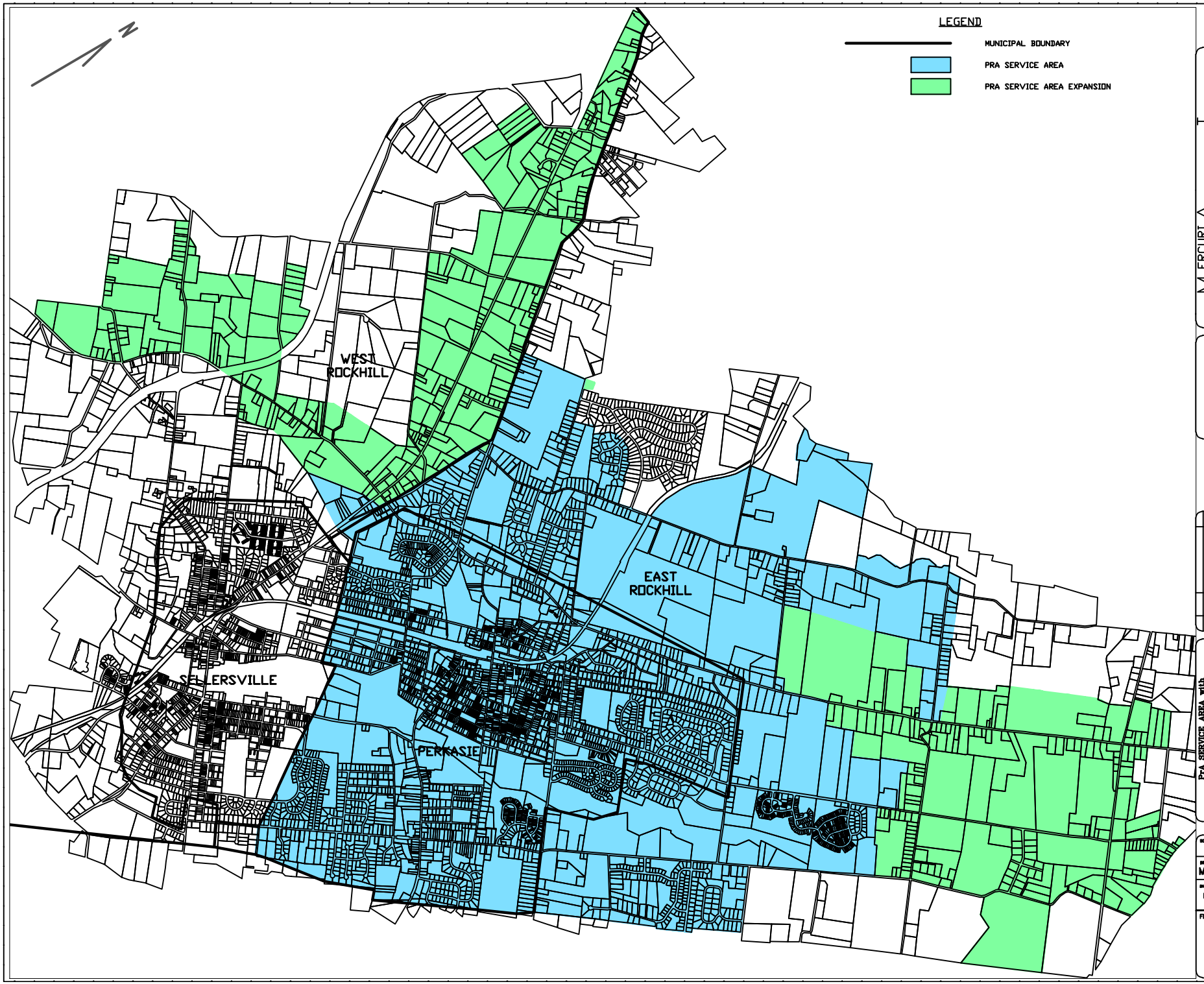

Average Daily PRA Well Water Use per EDU
from 1997-2020
Gallons per Day per EDU
226.0
216.0
206.0
196.0
186.0
176.0
166.0
156.0
146.0
136.0
1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020
Year of Production

EXPANSION OF SERVICE AREA

Long-Term Expansion

East Rockhill Township has requested and PRA has agreed to extend the water supply system to serve the Village of Hagersville located near the intersection of Fifth Street and State Route 313. Apparently, this area of East Rockhill Township is plagued with malfunctioning on-lot sewage disposal systems. Similarly, West Rockhill Township and PRA have entered into an agreement whereby PRA will provide water service to the portion of the township located near Route 309 and Ridge Road. The future service areas are shown on Figure 55.

PRA has purchased the Ridge Run Development from North Penn Water Authority, including their two wells and above ground water storage tank. PRA currently is serving the development via an interconnect because of the PFAS contamination at NP-73 and NP-74.


LEGEND
MUNICIPAL BOUNDARY
PRA SERVICE AREA
PRA SERVICE AREA EXPANSION
N
WEST ROCKHILL
EAST ROCKHILL
SELLERSVILLE
PERKASIE
MERCURI ASSOCIATES INC.
GEOLOGICAL, ENGINEERING & ENVIRONMENTAL CONSULTANTS
627 HAMPTON AVENUE
SOUTHAMPTON, PA. 18966
PrA SERVICE AREA with PROPOSED SERVICE AREA EXPANSIONS
PERKASIE REGIONAL AUTHORITY
PERKASIE BOROUGH
BUCKS COUNTY, PA
1" = 3000'
MFM
BMM
MARCH 15, 2013
FIGURE:
55

CONCLUSIONS

1. The Perkasie Regional Authority (PRA) is the water purveyor for a population of approximately 12,800. The service area includes the Borough of Perkasie, East Rockhill Township and a small portion of Hilltown Township.

2. The Authority obtains its water supply from the underlying ground water via production wells designated as Well Nos. 5, 6, 7, 10 and 11. Well No. 7 was approved by the DRBC on September 24, 2008 under Docket No. D-1997-012-CP-3. The well had previously been approved by PADEP on June 16, 2008 (Public Water Supply Permit No. 0908503). Five (5) production wells are presently in operation, Well Nos. 5, 6, 7, 10 and 11. Well No. 9 is not in service due to an electrical fire that occurred in late 2012. Well No. 12 is not in service because the concentration of arsenic in the ground water exceeds the drinking water standards. DRBC Docket No. D-1997-012-CP-4 was approved in late 2018.

3. The monitoring network, including the five (5) production wells and non-production wells No. 9 and No. 12, consists of 39 wells.

4. The project area lies within the Delaware River Basin Commission-designated southeastern Pennsylvania Ground Water Protected Area. Regulations applicable to the protected area require a DRBC permit for withdrawals exceeding 10,000 gpd over any 30-day period.

5. The new DRBC Docket No. D-1997-012-CP-4 allows a maximum ground water withdrawal of 44.83 million gallons per 30-days, or 1.494 million gallons per day. The new docket (D-1997-012-CP-4) allocates 24.99 mg/30 days to the Tohickon Three Mile Run sub-basin wells (Wells Nos. 5, 6 and 7) and 19.84 mg to the East Branch Perkiomen Creek Morris Run sub-basin (Well Nos. 10 and 11).

6. Perkasie Borough is located in an outcrop area of the "mixed zone" which is comprised of interbedded layers of the Brunswick and Lockatong Formation. North of the Borough are Jurassic diabase intrusions that have also caused alteration of

adjacent sedimentary rocks to hornfels. The Brunswick Formation, in the project area, is comprised of red shale, siltstone, gray shale, and infrequent, weakly cemented sandstone. The Lockatong Formation consists primarily of hard black to gray argillite.

7. Ground water occurrence and movement in the Perkasie area is controlled by both primary and secondary porosity and permeability. Drilled wells receive water contribution from bedding plane openings and well-developed fractures.

8. The aquifers that underlie the PRA area are recharged by precipitation.

9. Precipitation received by the area was approximately 55.10 inches for 2020, which is 5.06 inches above the long-term average precipitation based on available data.

10. System withdrawals for the 12-month period totaled 264.336 million gallons. Combined monthly ranged from a high of 24.876 million gallons in July to a low of 19.173 million gallons in February. The system daily average withdrawal for 2020 was 0.722 mgd.

11. Thirty-nine (39) wells are in the PRA monitoring network: twenty-seven (27) non-municipal wells and twelve (12) municipal wells. Analysis of the monitoring well hydrographs indicates, in general, no clear relationship between water level changes in the monitoring wells and pumping activity at the Perkasie Regional Authority Production wells.

12. The on-going water conservation and leak detection program recorded unaccounted-for water loss of 19.38 mg, or 7.48% of the total production. In 2018, water lost was 13.09 mg, therefore, in 2020 water lost increased by 6.29 mg.

13. Wastewater from the PRA system is conveyed to the Pennridge Wastewater Treatment Plant and is discharged into the East Branch of Perkiomen Creek after treatment. Normal flows at PWTP may be exceeded by 100% or more during periods of high precipitation due to a corresponding increase in inflow and infiltration (I & I).

14. Total PWTP flow for 2020 was 740.67 mg. Meter 7 in January 2020 showed a negative value of 89.255 mg, Meters 5 & 8, also, appeared to have values lower than expected throughout the year.

15. An investigation of the PRA system conducted by Gannett Fleming in 1991 found infiltration to be 1 to 14 gpd per foot of sewer line and inflow to be 2 to 56 gpd per foot of sewer line. In response, PRA initiated corrective action to reduce I & I. In 2000, a new study was performed by Andersen Engineering for PRA, which indicated a reduction of 211,542 gpd of I&I. PRA is continuing the necessary corrective work to reduce I&I.

APPENDIX A

PRODUCION WELL DATA &
PRECIPITATION DATA
PERKASIE REGIONAL AUTHORITY

THREE MILE RUN WELL READINGS FOR JANUARY 2020 (all production is in 1,000 of gallons)

High Pressure Serving 2 Million Gallon Storage Tank

Well # 5

Well Depth: 303 ft
Pump Depth: 240 ft
Pump HP: 20
Pump Rate: 180 gpm

Day	Gallons Produced	Hours Run	Pumping Level	Static Level
1	148.00	14.00	108.00	80.00
2	139.00	12.80	109.00	80.00
3	104.00	9.60	108.00	80.00
4	152.00	13.90	108.00	80.00
5	137.00	12.60	108.00	80.00
6	122.00	11.20	109.00	80.00
7	137.00	12.60	107.00	80.00
8	134.00	12.30	108.00	79.00
9	122.00	11.30	108.00	80.00
10	100.00	9.20	107.00	79.00
11	121.00	11.10	107.00	79.00
12	137.00	12.60	107.00	79.00
13	132.00	12.10	107.00	79.00
14	127.00	11.60	107.00	79.00
15	119.00	10.90	107.00	78.00
16	124.00	11.30	107.00	78.00
17	103.00	9.50	107.00	78.00
18	109.00	10.00	106.00	78.00
19	132.00	12.10	106.00	78.00
20	117.00	10.80	106.00	78.00
21	117.00	10.70	106.00	78.00
22	120.00	11.00	106.00	78.00
23	121.00	11.10	106.00	78.00
24	106.00	9.70	106.00	77.00
25	115.00	10.60	106.00	77.00
26	143.00	13.00	105.00	77.00
27	114.00	10.40	105.00	76.00
28	98.00	9.00	104.00	76.00
29	123.00	11.20	104.00	76.00
30	111.00	10.10	104.00	76.00
31	110.00	10.10	104.00	76.00
TOTAL	3,794	348.4		
AVG	122.39	11.24	106.55	78.29

Well # 6

Well Depth: 300 ft
Pump Depth: 260 ft
Pump HP: 40
Pump Rate: 350 gpm

Day	Gallons Produced	Hours Run	Pumping Level	Static Level
1	246.00	14.20	66.00	23.00
2	219.00	12.80	67.00	22.00
3	165.00	0.00	65.00	21.00
4	238.00	13.90	66.00	22.00
5	215.00	12.60	66.00	22.00
6	196.00	11.40	66.00	22.00
7	213.00	12.50	65.00	21.00
8	210.00	12.30	65.00	24.00
9	195.00	11.50	65.00	21.00
10	156.00	9.10	64.00	21.00
11	191.00	11.10	64.00	21.00
12	216.00	12.70	64.00	21.00
13	206.00	12.00	64.00	21.00
14	214.00	12.40	64.00	20.00
15	176.00	10.30	64.00	19.00
16	162.00	9.40	64.00	19.00
17	162.00	9.30	63.00	18.00
18	175.00	10.10	63.00	18.00
19	211.00	12.20	63.00	19.00
20	186.00	10.80	63.00	18.00
21	185.00	11.10	64.00	20.00
22	190.00	10.60	63.00	19.00
23	192.00	11.20	64.00	19.00
24	164.00	9.50	64.00	19.00
25	184.00	10.60	63.00	18.00
26	228.00	13.20	62.00	17.00
27	180.00	10.30	62.00	16.00
28	160.00	9.20	61.00	16.00
29	196.00	11.20	60.00	16.00
30	176.00	10.10	61.00	15.00
31	173.00	10.00	61.00	16.00
TOTAL	5,980	337.6		
AVG	192.90	10.89	63.74	19.48

Well # 4

Chlorine & Aqua Mag Treatment Site

Day	Chlorine Residual	Precip.
1	1.02	
2	1.05	
3	1.04	
4	1.04	
5	1.04	
6	1.04	
7	1.05	
8	1.04	
9	1.02	
10	1.02	
11	1.01	
12	1.01	
13	1.02	
14	1.02	
15	1.01	
16	1.01	
17	1.02	
18	1.02	
19	1.01	
20	1.02	
21	1.02	
22	1.02	
23	1.02	
24	1.02	
25	1.02	
26	1.02	
27	1.01	
28	1.01	
29	1.02	
30	1.02	
31	1.02	
TOTAL		0.00
AVG	1.02	#DIV/0!

Well # 7

Well Depth: 420 ft
Pump Depth: 240 ft
Pump HP: 30
Pump Rate: 360 gpm

Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	225.00	14.20	188.00	80.00	0.99
2	203.00	12.90	189.00	79.00	1.03
3	157.00	9.80	188.00	79.00	1.00
4	224.00	14.20	187.00	79.00	1.02
5	195.00	12.20	186.00	79.00	1.01
6	179.00	11.30	187.00	79.00	0.99
7	202.00	12.70	186.00	79.00	1.05
8	192.00	12.10	187.00	77.00	0.98
9	178.00	11.20	187.00	78.00	1.07
10	152.00	9.50	186.00	77.00	1.05
11	178.00	11.20	186.00	76.00	1.05
12	201.00	12.60	185.00	76.00	1.00
13	196.00	12.30	185.00	76.00	1.02
14	183.00	11.00	185.00	75.00	1.01
15	178.00	11.40	185.00	74.00	0.99
16	180.00	11.20	185.00	73.00	1.02
17	154.00	9.60	185.00	73.00	1.00
18	159.00	9.90	183.00	72.00	1.04
19	196.00	12.10	183.00	72.00	0.97
20	175.00	10.80	183.00	70.00	1.07
21	174.00	10.70	183.00	70.00	1.08
22	178.00	11.00	183.00	70.00	1.09
23	181.00	11.10	183.00	69.00	1.08
24	156.00	9.70	182.00	68.00	1.02
25	173.00	10.60	181.00	68.00	1.16
26	216.00	13.30	181.00	67.00	1.11
27	166.00	10.10	181.00	66.00	1.02
28	148.00	9.10	181.00	66.00	1.00
29	186.00	11.30	180.00	66.00	1.10
30	164.00	10.00	180.00	65.00	1.02
31	167.00	10.30	180.00	64.00	1.10
TOTAL	5,616	349.4			
AVG	181.16	11.27	184.23	72.97	1.04

TOTAL THREE MILE RUN WELL PRODUCTION

Day	Gallons Produced	Hours Run
1	619	42.40
2	561	38.50
3	426	19.40
4	614	42.00
5	547	37.40
6	497	33.90
7	552	37.80
8	536	36.70
9	495	34.00
10	408	27.80
11	490	33.40
12	554	37.90
13	534	36.40
14	524	35.00
15	473	32.60
16	466	31.90
17	419	28.40
18	443	30.00
19	539	36.40
20	478	32.40
21	476	32.50
22	488	32.60
23	494	33.40
24	426	28.90
25	472	31.80
26	587	39.50
27	460	30.80
28	406	27.30
29	505	33.70
30	451	30.20
31	450	30.40
TOTAL	15,390	1035.40
AVG	496.45	33.40

PERKIOMEN WELL READINGS FOR JANUARY 2020 (all production is in 1,000 of gallons)

Low Pressure Serving 1.2 Million Gallon Reservoir

Well # 10					
Well Depth: 420 feet Pump Depth: 240 feet			Pump HP: 30 Pump Rate: 250 gpm		
Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	122.00	8.90	158.00	60.00	0.92
2	93.00	6.80	159.00	59.00	1.03
3	72.00	5.30	158.00	58.00	1.04
4	119.00	8.70	158.00	59.00	0.95
5	108.00	7.90	156.00	59.00	1.02
6	92.00	6.60	158.00	59.00	1.00
7	84.00	6.20	157.00	60.00	1.04
8	105.00	7.60	157.00	58.00	0.96
9	64.00	4.70	159.00	59.00	1.04
10	23.00	1.60	158.00	59.00	1.03
11	74.00	5.40	156.00	56.00	0.90
12	77.00	5.60	156.00	56.00	0.90
13	70.00	5.10	157.00	58.00	0.90
14	42.00	3.00	153.00	56.00	1.01
15	70.00	5.10	156.00	57.00	0.90
16	43.00	3.10	155.00	54.00	1.03
17	43.00	3.10	155.00	55.00	0.88
18	73.00	5.30	155.00	55.00	0.89
19	72.00	5.30	154.00	56.00	0.88
20	67.00	4.80	155.00	56.00	0.89
21	58.00	4.30	155.00	56.00	0.88
22	66.00	4.80	154.00	56.00	0.98
23	47.00	3.40	155.00	55.00	1.02
24	44.00	3.20	155.00	56.00	0.90
25	70.00	5.10	155.00	55.00	0.92
26	73.00	5.30	154.00	55.00	0.89
27	61.00	4.50	154.00	56.00	0.88
28	59.00	4.20	154.00	55.00	0.90
29	52.00	3.80	154.00	53.00	0.95
30	59.00	4.30	154.00	54.00	0.86
31	42.00	3.00	153.00	55.00	0.89
TOTAL	2,144	156.0			
AVG	69.16	5.03	155.71	56.61	0.94

Well # 11					
Well Depth: 420 feet Pump Depth: 240 feet			Pump HP: 30 Pump Rate: 465 gpm		
Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	292.00	8.60	53	0.00	0.96
2	185.00	6.90	59	0.00	1.03
3	130.00	4.80	56	0.00	0.99
4	227.00	8.40	54	0.00	0.89
5	205.00	7.70	53	0.00	0.98
6	181.00	6.70	60	0.00	0.96
7	153.00	5.70	55	0.00	0.91
8	198.00	7.30	56	0.00	0.89
9	102.00	4.60	60	0.00	1.07
10	44.00	1.60	58	0.00	1.05
11	141.00	5.20	54	0.00	0.88
12	146.00	5.40	56	0.00	1.01
13	135.00	5.00	58	0.00	0.94
14	79.00	2.90	54	0.00	0.96
15	135.00	5.00	54	0.00	0.80
16	81.00	3.00	54	0.00	0.94
17	82.00	3.10	56	0.00	0.80
18	139.00	5.10	54	0.00	0.81
19	138.00	5.10	56	0.00	0.80
20	127.00	4.80	56	0.00	0.79
21	112.00	4.10	56	0.00	0.81
22	133.00	4.90	51	0.00	0.80
23	81.00	3.00	56	0.00	0.92
24	85.00	3.20	56	0.00	0.77
25	133.00	4.90	54	0.00	0.78
26	138.00	5.20	54	0.00	0.82
27	118.00	4.30	56	0.00	0.85
28	120.00	4.40	53	0.00	0.80
29	92.00	3.50	54	0.00	0.96
30	118.00	4.10	56	0.00	0.81
31	73.00	3.00	53	0.00	0.82
TOTAL	4,123	151.5			
AVG	133.00	4.89	55.32	0.00	0.89

TOTAL PERKIOMEN WELL PRODUCTION		
Day	Gallons Produced	Hours Run
1	414	17.5
2	278	13.7
3	202	10.1
4	346	17.1
5	313	15.6
6	273	13.3
7	237	11.9
8	303	14.9
9	166	9.3
10	67	3.2
11	215	10.6
12	223	11.0
13	205	10.1
14	121	5.9
15	205	10.1
16	124	6.1
17	125	6.2
18	212	10.4
19	210	10.4
20	194	9.6
21	170	8.4
22	199	9.7
23	128	6.4
24	129	6.4
25	203	10.0
26	211	10.5
27	179	8.8
28	179	8.6
29	144	7.3
30	177	8.4
31	115	6.0
TOTAL	6,267	307.5
AVG	202.16	9.92

OVERALL TOTAL		
Day	Gallons Produced	Hours Run
1	1,033	59.90
2	839	52.20
3	628	29.50
4	960	59.10
5	860	53.00
6	770	47.20
7	789	49.70
8	839	51.60
9	661	43.30
10	475	31.00
11	705	44.00
12	777	48.90
13	739	46.50
14	645	40.90
15	678	42.70
16	590	38.00
17	544	34.60
18	655	40.40
19	749	46.80
20	672	42.00
21	646	40.90
22	687	42.30
23	622	39.80
24	555	35.30
25	675	41.80
26	798	50.00
27	639	39.60
28	585	35.9
29	649	41.00
30	628	38.60
31	565	36.40
TOTAL	21,657	1342.90
AVG	699	43.32

THREE MILE RUN WELL READINGS FOR FEBRUARY 2020 (all production is in 1,000 of gallons)

High Pressure Serving 2 Million Gallon Storage Tank

Well # 5

Well Depth: 303 ft
Pump Depth: 240 ft
Pump HP: 20
Pump Rate: 180 gpm

Day	Gallons Produced	Hours Run	Pumping Level	Static Level
1	115.00	10.40	103.00	76.00
2	146.00	13.40	103.00	76.00
3	121.00	11.00	104.00	76.00
4	104.00	9.50	104.00	76.00
5	110.00	10.00	104.00	76.00
6	114.00	10.40	103.00	76.00
7	106.00	9.60	104.00	75.00
8	120.00	11.00	103.00	75.00
9	125.00	11.50	103.00	75.00
10	124.00	11.90	103.00	75.00
11	113.00	10.30	101.00	75.00
12	124.00	11.20	103.00	75.00
13	104.00	9.50	102.00	75.00
14	125.00	11.30	102.00	74.00
15	97.00	8.90	101.00	73.00
16	136.00	12.30	101.00	73.00
17	111.00	10.00	101.00	73.00
18	125.00	11.40	100.00	73.00
19	106.00	9.60	101.00	73.00
20	135.00	12.20	100.00	73.00
21	83.00	7.60	101.00	74.00
22	119.00	10.80	101.00	73.00
23	144.00	13.10	101.00	73.00
24	111.00	10.10	101.00	73.00
25	122.00	11.00	102.00	74.00
26	134.00	12.10	102.00	74.00
27	121.00	11.10	101.00	74.00
28	99.00	8.90	101.00	74.00
29	115.00	10.50	101.00	74.00
TOTAL	3,409	310.6		
AVG	117.55	10.71	101.97	74.34

Well # 6

Well Depth: 300 ft
Pump Depth: 260 ft
Pump HP: 40
Pump Rate: 350 gpm

Day	Gallons Produced	Hours Run	Pumping Level	Static Level
1	183.00	10.50	60.00	16.00
2	235.00	13.40	61.00	16.00
3	193.00	11.20	61.00	16.00
4	162.00	9.30	63.00	17.00
5	176.00	10.10	62.00	16.00
6	181.00	10.40	61.00	17.00
7	170.00	9.60	62.00	16.00
8	191.00	11.10	60.00	15.00
9	197.00	11.30	60.00	14.00
10	212.00	12.00	61.00	14.00
11	156.00	10.30	61.00	14.00
12	201.00	11.40	52.00	13.00
13	167.00	9.40	59.00	13.00
14	199.00	11.30	59.00	11.00
15	157.00	8.90	58.00	11.00
16	218.00	12.20	58.00	11.00
17	180.00	10.30	58.00	11.00
18	200.00	11.30	58.00	12.00
19	172.00	9.80	59.00	12.00
20	212.00	12.00	58.00	12.00
21	144.00	8.10	59.00	13.00
22	185.00	10.60	59.00	13.00
23	225.00	12.90	59.00	13.00
24	180.00	10.20	59.00	14.00
25	193.00	11.00	61.00	14.00
26	212.00	12.20	61.00	16.00
27	194.00	11.10	61.00	15.00
28	157.00	9.00	60.00	15.00
29	182.00	10.40	61.00	19.00
TOTAL	5,434	311.3		
AVG	187.38	10.73	59.69	14.10

Well # 4

Chlorine & Aqua Mag Treatment Site

Day	Chlorine Residual	Precip.
1	1.01	
2	1.01	
3	1.02	
4	1.00	
5	1.01	
6	1.02	
7	1.03	
8	1.03	
9	1.03	
10	1.03	
11	1.03	
12	1.03	
13	1.03	
14	1.03	
15	1.02	
16	1.02	
17	1.03	
18	1.03	
19	1.02	
20	1.02	
21	1.05	
22	1.06	
23	1.06	
24	1.05	
25	1.05	
26	1.05	
27	1.05	
28	1.04	
29	1.06	
TOTAL		2.74
AVG	1.03	#DIV/0!

Well # 7

Well Depth: 420 ft
Pump Depth: 240 ft
Pump HP: 30
Pump Rate: 360 gpm

Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	173.00	10.50	179.00	64.00	1.04
2	218.00	13.20	179.00	64.00	1.01
3	181.00	11.00	179.00	63.00	1.00
4	159.00	9.70	179.00	63.00	1.01
5	162.00	9.80	179.00	63.00	1.03
6	172.00	10.50	179.00	63.00	1.10
7	161.00	9.70	179.00	62.00	1.06
8	180.00	10.90	178.00	61.00	1.00
9	191.00	11.60	179.00	60.00	1.10
10	170.00	12.00	179.00	61.00	1.02
11	170.00	10.30	156.00	59.00	1.02
12	185.00	11.20	155.00	59.00	1.02
13	157.00	9.40	177.00	59.00	1.09
14	192.00	11.50	178.00	58.00	1.00
15	147.00	8.90	177.00	57.00	0.98
16	209.00	12.50	176.00	58.00	0.98
17	163.00	9.70	176.00	57.00	0.98
18	193.00	9.60	175.00	57.00	0.98
19	158.00	9.10	176.00	56.00	0.96
20	203.00	12.10	175.00	56.00	0.99
21	128.00	7.70	176.00	56.00	0.97
22	182.00	10.80	176.00	55.00	0.97
23	220.00	13.20	176.00	55.00	0.94
24	169.00	10.10	175.00	56.00	0.99
25	183.00	10.90	177.00	56.00	1.01
26	203.00	12.20	177.00	56.00	1.06
27	197.00	11.80	176.00	56.00	0.67
28	150.00	9.00	176.00	56.00	0.95
29	177.00	10.60	176.00	55.00	1.06
TOTAL	5,153	309.5			
AVG	177.69	10.67	175.69	58.66	1.00

TOTAL THREE MILE RUN WELL PRODUCTION

Day	Gallons Produced	Hours Run
1	471	31.40
2	599	40.00
3	495	33.20
4	425	28.50
5	448	29.90
6	467	31.30
7	437	28.90
8	491	33.00
9	513	34.40
10	506	35.90
11	439	30.90
12	510	33.80
13	428	28.30
14	516	34.10
15	401	26.70
16	563	37.00
17	454	30.00
18	518	32.30
19	436	28.50
20	550	36.30
21	355	23.40
22	486	32.20
23	589	39.20
24	460	30.40
25	498	32.90
26	549	36.50
27	512	34.00
28	406	26.90
29	474	31.50
TOTAL	13,996	931.40
AVG	482.62	32.12

PERKIOMEN WELL READINGS FOR FEBRUARY 2020 (all production is in 1,000 of gallons)
Low Pressure Serving 1.2 Million Gallon Reservoir

Well # 10

Well Depth: 420 feet Pump Depth: 240 feet			Pump HP: 30 Pump Rate: 250 gpm		
Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	72.00	5.20	153.00	52.00	0.87
2	85.00	6.20	152.00	51.00	0.86
3	63.00	4.50	152.00	51.00	0.92
4	59.00	4.30	150.00	51.00	0.89
5	54.00	3.90	151.00	49.00	0.94
6	54.00	3.90	150.00	50.00	0.51
7	52.00	3.70	150.00	48.00	0.79
8	76.00	5.50	150.00	48.00	0.97
9	75.00	5.40	136.00	49.00	1.04
10	66.00	4.70	150.00	48.00	1.04
11	43.00	3.10	149.00	46.00	1.19
12	68.00	4.90	148.00	47.00	1.10
13	51.00	3.60	147.00	46.00	1.11
14	56.00	4.00	148.00	46.00	1.12
15	68.00	5.00	147.00	46.00	0.93
16	52.00	3.70	148.00	46.00	0.74
17	69.00	4.90	147.00	47.00	0.75
18	46.00	3.30	148.00	45.00	1.06
19	81.00	5.80	148.00	46.00	0.96
20	46.00	3.40	148.00	46.00	1.08
21	65.00	4.60	147.00	46.00	0.94
22	71.00	5.10	148.00	46.00	0.77
23	0.00	0.00	147.00	46.00	0.70
24	50.00	3.50	-	44.00	0.70
25	62.00	4.50	146.00	45.00	0.88
26	71.00	5.10	147.00	46.00	1.09
27	48.00	3.50	146.00	46.00	1.22
28	56.00	4.00	147.00	45.00	1.19
29	70.00	5.10	146.00	46.00	1.14
TOTAL	1,729	124.4			
AVG	59.62	4.29	148.07	47.17	0.95

Well # 11

Well Depth: 420 feet Pump Depth: 240 feet			Pump HP: 30 Pump Rate: 465 gpm		
Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	139.00	5.10	54	0.00	0.83
2	157.00	5.80	54	0.00	0.83
3	127.00	4.70	54	0.00	0.94
4	117.00	4.40	51	0.00	0.97
5	96.00	3.50	54	0.00	0.97
6	109.00	4.10	53	0.00	0.83
7	71.00	2.60	54	0.00	0.95
8	144.00	5.40	53	0.00	0.78
9	143.00	5.30	54	0.00	0.81
10	126.00	4.60	56	0.00	0.81
11	83.00	3.10	53	0.00	0.95
12	128.00	4.70	53	0.00	0.75
13	103.00	3.80	53	0.00	0.78
14	101.00	3.80	53	0.00	0.88
15	94.00	3.50	53	0.00	0.80
16	160.00	5.90	54	0.00	0.81
17	158.00	5.90	58	0.00	0.86
18	88.00	3.30	55	0.00	0.99
19	126.00	4.60	54	0.00	0.80
20	81.00	3.00	53	0.00	1.24
21	87.00	3.20	53	0.00	0.73
22	135.00	5.10	53	0.00	0.84
23	207.00	7.80	53	0.00	0.85
24	91.00	3.70	62	0.00	1.10
25	109.00	0.00	54	0.00	1.20
26	135.00	9.10	51	0.00	0.81
27	99.00	3.70	51	0.00	0.97
28	200.00	3.70	54	0.00	1.01
29	34.00	4.90	53	0.00	0.79
TOTAL	3,448	128.3			
AVG	118.90	4.42	53.79	0.00	0.89

TOTAL PERKIOMEN WELL PRODUCTION

Day	Gallons Produced	Hours Run
1	211	10.3
2	242	12.0
3	190	9.2
4	176	8.7
5	150	7.4
6	163	8.0
7	123	6.3
8	220	10.9
9	218	10.7
10	192	9.3
11	126	6.2
12	196	9.6
13	154	7.4
14	157	7.8
15	162	8.5
16	212	9.6
17	227	10.8
18	134	6.6
19	207	10.4
20	127	6.4
21	152	7.8
22	206	10.2
23	207	7.8
24	141	7.2
25	171	4.5
26	206	14.2
27	147	7.2
28	256	7.7
29	104	10.0
TOTAL	5,177	252.7
AVG	178.52	8.71

OVERALL TOTAL

Day	Gallons Produced	Hours Run
1	682	41.70
2	841	52.00
3	685	42.40
4	601	37.20
5	598	37.30
6	630	39.30
7	560	35.20
8	711	43.90
9	731	45.10
10	698	45.20
11	565	37.10
12	706	43.40
13	582	35.70
14	673	41.90
15	563	35.20
16	775	46.60
17	681	40.80
18	652	38.90
19	643	38.90
20	677	42.70
21	507	31.20
22	692	42.40
23	796	47.00
24	601	37.60
25	669	37.40
26	755	50.70
27	659	41.20
28	662	34.6
29	578	41.50
TOTAL	19,173	1184.10
AVG	661	40.83

THREE MILE RUN WELL READINGS FOR MARCH 2020 (all production is in 1,000 of gallons)

High Pressure Serving 2 Million Gallon Storage Tank

Well # 5				
Well Depth: 303 ft Pump Depth: 240 ft		Pump HP: 20 Pump Rate: 180 gpm		
Day	Gallons Produced	Hours Run	Pumping Level	Static Level
1	135.00	12.30	101.00	74.00
2	133.00	12.10	101.00	74.00
3	108.00	9.80	101.00	74.00
4	125.00	11.30	102.00	74.00
5	109.00	9.90	102.00	74.00
6	120.00	11.00	101.00	74.00
7	99.00	8.90	101.00	74.00
8	132.00	12.10	102.00	74.00
9	119.00	10.80	101.00	74.00
10	126.00	11.40	101.00	74.00
11	139.00	12.70	101.00	74.00
12	94.00	8.50	102.00	74.00
13	115.00	10.40	101.00	74.00
14	122.00	11.20	101.00	74.00
15	131.00	11.90	101.00	74.00
16	129.00	11.70	103.00	74.00
17	115.00	10.50	101.00	74.00
18	125.00	11.30	101.00	74.00
19	113.00	10.30	101.00	74.00
20	112.00	10.10	101.00	74.00
21	104.00	9.50	101.00	73.00
22	127.00	11.50	101.00	74.00
23	119.00	9.90	101.00	74.00
24	118.00	11.60	100.00	73.00
25	121.00	11.00	100.00	73.00
26	119.00	10.80	99.00	72.00
27	99.00	9.00	100.00	72.00
28	111.00	10.00	100.00	72.00
29	129.00	11.70	99.00	72.00
30	113.00	10.20	99.00	72.00
31	125.00	11.30	99.00	71.00
TOTAL	3,686	334.7		
AVG	118.90	10.80	100.81	73.48

Well # 6				
Well Depth: 300 ft Pump Depth: 260 ft		Pump HP: 40 Pump Rate: 350 gpm		
Day	Gallons Produced	Hours Run	Pumping Level	Static Level
1	216.00	12.40	61.00	18.00
2	212.00	12.00	60.00	15.00
3	171.00	9.90	60.00	15.00
4	199.00	11.30	61.00	15.00
5	173.00	9.90	61.00	15.00
6	190.00	10.90	59.00	14.00
7	158.00	9.00	60.00	14.00
8	214.00	12.20	61.00	15.00
9	189.00	10.80	60.00	15.00
10	201.00	11.40	59.00	15.00
11	219.00	12.60	59.00	14.00
12	153.00	8.70	60.00	14.00
13	181.00	10.30	59.00	15.00
14	195.00	11.20	59.00	14.00
15	210.00	12.00	59.00	15.00
16	209.00	12.00	60.00	16.00
17	180.00	10.20	60.00	14.00
18	198.00	11.40	61.00	17.00
19	180.00	10.30	60.00	14.00
20	180.00	10.20	60.00	14.00
21	166.00	9.40	59.00	12.00
22	204.00	11.60	59.00	13.00
23	192.00	10.90	58.00	13.00
24	188.00	10.60	60.00	15.00
25	197.00	11.00	57.00	10.00
26	188.00	10.60	57.00	10.00
27	162.00	9.20	57.00	10.00
28	177.00	9.90	58.00	10.00
29	219.00	12.30	57.00	12.00
30	174.00	9.70	58.00	10.00
31	207.00	11.60	57.00	8.00
TOTAL	5,902	335.5		
AVG	190.39	10.82	59.23	13.58

Well # 4		
Chlorine & Aqua Mag Treatment Site		
Day	Chlorine Residual	Precip.
1	1.04	
2	1.05	
3	1.05	
4	1.05	
5	1.04	
6	0.89	
7	0.89	
8	1.04	
9	1.05	
10	1.05	
11	1.05	
12	1.02	
13	1.01	
14	1.01	
15	1.02	
16	1.01	
17	1.01	
18	1.04	
19	1.05	
20	1.04	
21	1.04	
22	1.04	
23	1.05	
24	1.04	
25	1.04	
26	1.04	
27	1.09	
28	1.08	
29	1.09	
30	1.09	
31	1.08	
TOTAL		4.04
AVG	1.04	#DIV/0!

Well # 7					
Well Depth: 420 ft Pump Depth: 240 ft			Pump HP: 30 Pump Rate: 360 gpm		
Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	202.00	12.10	176.00	57.00	0.94
2	203.00	12.20	176.00	56.00	1.04
3	164.00	9.80	175.00	56.00	0.96
4	188.00	11.30	176.00	55.00	0.98
5	166.00	9.90	176.00	55.00	0.95
6	184.00	11.00	175.00	55.00	1.04
7	153.00	9.10	176.00	54.00	0.92
8	198.00	11.90	176.00	56.00	0.93
9	182.00	10.90	175.00	56.00	0.97
10	192.00	11.50	175.00	56.00	0.97
11	209.00	12.50	175.00	55.00	0.98
12	145.00	8.70	176.00	55.00	1.05
13	177.00	10.50	175.00	55.00	0.97
14	186.00	11.20	175.00	55.00	0.99
15	203.00	12.10	175.00	55.00	0.98
16	189.00	11.40	175.00	56.00	0.99
17	176.00	10.50	176.00	55.00	0.95
18	189.00	11.30	176.00	56.00	1.07
19	172.00	9.30	175.00	55.00	1.08
20	171.00	11.20	175.00	53.00	1.10
21	162.00	9.70	176.00	53.00	1.06
22	190.00	11.30	173.00	55.00	1.02
23	183.00	10.90	175.00	56.00	1.02
24	181.00	10.80	174.00	52.00	1.08
25	181.00	10.90	174.00	52.00	1.04
26	179.00	10.40	174.00	51.00	1.03
27	160.00	9.50	173.00	51.00	0.99
28	167.00	9.80	174.00	51.00	1.06
29	211.00	12.50	173.00	50.00	1.03
30	162.00	9.60	173.00	51.00	1.04
31	191.00	11.20	174.00	50.00	1.06
TOTAL	5,616	335.0			
AVG	181.16	10.81	174.90	54.13	1.01

TOTAL THREE MILE RUN WELL PRODUCTION		
Day	Gallons Produced	Hours Run
1	553	36.80
2	548	36.30
3	443	29.50
4	512	33.90
5	448	29.70
6	494	32.90
7	410	27.00
8	544	36.20
9	490	32.50
10	519	34.30
11	567	37.80
12	392	25.90
13	473	31.20
14	503	33.60
15	544	36.00
16	527	35.10
17	471	31.20
18	512	34.00
19	465	29.90
20	463	31.50
21	432	28.60
22	521	34.40
23	494	31.70
24	487	33.00
25	499	32.90
26	486	31.80
27	421	27.70
28	455	29.70
29	559	36.50
30	449	29.50
31	523	34.10
TOTAL	15,204	1005.20
AVG	490.45	32.43

PERKIOMEN WELL READINGS FOR MARCH 2020 (all production is in 1,000 of gallons)

Low Pressure Serving 1.2 Million Gallon Reservoir

Well # 10					
Well Depth: 420 feet Pump Depth: 240 feet			Pump HP: 30 Pump Rate: 250 gpm		
Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	73.00	5.20	146.00	47.00	1.15
2	69.00	5.00	148.00	46.00	1.15
3	61.00	4.30	147.00	45.00	1.26
4	43.00	3.10	147.00	45.00	1.07
5	72.00	5.30	148.00	46.00	0.99
6	41.00	2.90	146.00	45.00	1.11
7	70.00	5.00	146.00	46.00	1.02
8	76.00	5.50	146.00	47.00	1.03
9	64.00	4.60	146.00	46.00	1.02
10	71.00	5.10	148.00	47.00	1.03
11	46.00	3.30	147.00	45.00	1.11
12	60.00	4.40	147.00	46.00	1.03
13	45.00	3.20	146.00	46.00	0.99
14	77.00	5.50	147.00	45.00	0.85
15	85.00	6.10	148.00	47.00	0.95
16	68.00	4.90	149.00	46.00	0.93
17	68.00	5.00	147.00	46.00	0.92
18	66.00	4.70	148.00	46.00	0.94
19	67.00	4.80	147.00	47.00	0.94
20	54.00	4.00	148.00	45.00	1.03
21	79.00	5.60	148.00	46.00	0.92
22	78.00	5.70	148.00	47.00	0.91
23	60.00	4.30	147.00	46.00	0.91
24	62.00	4.40	148.00	47.00	0.99
25	70.00	5.10	151.00	48.00	0.89
26	74.00	5.40	150.00	49.00	0.89
27	51.00	3.70	151.00	49.00	1.04
28	74.00	5.40	152.00	51.00	0.89
29	79.00	5.70	151.00	51.00	0.92
30	54.00	4.00	152.00	52.00	1.03
31	70.00	5.10	153.00	51.00	0.90
TOTAL	2,027	146.3			
AVG	65.39	4.72	148.16	46.97	0.99

Well # 11					
Well Depth: 420 feet Pump Depth: 240 feet			Pump HP: 30 Pump Rate: 465 gpm		
Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	138.00	5.20	51	0.00	0.85
2	132.00	4.80	56	0.00	0.84
3	110.00	4.10	54	0.00	1.00
4	84.00	3.20	54	0.00	0.98
5	136.00	5.00	54	0.00	0.78
6	78.00	2.90	53	0.00	0.98
7	133.00	4.90	53	0.00	0.90
8	145.00	5.40	53	0.00	0.95
9	122.00	4.50	53	0.00	0.99
10	135.00	5.10	53	0.00	0.93
11	87.00	3.20	54	0.00	1.11
12	115.00	4.20	54	0.00	0.83
13	86.00	3.20	51	0.00	0.84
14	47.00	5.50	54	0.00	0.87
15	260.00	5.90	58	0.00	0.89
16	129.00	4.80	56	0.00	0.87
17	130.00	4.80	54	0.00	0.92
18	127.00	4.70	53	0.00	0.85
19	132.00	4.90	53	0.00	0.88
20	98.00	3.70	54	0.00	0.97
21	148.00	5.50	54	0.00	0.82
22	150.00	5.50	56	0.00	0.86
23	122.00	4.10	55	0.00	0.88
24	111.00	4.60	53	0.00	0.96
25	133.00	4.90	56	0.00	0.78
26	140.00	5.20	52	0.00	0.81
27	97.00	3.60	54	0.00	1.07
28	141.00	5.20	56	0.00	0.83
29	145.00	5.40	51	0.00	0.90
30	109.00	4.00	56	0.00	1.02
31	132.00	5.00	56	0.00	0.88
TOTAL	3,852	143.0			
AVG	124.26	4.61	54.00	0.00	0.90

TOTAL PERKIOMEN WELL PRODUCTION		
Day	Gallons Produced	Hours Run
1	211	10.4
2	201	9.8
3	171	8.4
4	127	6.3
5	208	10.3
6	119	5.8
7	203	9.9
8	221	10.9
9	186	9.1
10	206	10.2
11	133	6.5
12	175	8.6
13	131	6.4
14	124	11.0
15	345	12.0
16	197	9.7
17	198	9.8
18	193	9.4
19	199	9.7
20	152	7.7
21	227	11.1
22	228	11.2
23	182	8.4
24	173	9.0
25	203	10.0
26	214	10.6
27	148	7.3
28	215	10.6
29	224	11.1
30	163	8.0
31	202	10.1
TOTAL	5,879	289.3
AVG	189.65	9.33

OVERALL TOTAL		
Day	Gallons Produced	Hours Run
1	764	47.20
2	749	46.10
3	614	37.90
4	639	40.20
5	656	40.00
6	613	38.70
7	613	36.90
8	765	47.10
9	676	41.60
10	725	44.50
11	700	44.30
12	567	34.50
13	604	37.60
14	627	44.60
15	889	48.00
16	724	44.80
17	669	41.00
18	705	43.40
19	664	39.60
20	615	39.20
21	659	39.70
22	749	45.60
23	676	40.10
24	660	42.00
25	702	42.90
26	700	42.40
27	569	35.00
28	670	40.3
29	783	47.60
30	612	37.50
31	725	44.20
TOTAL	21,083	1294.50
AVG	680	41.76

THREE MILE RUN WELL READINGS FOR APRIL 2020 (all production is in 1,000 of gallons)

High Pressure Serving 2 Million Gallon Storage Tank

Well # 5

Well Depth: 303 ft | Pump HP: 20
Pump Depth: 240 ft | Pump Rate: 180 gpm

Day	Gallons Produced	Hours Run	Pumping Level	Static Level
1	115.00	10.40	98.00	71.00
2	102.00	9.20	98.00	71.00
3	118.00	10.70	97.00	71.00
4	106.00	9.50	98.00	71.00
5	138.00	12.40	97.00	71.00
6	116.00	10.60	98.00	71.00
7	106.00	9.60	98.00	71.00
8	117.00	10.60	98.00	71.00
9	118.00	10.60	98.00	71.00
10	104.00	9.30	97.00	71.00
11	118.00	10.70	98.00	72.00
12	146.00	13.30	99.00	72.00
13	109.00	9.80	99.00	71.00
14	121.00	11.00	98.00	71.00
15	119.00	10.60	98.00	71.00
16	105.00	9.60	98.00	71.00
17	130.00	11.60	98.00	71.00
18	104.00	9.40	97.00	70.00
19	137.00	12.40	98.00	71.00
20	123.00	11.00	98.00	71.00
21	102.00	9.30	98.00	71.00
22	123.00	11.10	97.00	71.00
23	165.00	14.80	98.00	71.00
24	115.00	10.40	100.00	72.00
25	109.00	9.90	96.00	72.00
26	131.00	11.80	99.00	72.00
27	124.00	11.30	98.00	72.00
28	110.00	9.90	99.00	72.00
29	128.00	11.50	98.00	71.00
30	103.00	9.30	98.00	70.00
TOTAL	3,562	321.6		
AVG	118.73	10.72	97.97	71.17

Well # 6

Well Depth: 300 ft | Pump HP: 40
Pump Depth: 260 ft | Pump Rate: 350 gpm

Day	Gallons Produced	Hours Run	Pumping Level	Static Level
1	184.00	10.30	55.00	8.00
2	165.00	9.30	56.00	8.00
3	189.00	10.50	55.00	8.00
4	171.00	9.60	57.00	9.00
5	225.00	12.60	56.00	10.00
6	184.00	10.40	57.00	10.00
7	173.00	9.70	57.00	10.00
8	188.00	10.60	57.00	10.00
9	188.00	10.60	57.00	11.00
10	166.00	9.30	56.00	10.00
11	190.00	10.70	57.00	11.00
12	235.00	13.30	57.00	11.00
13	175.00	9.90	58.00	11.00
14	199.00	11.10	55.00	9.00
15	191.00	10.70	56.00	8.00
16	175.00	9.70	56.00	8.00
17	204.00	11.40	56.00	8.00
18	166.00	9.30	56.00	8.00
19	227.00	12.70	57.00	10.00
20	197.00	11.10	56.00	10.00
21	164.00	9.10	56.00	9.00
22	196.00	11.10	56.00	9.00
23	267.00	14.90	56.00	10.00
24	182.00	10.30	60.00	12.00
25	178.00	10.10	57.00	11.00
26	211.00	11.80	57.00	9.00
27	202.00	11.30	55.00	8.00
28	176.00	9.80	57.00	10.00
29	207.00	11.50	56.00	7.00
30	167.00	9.30	55.00	7.00
TOTAL	5,742	322.0		
AVG	191.40	10.73	56.40	9.33

Well # 4

Chlorine & Aqua Mag Treatment Site

Day	Chlorine Residual	Precip.
1	1.08	
2	1.08	
3	1.08	
4	1.08	
5	1.08	
6	1.08	
7	1.08	
8	1.06	
9	1.05	
10	1.05	
11	1.05	
12	1.04	
13	1.07	
14	1.07	
15	1.05	
16	1.08	
17	1.08	
18	1.00	
19	1.00	
20	1.00	
21	1.00	
22	1.00	
23	1.00	
24	1.00	
25	1.00	
26	0.99	
27	1.00	
28	1.00	
29	1.00	
30	0.99	
TOTAL		4.94
AVG	1.04	#DIV/0!

Well # 7

Well Depth: 420 ft | Pump HP: 30
Pump Depth: 240 ft | Pump Rate: 360 gpm

Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	176.00	10.50	173.00	49.00	1.03
2	157.00	9.20	172.00	51.00	1.08
3	183.00	10.80	171.00	49.00	1.07
4	163.00	9.50	173.00	48.00	1.04
5	208.00	12.30	172.00	49.00	1.06
6	182.00	10.70	171.00	49.00	1.11
7	161.00	9.50	173.00	48.00	1.06
8	180.00	10.60	171.00	49.00	1.09
9	184.00	10.80	172.00	49.00	1.07
10	159.00	9.40	171.00	48.00	1.06
11	182.00	10.60	172.00	48.00	1.04
12	225.00	13.30	172.00	48.00	1.05
13	168.00	9.80	173.00	47.00	1.05
14	185.00	10.90	171.00	47.00	1.06
15	181.00	10.70	172.00	47.00	1.09
16	174.00	10.10	172.00	47.00	1.08
17	192.00	11.30	172.00	47.00	0.95
18	156.00	9.10	171.00	46.00	0.95
19	210.00	12.40	172.00	48.00	0.94
20	190.00	11.10	172.00	47.00	1.00
21	158.00	9.30	171.00	46.00	0.98
22	193.00	11.30	171.00	46.00	0.97
23	35.00	2.00	171.00	46.00	0.94
24	143.00	8.30	174.00	46.00	0.90
25	171.00	9.90	168.00	40.00	0.98
26	202.00	11.60	170.00	41.00	0.96
27	188.00	10.90	169.00	41.00	0.96
28	181.00	10.50	169.00	41.00	0.99
29	197.00	11.30	170.00	42.00	0.96
30	163.00	9.50	170.00	42.00	0.90
TOTAL	5,247	307.2			
AVG	174.90	10.24	171.37	46.40	1.01

TOTAL THREE MILE RUN WELL PRODUCTION

Day	Gallons Produced	Hours Run
1	475	31.20
2	424	27.70
3	490	32.00
4	440	28.60
5	571	37.30
6	482	31.70
7	440	28.80
8	485	31.80
9	490	32.00
10	429	28.00
11	490	32.00
12	606	39.90
13	452	29.50
14	505	33.00
15	491	32.00
16	454	29.40
17	526	34.30
18	426	27.80
19	574	37.50
20	510	33.20
21	424	27.70
22	512	33.50
23	467	31.70
24	440	29.00
25	458	29.90
26	544	35.20
27	514	33.50
28	467	30.20
29	532	34.30
30	433	28.10
TOTAL	14,551	950.80
AVG	485.03	31.69

PERKIOMEN WELL READINGS FOR APRIL 2020 (all production is in 1,000 of gallons)

Low Pressure Serving 1.2 Million Gallon Reservoir

Well # 10					
Well Depth: 420 feet Pump Depth: 240 feet			Pump HP: 30 Pump Rate: 250 gpm		
Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	69.00	5.00	153.00	51.00	0.90
2	72.00	5.20	152.00	51.00	0.91
3	52.00	3.80	152.00	49.00	1.03
4	79.00	5.70	152.00	50.00	0.93
5	81.00	5.90	151.00	50.00	0.95
6	69.00	5.00	151.00	48.00	0.96
7	71.00	5.20	151.00	48.00	0.97
8	69.00	4.90	149.00	49.00	0.97
9	51.00	3.70	149.00	49.00	1.00
10	73.00	5.30	151.00	49.00	0.96
11	79.00	5.80	152.00	51.00	0.97
12	77.00	5.60	153.00	52.00	0.97
13	51.00	4.00	153.00	52.00	1.01
14	74.00	5.20	154.00	52.00	0.96
15	70.00	5.00	153.00	60.00	0.95
16	65.00	4.80	153.00	53.00	0.95
17	59.00	4.40	153.00	51.00	1.04
18	79.00	5.70	153.00	53.00	0.97
19	80.00	5.90	153.00	52.00	1.03
20	70.00	5.10	153.00	53.00	1.04
21	65.00	4.80	153.00	53.00	1.03
22	60.00	4.40	155.00	52.00	1.14
23	68.00	5.00	155.00	54.00	0.99
24	39.00	3.60	154.00	53.00	1.02
25	91.00	5.90	155.00	53.00	1.02
26	75.00	5.50	156.00	53.00	1.02
27	68.00	5.00	155.00	57.00	1.04
28	60.00	4.40	155.00	53.00	1.14
29	70.00	5.10	156.00	53.00	1.00
30	67.00	4.90	156.00	53.00	1.03
TOTAL	2,053	149.8			
AVG	68.43	4.99	153.03	51.90	1.00

Well # 11					
Well Depth: 420 feet Pump Depth: 240 feet			Pump HP: 30 Pump Rate: 465 gpm		
Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	131.00	4.80	54	0.00	0.89
2	142.00	5.30	51	0.00	0.87
3	94.00	3.50	54	0.00	1.01
4	150.00	5.60	54	0.00	0.85
5	154.00	5.70	58	0.00	0.87
6	131.00	4.90	58	0.00	0.83
7	136.00	5.00	58	0.00	0.81
8	131.00	4.90	56	0.00	0.83
9	98.00	3.60	53	0.00	0.85
10	137.00	5.10	56	0.00	0.78
11	150.00	5.60	56	0.00	0.87
12	147.00	5.50	58	0.00	0.88
13	97.00	3.60	56	0.00	0.78
14	140.00	5.20	56	0.00	0.83
15	132.00	4.90	56	0.00	0.85
16	120.00	4.40	54	0.00	0.86
17	117.00	4.40	56	0.00	0.98
18	149.00	5.60	56	0.00	0.90
19	152.00	5.60	53	0.00	0.96
20	132.00	4.90	54	0.00	0.95
21	130.00	4.90	53	0.00	0.95
22	108.00	4.00	56	0.00	0.85
23	129.00	4.80	58	0.00	0.79
24	94.00	3.50	56	0.00	0.78
25	152.00	5.60	54	0.00	0.84
26	143.00	5.40	58	0.00	0.88
27	126.00	4.60	53	0.00	0.91
28	117.00	4.40	56	0.00	0.95
29	133.00	5.00	57	0.00	0.89
30	126.00	4.70	54	0.00	0.84
TOTAL	3,898	145.0			
AVG	129.93	4.83	55.40	0.00	0.87

TOTAL PERKIOMEN WELL PRODUCTION		
Day	Gallons Produced	Hours Run
1	200	9.8
2	214	10.5
3	146	7.3
4	229	11.3
5	235	11.6
6	200	9.9
7	207	10.2
8	200	9.8
9	149	7.3
10	210	10.4
11	229	11.4
12	224	11.1
13	148	7.6
14	214	10.4
15	202	9.9
16	185	9.2
17	176	8.8
18	228	11.3
19	232	11.5
20	202	10.0
21	195	9.7
22	168	8.4
23	197	9.8
24	133	7.1
25	243	11.5
26	218	10.9
27	194	9.6
28	177	8.8
29	203	10.1
30	193	9.6
TOTAL	5,951	294.8
AVG	198.37	9.83

OVERALL TOTAL		
Day	Gallons Produced	Hours Run
1	675	41.00
2	638	38.20
3	636	39.30
4	669	39.90
5	806	48.90
6	682	41.60
7	647	39.00
8	685	41.60
9	639	39.30
10	639	38.40
11	719	43.40
12	830	51.00
13	600	37.10
14	719	43.40
15	693	41.90
16	639	38.60
17	702	43.10
18	654	39.10
19	806	49.00
20	712	43.20
21	619	37.40
22	680	41.90
23	664	41.50
24	573	36.10
25	701	41.40
26	762	46.10
27	708	43.10
28	644	39
29	735	44.40
30	626	37.70
TOTAL	20,502	1245.60
AVG	683	41.52

THREE MILE RUN WELL READINGS FOR May 2020 (all production is in 1,000 of gallons)

High Pressure Serving 2 Million Gallon Storage Tank

Well # 5

Well Depth: 303 ft | **Pump HP: 20**
Pump Depth: 240 ft | **Pump Rate: 180 gpm**

Day	Gallons Produced	Hours Run	Pumping Level	Static Level
1	103.00	9.20	98.00	70.00
2	123.00	11.10	96.00	70.00
3	144.00	13.00	97.00	71.00
4	112.00	10.10	97.00	70.00
5	117.00	10.60	97.00	71.00
6	129.00	11.60	96.00	70.00
7	200.00	17.70	96.00	70.00
8	134.00	12.20	101.00	72.00
9	121.00	10.90	100.00	72.00
10	141.00	12.70	99.00	71.00
11	133.00	12.10	99.00	72.00
12	117.00	10.50	99.00	72.00
13	125.00	11.30	99.00	72.00
14	127.00	11.50	99.00	72.00
15	99.00	9.00	99.00	72.00
16	143.00	12.90	100.00	72.00
17	150.00	13.60	100.00	72.00
18	147.00	13.40	100.00	73.00
19	134.00	12.10	101.00	74.00
20	156.00	14.20	102.00	74.00
21	148.00	13.50	102.00	75.00
22	92.00	8.30	102.00	76.00
23	121.00	11.10	102.00	75.00
24	135.00	12.30	102.00	75.00
25	125.00	11.30	103.00	75.00
26	140.00	12.80	102.00	75.00
27	120.00	11.00	102.00	76.00
28	125.00	11.30	103.00	75.00
29	103.00	9.40	103.00	76.00
30	132.00	12.00	103.00	76.00
31	142.00	12.90	103.00	76.00
TOTAL	4,038	365.6		
AVG	130.26	11.79	100.06	72.97

Well # 6

Well Depth: 300 ft | **Pump HP: 40**
Pump Depth: 260 ft | **Pump Rate: 350 gpm**

Day	Gallons Produced	Hours Run	Pumping Level	Static Level
1	168.00	9.30	56.00	7.00
2	199.00	11.10	54.00	7.00
3	235.00	13.10	54.00	8.00
4	186.00	10.30	55.00	7.00
5	179.00	9.90	56.00	8.00
6	168.00	9.40	54.00	7.00
7	0.00	0.00	54.00	7.00
8	121.00	6.70	0.00	0.00
9	196.00	10.90	51.00	4.00
10	228.00	12.70	53.00	5.00
11	215.00	12.10	54.00	8.00
12	185.00	10.40	55.00	7.00
13	205.00	11.50	54.00	8.00
14	206.00	11.50	56.00	9.00
15	160.00	9.10	56.00	9.00
16	231.00	13.00	56.00	10.00
17	237.00	13.50	57.00	11.00
18	236.00	13.40	58.00	12.00
19	212.00	12.10	59.00	13.00
20	249.00	14.20	60.00	14.00
21	233.00	13.50	60.00	15.00
22	248.00	8.50	61.00	17.00
23	93.00	11.10	61.00	16.00
24	216.00	12.60	60.00	16.00
25	197.00	11.00	60.00	14.00
26	222.00	12.80	59.00	15.00
27	190.00	10.90	62.00	15.00
28	202.00	11.50	61.00	16.00
29	161.00	9.30	60.00	15.00
30	209.00	12.00	61.00	16.00
31	225.00	13.00	60.00	16.00
TOTAL	6,012	340.4		
AVG	193.94	10.98	55.39	10.71

Well # 4

Chlorine & Aqua Mag Treatment Site

Day	Chlorine Residual	Precip.
1	0.99	
2	0.99	
3	0.95	
4	0.99	
5	1.00	
6	1.03	
7	1.01	
8	1.04	
9	1.05	
10	1.05	
11	0.89	
12	1.05	
13	1.05	
14	1.05	
15	1.04	
16	1.04	
17	1.04	
18	1.05	
19	1.05	
20	1.02	
21	1.02	
22	1.02	
23	1.02	
24	1.02	
25	1.02	
26	1.02	
27	1.07	
28	1.07	
29	1.07	
30	1.07	
31	1.07	
TOTAL		3.36
AVG	1.03	#DIV/0!

Well # 7

Well Depth: 420 ft | **Pump HP: 30**
Pump Depth: 240 ft | **Pump Rate: 360 gpm**

Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	161.00	9.30	170.00	42.00	0.98
2	191.00	11.10	168.00	43.00	0.97
3	220.00	12.80	169.00	43.00	0.95
4	175.00	10.20	170.00	42.00	1.01
5	183.00	10.60	170.00	44.00	0.96
6	200.00	11.60	169.00	43.00	1.01
7	301.00	17.70	168.00	42.00	1.05
8	210.00	12.30	174.00	42.00	1.00
9	183.00	10.80	173.00	49.00	1.02
10	214.00	12.60	172.00	47.00	1.04
11	207.00	12.10	172.00	48.00	0.94
12	177.00	10.50	172.00	47.00	0.92
13	196.00	11.50	171.00	47.00	0.95
14	202.00	11.80	173.00	48.00	0.94
15	149.00	8.80	172.00	47.00	0.94
16	218.00	12.80	172.00	48.00	0.93
17	230.00	13.60	173.00	47.00	0.98
18	222.00	13.20	174.00	49.00	0.99
19	213.00	12.60	174.00	50.00	0.91
20	238.00	14.30	176.00	51.00	0.96
21	226.00	13.50	176.00	54.00	0.95
22	137.00	8.20	176.00	56.00	0.97
23	185.00	11.00	176.00	55.00	0.98
24	203.00	12.20	176.00	54.00	0.98
25	193.00	11.50	176.00	52.00	1.05
26	216.00	13.00	176.00	54.00	0.99
27	182.00	10.90	178.00	54.00	0.82
28	185.00	11.10	178.00	54.00	1.07
29	157.00	9.40	176.00	53.00	1.02
30	201.00	12.10	176.00	53.00	1.03
31	216.00	13.00	177.00	54.00	1.03
TOTAL	6,191	366.1			
AVG	199.71	11.81	173.32	48.77	0.98

TOTAL THREE MILE RUN WELL PRODUCTION

Day	Gallons Produced	Hours Run
1	432	27.80
2	513	33.30
3	599	38.90
4	473	30.60
5	479	31.10
6	497	32.60
7	501	35.40
8	465	31.20
9	500	32.60
10	583	38.00
11	555	36.30
12	479	31.40
13	526	34.30
14	535	34.80
15	408	26.90
16	592	38.70
17	617	40.70
18	605	40.00
19	559	36.80
20	643	42.70
21	607	40.50
22	477	25.00
23	399	33.20
24	554	37.10
25	515	33.80
26	578	38.60
27	492	32.80
28	512	33.90
29	421	28.10
30	542	36.10
31	583	38.90
TOTAL	16,241	1072.10
AVG	523.90	34.58

PERKIOMEN WELL READINGS FOR May 2020 (all production is in 1,000 of gallons)

Low Pressure Serving 1.2 Million Gallon Reservoir

Well # 10					
Well Depth: 420 feet Pump Depth: 240 feet			Pump HP: 30 Pump Rate: 250 gpm		
Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	68.00	5.00	155.00	53.00	1.04
2	80.00	5.90	156.00	54.00	1.08
3	83.00	6.10	155.00	55.00	1.05
4	72.00	5.30	157.00	55.00	1.04
5	70.00	5.10	156.00	54.00	1.03
6	73.00	5.40	157.00	54.00	1.14
7	68.00	5.00	157.00	54.00	1.13
8	49.00	3.60	157.00	54.00	0.99
9	79.00	5.80	156.00	53.00	1.01
10	86.00	6.40	156.00	54.00	1.02
11	90.00	6.60	156.00	56.00	1.01
12	83.00	6.10	157.00	56.00	0.85
13	91.00	6.80	159.00	56.00	0.90
14	92.00	6.90	157.00	57.00	0.90
15	78.00	5.70	158.00	56.00	0.92
16	89.00	6.60	158.00	56.00	0.91
17	128.00	9.60	0.00	0.00	0.91
18	146.00	10.90	159.00	58.00	1.03
19	116.00	8.70	161.00	60.00	1.05
20	117.00	8.80	161.00	61.00	1.06
21	76.00	5.70	162.00	59.00	1.07
22	65.00	4.80	162.00	61.00	1.02
23	77.00	5.80	158.00	58.00	0.96
24	78.00	5.80	160.00	59.00	0.94
25	87.00	6.50	159.00	59.00	0.92
26	84.00	6.30	160.00	59.00	0.91
27	79.00	5.90	161.00	58.00	0.82
28	69.00	5.20	160.00	57.00	0.87
29	72.00	5.30	159.00	58.00	0.90
30	85.00	6.40	158.00	57.00	0.93
31	93.00	6.90	159.00	58.00	0.88
TOTAL	2,623	194.9			
AVG	84.61	6.29	153.10	54.81	0.98

Well # 11					
Well Depth: 420 feet Pump Depth: 240 feet			Pump HP: 30 Pump Rate: 465 gpm		
Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	130.00	4.80	54	0.00	0.84
2	151.00	5.60	53	0.00	0.89
3	158.00	5.90	56	0.00	0.85
4	137.00	5.10	56	2.00	0.73
5	140.00	5.20	56	0.00	0.71
6	105.00	3.90	56	0.00	1.10
7	130.00	4.80	56	0.00	0.92
8	93.00	3.50	56	0.00	0.99
9	149.00	5.60	54	0.00	0.92
10	155.00	5.70	56	0.00	0.98
11	179.00	6.70	54	0.00	0.85
12	157.00	5.90	54	0.00	0.83
13	172.00	6.40	56	0.00	0.94
14	175.00	6.50	53	0.00	0.95
15	146.00	5.50	54	0.00	0.95
16	169.00	6.30	56	0.00	0.92
17	235.00	8.70	58	0.00	0.90
18	279.00	10.50	58	0.00	1.04
19	217.00	8.20	65	2.00	1.00
20	224.00	8.30	63	2.00	1.00
21	144.00	5.40	32	0.00	1.00
22	122.00	4.60	53	0.00	0.95
23	146.00	5.40	54	0.00	0.81
24	148.00	5.60	54	0.00	0.81
25	165.00	6.10	56	0.00	0.83
26	159.00	6.00	56	0.00	0.77
27	148.00	5.50	58	0.00	0.92
28	132.00	4.90	58	0.00	0.86
29	135.00	5.10	56	0.00	0.84
30	162.00	6.00	54	0.00	0.85
31	174.00	6.50	58	0.00	0.84
TOTAL	4,936	184.2			
AVG	159.23	5.94	55.26	0.19	0.90

TOTAL PERKIOMEN WELL PRODUCTION		
Day	Gallons Produced	Hours Run
1	198	9.8
2	231	11.5
3	241	12.0
4	209	10.4
5	210	10.3
6	178	9.3
7	198	9.8
8	142	7.1
9	228	11.4
10	241	12.1
11	269	13.3
12	240	12.0
13	263	13.2
14	267	13.4
15	224	11.2
16	258	12.9
17	363	18.3
18	425	21.4
19	333	16.9
20	341	17.1
21	220	11.1
22	187	9.4
23	223	11.2
24	226	11.4
25	252	12.6
26	243	12.3
27	227	11.4
28	201	10.1
29	207	10.4
30	247	12.4
31	267	13.4
TOTAL	7,559	379.1
AVG	243.84	12.23

OVERALL TOTAL		
Day	Gallons Produced	Hours Run
1	630	37.60
2	744	44.80
3	840	50.90
4	682	41.00
5	689	41.40
6	675	41.90
7	699	45.20
8	607	38.30
9	728	44.00
10	824	50.10
11	824	49.60
12	719	43.40
13	789	47.50
14	802	48.20
15	632	38.10
16	850	51.60
17	980	59.00
18	1,030	61.40
19	892	53.70
20	984	59.80
21	827	51.60
22	664	34.40
23	622	44.40
24	780	48.50
25	767	46.40
26	821	50.90
27	719	44.20
28	713	44
29	628	38.50
30	789	48.50
31	850	52.30
TOTAL	23,800	1451.20
AVG	768	46.81

THREE MILE RUN WELL READINGS FOR JUNE 2020 (all production is in 1,000 of gallons)

High Pressure Serving 2 Million Gallon Storage Tank

Well # 5

Well Depth: 303 ft | Pump HP: 20
Pump Depth: 240 ft | Pump Rate: 180 gpm

Day	Gallons Produced	Hours Run	Pumping Level	Static Level
1	122.00	11.10	103.00	76.00
2	144.00	13.20	104.00	76.00
3	123.00	11.10	105.00	76.00
4	105.00	9.60	105.00	77.00
5	118.00	10.80	105.00	77.00
6	126.00	11.40	104.00	76.00
7	160.00	14.60	104.00	76.00
8	132.00	12.10	104.00	76.00
9	136.00	12.40	105.00	77.00
10	115.00	10.40	105.00	77.00
11	143.00	13.10	105.00	77.00
12	102.00	9.30	106.00	78.00
13	137.00	12.50	105.00	78.00
14	146.00	13.40	105.00	78.00
15	149.00	13.60	107.00	78.00
16	131.00	12.00	107.00	78.00
17	118.00	10.80	107.00	79.00
18	133.00	12.20	106.00	79.00
19	128.00	11.80	107.00	79.00
20	119.00	10.90	107.00	79.00
21	143.00	13.10	107.00	79.00
22	135.00	12.40	108.00	79.00
23	126.00	11.60	108.00	80.00
24	127.00	11.60	108.00	80.00
25	185.00	17.10	108.00	80.00
26	149.00	13.80	110.00	81.00
27	126.00	11.60	111.00	82.00
28	178.00	16.50	110.00	82.00
29	124.00	11.40	111.00	82.00
30	131.00	12.10	110.00	83.00
TOTAL	4,011	367.5		
AVG	133.70	12.25	106.57	78.50

Well # 6

Well Depth: 300 ft | Pump HP: 40
Pump Depth: 260 ft | Pump Rate: 350 gpm

Day	Gallons Produced	Hours Run	Pumping Level	Static Level
1	193.00	11.20	61.00	16.00
2	228.00	13.00	61.00	17.00
3	192.00	11.20	62.00	17.00
4	168.00	9.70	63.00	17.00
5	190.00	10.90	63.00	17.00
6	199.00	11.50	61.00	16.00
7	253.00	14.50	61.00	16.00
8	208.00	12.00	61.00	16.00
9	214.00	12.40	62.00	16.00
10	182.00	10.50	62.00	16.00
11	225.00	13.20	63.00	17.00
12	159.00	9.40	62.00	18.00
13	214.00	12.50	60.00	18.00
14	228.00	13.50	61.00	18.00
15	230.00	13.50	63.00	18.00
16	204.00	12.10	63.00	18.00
17	185.00	11.00	64.00	19.00
18	206.00	12.10	64.00	20.00
19	196.00	11.60	63.00	19.00
20	186.00	11.10	63.00	19.00
21	221.00	13.10	64.00	20.00
22	209.00	12.50	64.00	20.00
23	197.00	11.60	65.00	21.00
24	196.00	11.80	64.00	21.00
25	285.00	17.10	64.00	22.00
26	228.00	13.70	67.00	24.00
27	194.00	11.60	68.00	25.00
28	272.00	16.60	67.00	25.00
29	188.00	11.40	69.00	26.00
30	201.00	12.10	67.00	26.00
TOTAL	6,251	368.4		
AVG	208.37	12.28	63.40	19.27

Well # 4

Chlorine & Aqua Mag Treatment Site

Day	Chlorine Residual	Precip.
1	1.06	
2	1.06	
3	1.09	
4	1.09	
5	1.08	
6	1.09	
7	1.09	
8	1.08	
9	1.08	
10	1.08	
11	1.08	
12	1.10	
13	1.10	
14	1.10	
15	1.09	
16	1.03	
17	1.03	
18	1.03	
19	1.03	
20	1.02	
21	1.02	
22	1.02	
23	1.02	
24	1.02	
25	1.03	
26	1.02	
27	1.02	
28	1.02	
29	1.02	
30	1.03	
TOTAL		3.00
AVG	1.05	#DIV/0!

Well # 7

Well Depth: 420 ft | Pump HP: 30
Pump Depth: 240 ft | Pump Rate: 360 gpm

Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	185.00	11.10	177.00	55.00	1.03
2	220.00	13.30	177.00	56.00	1.05
3	185.00	11.10	179.00	56.00	0.97
4	157.00	9.50	179.00	56.00	1.02
5	177.00	10.70	179.00	56.00	1.06
6	190.00	11.50	177.00	55.00	1.12
7	240.00	14.50	178.00	58.00	1.01
8	203.00	12.30	179.00	57.00	0.99
9	201.00	12.20	180.00	57.00	0.95
10	174.00	10.60	180.00	58.00	0.99
11	215.00	13.30	180.00	60.00	1.05
12	149.00	9.10	179.00	59.00	0.93
13	205.00	12.50	180.00	60.00	1.04
14	220.00	13.50	180.00	60.00	1.04
15	224.00	13.70	182.00	61.00	1.04
16	195.00	12.00	183.00	62.00	0.94
17	171.00	10.50	181.00	62.00	1.02
18	198.00	12.20	182.00	63.00	1.07
19	191.00	11.80	182.00	62.00	0.98
20	180.00	11.10	182.00	63.00	0.98
21	212.00	13.10	183.00	63.00	1.03
22	201.00	12.50	183.00	64.00	1.00
23	190.00	11.70	184.00	65.00	1.01
24	185.00	11.50	183.00	66.00	1.05
25	273.00	17.10	183.00	66.00	1.05
26	219.00	13.80	187.00	70.00	1.01
27	186.00	11.80	188.00	72.00	1.02
28	258.00	16.30	187.00	73.00	1.02
29	180.00	11.40	189.00	74.00	1.02
30	191.00	12.10	188.00	74.00	1.08
TOTAL	5,975	367.8			
AVG	199.17	12.26	181.70	62.10	1.02

TOTAL THREE MILE RUN WELL PRODUCTION

Day	Gallons Produced	Hours Run
1	500	33.40
2	592	39.50
3	500	33.40
4	430	28.80
5	485	32.40
6	515	34.40
7	653	43.60
8	543	36.40
9	551	37.00
10	471	31.50
11	583	39.60
12	410	27.80
13	556	37.50
14	594	40.40
15	603	40.80
16	530	36.10
17	474	32.30
18	537	36.50
19	515	35.20
20	485	33.10
21	576	39.30
22	545	37.40
23	513	34.90
24	508	34.90
25	743	51.30
26	596	41.30
27	506	35.00
28	708	49.40
29	492	34.20
30	523	36.30
TOTAL	16,237	1103.70
AVG	541.23	36.79

PERKIOMEN WELL READINGS FOR JUNE 2020 (all production is in 1,000 of gallons)

Low Pressure Serving 1.2 Million Gallon Reservoir

Well # 10

Well Depth: 420 feet | **Pump HP: 30**
Pump Depth: 240 feet | **Pump Rate: 250 gpm**

Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	81.00	6.10	154.00	60.00	0.87
2	74.00	5.50	161.00	59.00	0.88
3	75.00	5.60	161.00	58.00	1.02
4	77.00	5.70	160.00	58.00	1.01
5	76.00	5.70	160.00	58.00	0.97
6	90.00	6.70	160.00	57.00	0.97
7	110.00	8.20	160.00	58.00	0.99
8	88.00	6.60	162.00	58.00	1.11
9	101.00	7.60	161.00	58.00	1.13
10	85.00	6.40	161.00	58.00	1.14
11	76.00	5.60	162.00	61.00	1.04
12	78.00	6.00	161.00	58.00	0.98
13	89.00	6.00	161.00	60.00	0.93
14	99.00	8.00	162.00	60.00	0.91
15	99.00	7.50	162.00	59.00	0.92
16	99.00	7.40	163.00	61.00	1.04
17	62.00	4.70	162.00	59.00	1.15
18	76.00	5.70	160.00	60.00	1.04
19	76.00	5.70	161.00	60.00	1.07
20	82.00	6.20	161.00	58.00	1.05
21	111.00	8.30	161.00	58.00	1.01
22	80.00	6.00	160.00	59.00	1.14
23	83.00	6.30	162.00	61.00	1.01
24	88.00	6.50	161.00	60.00	1.07
25	191.00	14.70	161.00	60.00	1.11
26	186.00	14.30	166.00	63.00	1.10
27	147.00	11.30	166.00	65.00	0.99
28	181.00	14.00	164.00	65.00	1.00
29	90.00	6.90	167.00	63.00	1.01
30	89.00	6.80	165.00	64.00	1.12
TOTAL	2,939	222.0			
AVG	97.97	7.40	161.60	59.87	1.03

Well # 11

Well Depth: 420 feet | **Pump HP: 30**
Pump Depth: 240 feet | **Pump Rate: 465 gpm**

Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	145.00	5.80	60	2.00	0.82
2	146.00	5.40	58	0.00	0.84
3	136.00	5.10	60	0.00	0.99
4	145.00	5.40	58	0.00	1.00
5	142.00	5.40	58	0.00	0.85
6	170.00	6.40	58	0.00	0.87
7	198.00	7.70	60	0.00	0.87
8	162.00	6.30	62	0.00	1.05
9	192.00	7.10	58	0.00	1.28
10	160.00	6.00	62	0.00	1.04
11	140.00	5.20	60	0.00	0.81
12	152.00	5.70	60	0.00	0.87
13	167.00	6.30	60	2.00	0.80
14	190.00	7.10	62	2.00	0.79
15	179.00	6.70	63	0.00	0.89
16	194.00	7.20	62	0.00	1.09
17	142.00	5.30	62	0.00	1.01
18	143.00	5.40	62	0.00	0.98
19	137.00	5.10	58	2.00	1.00
20	156.00	5.80	58	0.00	0.95
21	211.00	7.90	60	0.00	0.83
22	150.00	5.60	56	0.00	0.92
23	155.00	6.10	62	6.00	0.82
24	166.00	6.20	59	2.00	0.95
25	128.00	13.50	60	2.00	0.99
26	57.00	14.00	63	0.00	0.98
27	1.00	0.00	63	0.00	0.89
28	0.00	0.00	0	0.00	0.90
29	177.00	6.60	0	0.00	0.93
30	170.00	6.30	60	0.00	1.01
TOTAL	4,411	186.6			
AVG	147.03	6.22	56.13	0.60	0.93

TOTAL PERKIOMEN WELL PRODUCTION

Day	Gallons Produced	Hours Run
1	226	11.9
2	220	10.9
3	211	10.7
4	222	11.1
5	218	11.1
6	260	13.1
7	308	15.9
8	250	12.9
9	293	14.7
10	245	12.4
11	216	10.8
12	230	11.7
13	256	12.3
14	289	15.1
15	278	14.2
16	293	14.6
17	204	10.0
18	219	11.1
19	213	10.8
20	238	12.0
21	322	16.2
22	230	11.6
23	238	12.4
24	254	12.7
25	319	28.2
26	243	28.3
27	148	11.3
28	181	14.0
29	267	13.5
30	259	13.1
TOTAL	7,350	408.6
AVG	245.00	13.62

OVERALL TOTAL

Day	Gallons Produced	Hours Run
1	726	45.30
2	812	50.40
3	711	44.10
4	652	39.90
5	703	43.50
6	775	47.50
7	961	59.50
8	793	49.30
9	844	51.70
10	716	43.90
11	799	50.40
12	640	39.50
13	812	49.80
14	883	55.50
15	881	55.00
16	823	50.70
17	678	42.30
18	756	47.60
19	728	46.00
20	723	45.10
21	898	55.50
22	775	49.00
23	751	47.30
24	762	47.60
25	1,062	79.50
26	839	69.60
27	654	46.30
28	889	63.4
29	759	47.70
30	782	49.40
TOTAL	23,587	1512.30
AVG	786	50.41

THREE MILE RUN WELL READINGS FOR JULY 2020 (all production is in 1,000 of gallons)

High Pressure Serving 2 Million Gallon Storage Tank

Well # 5

Well Depth: 303 ft | **Pump HP: 20**
Pump Depth: 240 ft | **Pump Rate: 180 gpm**

Day	Gallons Produced	Hours Run	Pumping Level	Static Level
1	153.00	14.00	110.00	83.00
2	101.00	14.00	111.00	83.00
3	131.00	12.10	111.00	83.00
4	135.00	12.50	111.00	83.00
5	178.00	16.50	111.00	83.00
6	137.00	12.60	112.00	84.00
7	145.00	13.50	112.00	84.00
8	141.00	13.00	113.00	84.00
9	129.00	12.00	113.00	85.00
10	131.00	12.10	113.00	85.00
11	119.00	11.10	113.00	85.00
12	162.00	14.90	113.00	85.00
13	131.00	12.20	112.00	84.00
14	134.00	12.40	113.00	85.00
15	134.00	12.40	113.00	85.00
16	121.00	11.20	112.00	86.00
17	120.00	11.10	113.00	85.00
18	139.00	12.90	113.00	85.00
19	156.00	14.40	112.00	85.00
20	148.00	13.80	113.00	86.00
21	166.00	15.40	114.00	85.00
22	105.00	9.80	114.00	86.00
23	161.00	15.00	114.00	86.00
24	114.00	10.60	115.00	86.00
25	171.00	15.90	115.00	87.00
26	191.00	17.80	116.00	87.00
27	167.00	15.50	117.00	88.00
28	179.00	16.70	118.00	88.00
29	195.00	18.20	118.00	90.00
30	160.00	15.00	119.00	93.00
31	145.00	13.60	119.00	90.00
TOTAL	4,499	422.2		
AVG	145.13	13.62	113.65	85.61

Well # 6

Well Depth: 300 ft | **Pump HP: 40**
Pump Depth: 260 ft | **Pump Rate: 350 gpm**

Day	Gallons Produced	Hours Run	Pumping Level	Static Level
1	230.00	13.90	67.00	25.00
2	156.00	13.90	68.00	26.00
3	201.00	12.20	67.00	26.00
4	207.00	12.50	67.00	27.00
5	274.00	16.60	67.00	27.00
6	207.00	12.70	70.00	27.00
7	219.00	14.00	70.00	27.00
8	215.00	12.50	71.00	29.00
9	215.00	12.00	71.00	30.00
10	175.00	11.90	71.00	31.00
11	183.00	11.20	71.00	29.00
12	246.00	14.90	71.00	29.00
13	200.00	12.20	68.00	27.00
14	206.00	12.40	70.00	27.00
15	209.00	12.70	70.00	27.00
16	183.00	11.10	68.00	26.00
17	182.00	11.00	68.00	27.00
18	214.00	13.00	68.00	27.00
19	239.00	14.50	68.00	27.00
20	224.00	13.70	69.00	29.00
21	254.00	15.40	71.00	28.00
22	161.00	9.80	71.00	31.00
23	244.00	14.90	70.00	29.00
24	175.00	10.80	71.00	29.00
25	260.00	15.90	71.00	31.00
26	285.00	17.70	73.00	30.00
27	249.00	15.50	74.00	34.00
28	271.00	16.90	75.00	34.00
29	292.00	18.30	76.00	37.00
30	235.00	14.80	76.00	36.00
31	215.00	13.50	78.00	38.00
TOTAL	6,826	422.4		
AVG	220.19	13.63	70.52	29.26

Well # 4

Chlorine & Aqua Mag Treatment Site

Day	Chlorine Residual	Precip.
1	1.03	
2	0.91	
3	0.91	
4	0.91	
5	0.91	
6	0.91	
7	0.91	
8	0.91	
9	0.91	
10	0.91	
11	0.91	
12	0.91	
13	0.85	
14	0.85	
15	0.85	
16	0.84	
17	0.84	
18	0.84	
19	0.85	
20	0.84	
21	0.85	
22	0.91	
23	0.91	
24	0.91	
25	0.91	
26	0.91	
27	0.91	
28	1.05	
29	1.05	
30	1.04	
31	1.05	
TOTAL		5.37
AVG	0.91	#DIV/0!

Well # 7

Well Depth: 420 ft | **Pump HP: 30**
Pump Depth: 240 ft | **Pump Rate: 360 gpm**

Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	226.00	14.40	188.00	74.00	1.08
2	145.00	14.40	189.00	74.00	0.83
3	191.00	12.10	189.00	75.00	0.98
4	196.00	12.50	189.00	75.00	0.98
5	257.00	16.40	189.00	76.00	0.99
6	198.00	12.70	191.00	76.00	0.92
7	210.00	13.50	191.00	77.00	0.95
8	201.00	13.00	192.00	79.00	0.96
9	181.00	11.60	193.00	80.00	0.98
10	187.00	12.10	192.00	81.00	0.73
11	175.00	11.30	192.00	80.00	1.00
12	221.00	14.20	192.00	80.00	0.99
13	192.00	12.40	191.00	79.00	0.90
14	198.00	12.70	193.00	80.00	0.94
15	200.00	13.00	193.00	80.00	0.94
16	166.00	10.70	192.00	80.00	0.89
17	175.00	11.30	192.00	81.00	0.97
18	199.00	12.90	192.00	81.00	0.91
19	221.00	14.30	192.00	81.00	0.92
20	213.00	13.90	193.00	83.00	0.92
21	236.00	15.50	195.00	83.00	0.90
22	151.00	9.80	195.00	84.00	0.88
23	227.00	14.80	195.00	84.00	1.03
24	163.00	10.70	196.00	85.00	0.98
25	241.00	15.90	196.00	86.00	0.96
26	272.00	18.00	198.00	86.00	1.07
27	227.00	15.30	199.00	91.00	1.03
28	226.00	16.70	200.00	92.00	0.83
29	246.00	18.30	188.00	93.00	0.91
30	203.00	15.10	189.00	94.00	0.85
31	178.00	13.20	190.00	95.00	0.86
TOTAL	6,322	422.7			
AVG	203.94	13.64	192.45	82.10	0.94

TOTAL THREE MILE RUN WELL PRODUCTION

Day	Gallons Produced	Hours Run
1	609	42.30
2	402	42.30
3	523	36.40
4	538	37.50
5	709	49.50
6	542	38.00
7	574	41.00
8	557	38.50
9	525	35.60
10	493	36.10
11	477	33.60
12	629	44.00
13	523	36.80
14	538	37.50
15	543	38.10
16	470	33.00
17	477	33.40
18	552	38.80
19	616	43.20
20	585	41.40
21	656	46.30
22	417	29.40
23	632	44.70
24	452	32.10
25	672	47.70
26	748	53.50
27	643	46.30
28	676	50.30
29	733	54.80
30	598	44.90
31	538	40.30
TOTAL	17,647	1267.30
AVG	569.26	40.88

PERKIOMEN WELL READINGS FOR JULY 2020 (all production is in 1,000 of gallons)

Low Pressure Serving 1.2 Million Gallon Reservoir

Well # 10					
Well Depth: 420 feet Pump Depth: 240 feet			Pump HP: 30 Pump Rate: 250 gpm		
Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	94.00	7.10	164.00	63.00	1.16
2	76.00	7.10	163.00	60.00	1.06
3	88.00	6.60	161.00	61.00	0.97
4	87.00	6.60	162.00	62.00	0.95
5	126.00	9.50	164.00	62.00	0.94
6	82.00	6.10	164.00	63.00	1.04
7	153.00	11.60	165.00	61.00	1.03
8	164.00	12.50	168.00	63.00	0.88
9	103.00	7.80	169.00	64.00	0.90
10	81.00	6.10	166.00	65.00	0.92
11	78.00	5.80	165.00	61.00	1.04
12	112.00	8.40	165.00	62.00	0.94
13	88.00	6.60	165.00	63.00	1.04
14	85.00	6.40	165.00	60.00	1.01
15	73.00	5.40	165.00	60.00	1.00
16	83.00	6.20	164.00	59.00	1.00
17	82.00	6.20	165.00	59.00	1.00
18	100.00	7.50	163.00	60.00	0.92
19	162.00	12.20	165.00	60.00	0.86
20	117.00	8.80	167.00	64.00	0.87
21	109.00	8.30	166.00	61.00	1.02
22	70.00	5.20	166.00	61.00	0.94
23	163.00	12.50	165.00	61.00	0.85
24	154.00	11.70	169.00	65.00	0.81
25	193.00	14.70	169.00	65.00	0.86
26	217.00	16.80	171.00	63.00	0.88
27	204.00	15.80	172.00	68.00	0.89
28	202.00	15.40	173.00	69.00	0.99
29	203.00	15.70	173.00	73.00	1.00
30	178.00	13.70	175.00	69.00	0.97
31	159.00	12.30	173.00	74.00	0.89
TOTAL	3,886	296.6			
AVG	125.35	9.57	166.68	63.26	0.96

Well # 11					
Well Depth: 420 feet Pump Depth: 240 feet			Pump HP: 30 Pump Rate: 465 gpm		
Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	167.00	6.30	58	2.00	1.01
2	145.00	6.30	60	0.00	1.04
3	166.00	6.20	54	0.00	0.75
4	165.00	6.20	60	4.00	0.81
5	246.00	9.20	60	4.00	0.85
6	152.00	5.70	67	0.00	0.92
7	31.00	1.20	62	0.00	0.92
8	0.00	0.30	60	0.00	0.72
9	115.00	4.00	0	0.00	0.95
10	120.00	4.50	54	0.00	1.04
11	146.00	5.40	53	0.00	1.05
12	201.00	7.60	51	0.00	0.86
13	175.00	6.50	58	2.00	0.99
14	162.00	6.10	58	0.00	0.99
15	178.00	6.70	60	0.00	0.96
16	157.00	5.80	60	0.00	1.01
17	146.00	5.50	60	0.00	1.00
18	188.00	7.10	53	0.00	0.85
19	136.00	5.10	62	0.00	0.78
20	221.00	8.30	58	0.00	0.80
21	196.00	7.40	63	0.00	0.91
22	130.00	4.90	63	0.00	0.82
23	0.00	0.00	56	0.00	0.78
24	0.00	0.00	0	0.00	0.80
25	0.00	0.00	0	0.00	0.78
26	0.00	0.00	0	0.00	0.88
27	0.00	0.00	0	0.00	0.89
28	0.00	0.00	0	0.00	0.86
29	0.00	0.00	0	0.00	0.81
30	0.00	0.00	0	0.00	0.83
31	0.00	0.00	0	0.00	0.84
TOTAL	3,343	126.3			
AVG	107.84	4.07	41.61	0.39	0.89

TOTAL PERKIOMEN WELL PRODUCTION		
Day	Gallons Produced	Hours Run
1	261	13.4
2	221	13.4
3	254	12.8
4	252	12.8
5	372	18.7
6	234	11.8
7	184	12.8
8	164	12.8
9	218	11.8
10	201	10.6
11	224	11.2
12	313	16.0
13	263	13.1
14	247	12.5
15	251	12.1
16	240	12.0
17	228	11.7
18	288	14.6
19	298	17.3
20	338	17.1
21	305	15.7
22	200	10.1
23	163	12.5
24	154	11.7
25	193	14.7
26	217	16.8
27	204	15.8
28	202	15.4
29	203	15.7
30	178	13.7
31	159	12.3
TOTAL	7,229	422.9
AVG	233.19	13.64

OVERALL TOTAL		
Day	Gallons Produced	Hours Run
1	870	55.70
2	623	55.70
3	777	49.20
4	790	50.30
5	1,081	68.20
6	776	49.80
7	758	53.80
8	721	51.30
9	743	47.40
10	694	46.70
11	701	44.80
12	942	60.00
13	786	49.90
14	785	50.00
15	794	50.20
16	710	45.00
17	705	45.10
18	840	53.40
19	914	60.50
20	923	58.50
21	961	62.00
22	617	39.50
23	795	57.20
24	606	43.80
25	865	62.40
26	965	70.30
27	847	62.10
28	878	65.7
29	936	70.50
30	776	58.60
31	697	52.60
TOTAL	24,876	1690.20
AVG	802	54.52

THREE MILE RUN WELL READINGS FOR August 2020 (all production is in 1,000 of gallons)

High Pressure Serving 2 Million Gallon Storage Tank

Well # 5

Well Depth: 303 ft | **Pump HP: 20**
Pump Depth: 240 ft | **Pump Rate: 180 gpm**

Day	Gallons Produced	Hours Run	Pumping Level	Static Level
1	169.00	15.70	119.00	91.00
2	161.00	15.10	120.00	90.00
3	156.00	14.60	119.00	90.00
4	10.00	0.90	113.00	91.00
5	161.00	15.00	118.00	90.00
6	158.00	14.70	116.00	88.00
7	124.00	11.50	117.00	88.00
8	163.00	15.20	117.00	68.00
9	171.00	16.00	117.00	87.00
10	152.00	14.20	118.00	88.00
11	168.00	15.60	117.00	88.00
12	149.00	13.90	118.00	88.00
13	164.00	15.40	117.00	89.00
14	151.00	14.00	118.00	88.00
15	142.00	13.30	117.00	89.00
16	170.00	15.90	117.00	89.00
17	156.00	14.60	118.00	88.00
18	153.00	14.30	118.00	89.00
19	150.00	14.00	118.00	89.00
20	171.00	16.00	118.00	89.00
21	155.00	14.60	119.00	91.00
22	156.00	14.50	119.00	90.00
23	182.00	17.10	120.00	90.00
24	181.00	17.00	120.00	90.00
25	166.00	15.50	120.00	91.00
26	159.00	15.00	120.00	91.00
27	161.00	15.10	121.00	92.00
28	145.00	13.60	121.00	92.00
29	142.00	13.40	121.00	92.00
30	191.00	17.90	121.00	92.00
31	166.00	15.50	122.00	93.00
TOTAL	4,803	449.1		
AVG	154.94	14.49	118.52	89.06

Well # 6

Well Depth: 300 ft | **Pump HP: 40**
Pump Depth: 260 ft | **Pump Rate: 350 gpm**

Day	Gallons Produced	Hours Run	Pumping Level	Static Level
1	252.00	15.80	77.00	36.00
2	244.00	15.20	78.00	36.00
3	234.00	14.70	78.00	35.00
4	19.00	1.20	75.00	37.00
5	249.00	14.90	75.00	36.00
6	243.00	14.70	68.00	27.00
7	191.00	11.60	70.00	26.00
8	254.00	15.30	69.00	26.00
9	262.00	15.90	69.00	24.00
10	237.00	14.30	70.00	25.00
11	259.00	15.70	69.00	25.00
12	229.00	13.90	70.00	26.00
13	253.00	15.40	69.00	28.00
14	229.00	13.90	70.00	27.00
15	219.00	13.40	69.00	28.00
16	261.00	15.90	69.00	28.00
17	250.00	15.10	71.00	28.00
18	245.00	14.90	71.00	29.00
19	225.00	13.90	72.00	29.00
20	262.00	16.00	72.00	30.00
21	236.00	14.60	74.00	33.00
22	236.00	14.60	73.00	31.00
23	277.00	17.10	75.00	31.00
24	274.00	17.00	75.00	33.00
25	248.00	15.40	76.00	35.00
26	239.00	15.00	76.00	34.00
27	242.00	15.20	77.00	38.00
28	218.00	13.70	78.00	36.00
29	214.00	13.40	76.00	38.00
30	285.00	17.80	76.00	36.00
31	252.00	15.80	78.00	38.00
TOTAL	7,338	451.3		
AVG	236.71	14.56	73.06	31.26

Well # 4

Chlorine & Aqua Mag Treatment Site

Day	Chlorine Residual	Precip.
1	1.31	
2	1.22	
3	1.22	
4	1.22	
5	1.20	
6	1.20	
7	0.94	
8	0.94	
9	0.94	
10	0.94	
11	0.94	
12	0.94	
13	0.94	
14	0.94	
15	0.94	
16	0.94	
17	0.94	
18	0.92	
19	0.92	
20	0.92	
21	1.04	
22	1.04	
23	1.04	
24	1.04	
25	1.04	
26	1.04	
27	1.01	
28	1.01	
29	1.01	
30	1.01	
31	1.01	
TOTAL		9.36
AVG	1.02	#DIV/0!

Well # 7

Well Depth: 420 ft | **Pump HP: 30**
Pump Depth: 240 ft | **Pump Rate: 360 gpm**

Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	214.00	15.90	189.00	94.00	1.31
2	203.00	15.10	190.00	94.00	1.19
3	196.00	18.60	190.00	95.00	1.09
4	308.00	18.50	189.00	96.00	1.20
5	218.00	16.40	197.00	94.00	0.97
6	193.00	14.50	191.00	100.00	1.12
7	158.00	11.80	192.00	98.00	1.01
8	202.00	15.00	190.00	97.00	1.03
9	216.00	16.10	190.00	96.00	1.09
10	190.00	14.10	188.00	96.00	1.07
11	209.00	15.60	190.00	96.00	1.11
12	189.00	14.00	190.00	96.00	1.03
13	202.00	15.10	190.00	98.00	0.83
14	193.00	14.40	190.00	95.00	1.09
15	180.00	13.30	189.00	96.00	1.06
16	214.00	15.90	188.00	96.00	1.07
17	198.00	14.70	190.00	94.00	1.03
18	193.00	14.30	189.00	95.00	0.94
19	190.00	14.10	190.00	95.00	0.94
20	215.00	15.90	190.00	94.00	0.92
21	197.00	14.80	190.00	97.00	1.03
22	195.00	14.50	190.00	95.00	1.03
23	229.00	17.00	191.00	95.00	1.04
24	227.00	17.00	191.00	96.00	1.07
25	207.00	15.50	191.00	98.00	1.00
26	198.00	14.90	192.00	97.00	0.96
27	200.00	15.20	192.00	98.00	1.01
28	183.00	13.80	193.00	99.00	1.07
29	178.00	13.40	191.00	99.00	1.01
30	235.00	17.60	191.00	98.00	0.98
31	208.00	15.70	192.00	100.00	1.05
TOTAL	6,338	472.7			
AVG	204.45	15.25	190.52	96.35	1.04

TOTAL THREE MILE RUN WELL PRODUCTION

Day	Gallons Produced	Hours Run
1	635	47.40
2	608	45.40
3	586	47.90
4	337	20.60
5	628	46.30
6	594	43.90
7	473	34.90
8	619	45.50
9	649	48.00
10	579	42.60
11	636	46.90
12	567	41.80
13	619	45.90
14	573	42.30
15	541	40.00
16	645	47.70
17	604	44.40
18	591	43.50
19	565	42.00
20	648	47.90
21	588	44.00
22	587	43.60
23	688	51.20
24	682	51.00
25	621	46.40
26	596	44.90
27	603	45.50
28	546	41.10
29	534	40.20
30	711	53.30
31	626	47.00
TOTAL	18,479	1373.10
AVG	596.10	44.29

PERKIOMEN WELL READINGS FOR August 2020 (all production is in 1,000 of gallons)

Low Pressure Serving 1.2 Million Gallon Reservoir

Well # 10					
Well Depth: 420 feet Pump Depth: 240 feet			Pump HP: 30 Pump Rate: 250 gpm		
Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	185.00	14.30	173.00	69.00	1.14
2	164.00	12.70	174.00	69.00	0.99
3	171.00	13.10	174.00	68.00	0.99
4	156.00	12.00	174.00	69.00	1.11
5	297.00	22.90	172.00	69.00	1.04
6	165.00	12.90	173.00	66.00	1.18
7	143.00	11.00	172.00	67.00	1.06
8	130.00	9.90	171.00	66.00	0.99
9	199.00	15.30	171.00	64.00	0.96
10	169.00	13.00	172.00	65.00	1.02
11	170.00	13.10	172.00	67.00	0.93
12	188.00	14.40	172.00	65.00	0.93
13	162.00	12.50	172.00	68.00	0.92
14	162.00	12.40	172.00	66.00	0.93
15	155.00	12.00	172.00	68.00	0.96
16	183.00	14.10	172.00	65.00	0.94
17	177.00	13.60	173.00	66.00	0.94
18	158.00	12.20	172.00	66.00	0.92
19	161.00	12.30	172.00	66.00	0.89
20	175.00	13.50	173.00	66.00	0.88
21	159.00	12.20	172.00	69.00	0.98
22	170.00	13.10	172.00	66.00	0.91
23	214.00	16.50	174.00	67.00	0.91
24	198.00	15.30	174.00	69.00	1.09
25	156.00	12.00	174.00	70.00	1.11
26	159.00	12.30	174.00	69.00	1.09
27	176.00	13.50	174.00	69.00	1.14
28	223.00	17.30	174.00	69.00	1.19
29	138.00	10.70	176.00	72.00	1.02
30	195.00	15.10	174.00	68.00	0.98
31	154.00	11.80	174.00	73.00	1.14
TOTAL	5,412	417.0			
AVG	174.58	13.45	172.90	67.61	1.01

Well # 11					
Well Depth: 311 feet Pump Depth: 240 feet			Pump HP: 30 Pump Rate: 465 gpm		
Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	0.00	0.00	0	0.00	0.80
2	0.00	0.00	0	0.00	0.79
3	0.00	0.00	0	0.00	0.82
4	0.00	0.00	0	0.00	0.80
5	0.00	0.00	0	0.00	0.80
6	0.00	0.00	0	0.00	0.81
7	0.00	0.00	0	0.00	0.79
8	0.00	0.00	0	0.00	0.79
9	0.00	0.00	0	0.00	0.79
10	0.00	0.00	0	0.00	0.80
11	0.00	0.00	0	0.00	0.81
12	0.00	0.00	0	0.00	0.80
13	0.00	0.00	0	0.00	0.81
14	0.00	0.00	0	0.00	0.81
15	0.00	0.00	0	0.00	0.80
16	0.00	0.00	0	0.00	0.79
17	0.00	0.00	0	0.00	0.80
18	0.00	0.00	0	0.00	0.80
19	0.00	0.00	0	0.00	0.73
20	0.00	0.00	0	0.00	0.74
21	0.00	0.00	0	0.00	0.80
22	0.00	0.00	0	0.00	0.88
23	0.00	0.00	0	0.00	0.89
24	0.00	0.00	0	0.00	0.80
25	0.00	0.00	0	0.00	0.87
26	0.00	0.00	0	0.00	0.86
27	0.00	0.00	0	0.00	0.96
28	0.00	0.00	0	0.00	0.82
29	0.00	0.00	0	0.00	0.97
30	0.00	0.00	0	0.00	0.81
31	0.00	0.00	0	0.00	0.89
TOTAL	0	0.0			
AVG	0.00	0.00	0.00	0.00	0.82

TOTAL PERKIOMEN WELL PRODUCTION		
Day	Gallons Produced	Hours Run
1	185	14.3
2	164	12.7
3	171	13.1
4	156	12.0
5	297	22.9
6	165	12.9
7	143	11.0
8	130	9.9
9	199	15.3
10	169	13.0
11	170	13.1
12	188	14.4
13	162	12.5
14	162	12.4
15	155	12.0
16	183	14.1
17	177	13.6
18	158	12.2
19	161	12.3
20	175	13.5
21	159	12.2
22	170	13.1
23	214	16.5
24	198	15.3
25	156	12.0
26	159	12.3
27	176	13.5
28	223	17.3
29	138	10.7
30	195	15.1
31	154	11.8
TOTAL	5,412	417.0
AVG	174.58	13.45

OVERALL TOTAL		
Day	Gallons Produced	Hours Run
1	820	61.70
2	772	58.10
3	757	61.00
4	493	32.60
5	925	69.20
6	759	56.80
7	616	45.90
8	749	55.40
9	848	63.30
10	748	55.60
11	806	60.00
12	755	56.20
13	781	58.40
14	735	54.70
15	696	52.00
16	828	61.80
17	781	58.00
18	749	55.70
19	726	54.30
20	823	61.40
21	747	56.20
22	757	56.70
23	902	67.70
24	880	66.30
25	777	58.40
26	755	57.20
27	779	59.00
28	769	58.4
29	672	50.90
30	906	68.40
31	780	58.80
TOTAL	23,891	1790.10
AVG	771	57.75

THREE MILE RUN WELL READINGS FOR SEPTEMBER 2020 (all production is in 1,000 of gallons)

High Pressure Serving 2 Million Gallon Storage Tank

Well # 5

Well Depth: 303 ft | **Pump HP: 20**
Pump Depth: 240 ft | **Pump Rate: 180 gpm**

Day	Gallons Produced	Hours Run	Pumping Level	Static Level
1	148.00	13.90	122.00	92.00
2	163.00	15.40	122.00	92.00
3	169.00	15.90	122.00	92.00
4	139.00	13.10	123.00	92.00
5	161.00	15.20	123.00	94.00
6	150.00	14.10	121.00	93.00
7	206.00	19.40	122.00	94.00
8	174.00	16.40	123.00	93.00
9	138.00	13.00	123.00	93.00
10	191.00	18.10	123.00	93.00
11	129.00	12.10	124.00	94.00
12	146.00	13.70	124.00	93.00
13	192.00	18.10	124.00	94.00
14	151.00	14.30	124.00	94.00
15	147.00	13.90	124.00	94.00
16	171.00	16.00	124.00	94.00
17	157.00	14.90	124.00	94.00
18	137.00	12.80	124.00	94.00
19	163.00	15.50	124.00	94.00
20	194.00	18.30	121.00	95.00
21	174.00	16.50	125.00	94.00
22	120.00	11.20	125.00	95.00
23	191.00	18.10	125.00	94.00
24	149.00	14.10	126.00	95.00
25	173.00	16.40	126.00	96.00
26	151.00	14.40	127.00	96.00
27	183.00	17.30	126.00	97.00
28	152.00	14.40	125.00	96.00
29	163.00	15.40	126.00	96.00
30	151.00	14.40	127.00	96.00
TOTAL	4,833	456.3		
AVG	161.10	15.21	123.97	94.10

Well # 6

Well Depth: 300 ft | **Pump HP: 40**
Pump Depth: 260 ft | **Pump Rate: 350 gpm**

Day	Gallons Produced	Hours Run	Pumping Level	Static Level
1	222.00	13.90	77.00	35.00
2	246.00	15.30	77.00	35.00
3	254.00	16.00	77.00	36.00
4	208.00	13.10	78.00	36.00
5	240.00	15.10	78.00	38.00
6	228.00	14.20	75.00	37.00
7	307.00	19.30	76.00	38.00
8	258.00	16.30	78.00	36.00
9	212.00	13.30	78.00	36.00
10	284.00	17.90	78.00	37.00
11	193.00	12.10	78.00	37.00
12	220.00	13.80	78.00	36.00
13	289.00	18.10	78.00	36.00
14	230.00	14.40	78.00	35.00
15	219.00	13.80	78.00	36.00
16	260.00	16.20	78.00	37.00
17	233.00	14.70	77.00	36.00
18	208.00	13.00	78.00	36.00
19	243.00	15.40	78.00	37.00
20	289.00	18.20	77.00	39.00
21	260.00	16.50	79.00	38.00
22	247.00	15.60	80.00	39.00
23	260.00	16.40	80.00	40.00
24	224.00	14.30	81.00	40.00
25	256.00	16.40	81.00	41.00
26	223.00	14.30	83.00	42.00
27	168.00	17.20	81.00	44.00
28	326.00	14.40	80.00	42.00
29	242.00	15.60	82.00	42.00
30	225.00	14.30	82.00	42.00
TOTAL	7,274	459.1		
AVG	242.47	15.30	78.63	37.97

Well # 4

Chlorine & Aqua Mag Treatment Site

Day	Chlorine Residual	Precip.
1	1.01	
2	1.01	
3	1.01	
4	1.01	
5	1.01	
6	1.01	
7	1.01	
8	1.01	
9	1.01	
10	1.01	
11	0.98	
12	0.98	
13	0.98	
14	0.98	
15	0.98	
16	0.98	
17	0.98	
18	1.04	
19	1.05	
20	1.04	
21	1.04	
22	1.04	
23	1.04	
24	1.04	
25	1.04	
26	1.04	
27	1.04	
28	0.93	
29	0.93	
30	0.93	
TOTAL		4.13
AVG	1.01	#DIV/0!

Well # 7

Well Depth: 420 ft | **Pump HP: 30**
Pump Depth: 240 ft | **Pump Rate: 360 gpm**

Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	185.00	14.00	192.00	98.00	0.98
2	204.00	15.30	192.00	98.00	1.05
3	174.00	13.10	192.00	99.00	1.03
4	174.00	13.10	192.00	97.00	1.06
5	203.00	15.30	192.00	99.00	0.93
6	185.00	14.00	191.00	98.00	1.01
7	257.00	19.50	192.00	99.00	0.97
8	214.00	16.20	193.00	99.00	0.97
9	174.00	13.20	193.00	99.00	0.97
10	241.00	18.30	193.00	99.00	1.07
11	156.00	11.80	193.00	99.00	0.89
12	184.00	13.90	193.00	99.00	1.01
13	236.00	18.00	193.00	100.00	1.03
14	192.00	14.60	193.00	99.00	0.98
15	178.00	13.50	193.00	99.00	0.98
16	212.00	16.10	194.00	101.00	1.00
17	195.00	14.80	194.00	101.00	1.02
18	170.00	12.90	194.00	100.00	1.05
19	204.00	15.60	194.00	100.00	0.94
20	237.00	18.10	193.00	102.00	1.07
21	215.00	16.60	195.00	101.00	1.05
22	201.00	15.40	195.00	101.00	1.07
23	245.00	18.90	195.00	102.00	1.10
24	183.00	14.20	195.00	102.00	1.06
25	210.00	16.40	196.00	106.00	1.13
26	186.00	14.50	196.00	106.00	1.13
27	219.00	17.10	196.00	107.00	1.03
28	191.00	14.80	195.00	105.00	0.94
29	197.00	15.30	197.00	104.00	0.97
30	183.00	14.10	196.00	104.00	0.91
TOTAL	6,005	458.6			
AVG	200.17	15.29	193.73	100.77	1.01

TOTAL THREE MILE RUN WELL PRODUCTION

Day	Gallons Produced	Hours Run
1	555	41.80
2	613	46.00
3	597	45.00
4	521	39.30
5	604	45.60
6	563	42.30
7	770	58.20
8	646	48.90
9	524	39.50
10	716	54.30
11	478	36.00
12	550	41.40
13	717	54.20
14	573	43.30
15	544	41.20
16	643	48.30
17	585	44.40
18	515	38.70
19	610	46.50
20	720	54.60
21	649	49.60
22	568	42.20
23	696	53.40
24	556	42.60
25	639	49.20
26	560	43.20
27	570	51.60
28	669	43.60
29	602	46.30
30	559	42.80
TOTAL	18,112	1374.00
AVG	603.73	45.80

PERKIOMEN WELL READINGS FOR SEPTEMBER 2020 (all production is in 1,000 of gallons)

Low Pressure Serving 1.2 Million Gallon Reservoir

Well # 10					
Well Depth: 420 feet Pump Depth: 240 feet			Pump HP: 30 Pump Rate: 250 gpm		
Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	144.00	11.20	174.00	67.00	1.12
2	152.00	11.60	173.00	67.00	1.11
3	153.00	11.80	173.00	67.00	1.10
4	144.00	11.10	173.00	68.00	1.16
5	150.00	11.60	173.00	68.00	0.99
6	147.00	11.20	173.00	68.00	0.99
7	184.00	14.20	173.00	68.00	0.99
8	171.00	13.10	174.00	67.00	1.11
9	140.00	10.80	174.00	68.00	1.15
10	176.00	13.60	173.00	68.00	0.92
11	110.00	8.40	172.00	71.00	1.07
12	163.00	12.60	172.00	66.00	0.87
13	187.00	14.50	172.00	69.00	0.87
14	147.00	11.40	174.00	67.00	1.06
15	159.00	12.30	173.00	67.00	0.97
16	160.00	12.40	173.00	67.00	0.97
17	145.00	11.20	173.00	67.00	1.02
18	152.00	11.80	173.00	67.00	1.01
19	168.00	13.10	174.00	68.00	0.88
20	178.00	13.70	173.00	69.00	0.93
21	176.00	13.70	175.00	69.00	1.00
22	147.00	11.40	174.00	69.00	1.06
23	193.00	15.10	174.00	73.00	0.96
24	148.00	11.50	174.00	70.00	1.05
25	106.00	8.20	175.00	70.00	0.85
26	171.00	13.20	174.00	69.00	0.86
27	166.00	12.90	174.00	71.00	0.91
28	146.00	11.30	176.00	70.00	1.12
29	134.00	10.30	176.00	70.00	0.90
30	128.00	9.90	174.00	70.00	0.90
TOTAL	4,645	359.1			
AVG	154.83	11.97	173.60	68.50	1.00

Well # 11					
Well Depth: 311 feet Pump Depth: 240 feet			Pump HP: 30 Pump Rate: 465 gpm		
Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	0.00	0.00	0	0.00	0.74
2	0.00	0.00	0	0.00	0.76
3	0.00	0.00	0	0.00	0.74
4	0.00	0.00	0	0.00	0.81
5	0.00	0.00	0	0.00	1.00
6	0.00	0.00	0	0.00	0.81
7	0.00	0.00	0	0.00	0.81
8	0.00	0.00	0	0.00	0.84
9	0.00	0.00	0	0.00	0.80
10	0.00	0.00	0	0.00	0.79
11	0.00	0.00	0	0.00	0.76
12	0.00	0.00	0	0.00	0.76
13	0.00	0.00	0	0.00	0.77
14	0.00	0.00	0	0.00	0.82
15	0.00	0.00	0	0.00	0.76
16	0.00	0.00	0	0.00	0.75
17	0.00	0.00	0	0.00	0.73
18	0.00	0.00	0	0.00	0.77
19	0.00	0.00	0	0.00	0.99
20	0.00	0.00	0	0.00	1.02
21	0.00	0.00	0	0.00	0.79
22	0.00	0.00	0	0.00	0.74
23	0.00	0.00	0	0.00	0.76
24	0.00	0.00	0	0.00	0.74
25	0.00	0.00	0	0.00	0.83
26	0.00	0.00	0	0.00	0.70
27	0.00	0.00	0	0.00	0.78
28	0.00	0.00	0	0.00	0.75
29	0.00	0.00	0	0.00	0.81
30	0.00	0.00	0	0.00	0.75
TOTAL	0	0.0			
AVG	0.00	0.00	0.00	0.00	0.80

TOTAL PERKIOMEN WELL PRODUCTION		
Day	Gallons Produced	Hours Run
1	144	11.2
2	152	11.6
3	153	11.8
4	144	11.1
5	150	11.6
6	147	11.2
7	184	14.2
8	171	13.1
9	140	10.8
10	176	13.6
11	110	8.4
12	163	12.6
13	187	14.5
14	147	11.4
15	159	12.3
16	160	12.4
17	145	11.2
18	152	11.8
19	168	13.1
20	178	13.7
21	176	13.7
22	147	11.4
23	193	15.1
24	148	11.5
25	106	8.2
26	171	13.2
27	166	12.9
28	146	11.3
29	134	10.3
30	128	9.9
TOTAL	4,645	359.1
AVG	154.83	11.97

OVERALL TOTAL		
Day	Gallons Produced	Hours Run
1	699	53.00
2	765	57.60
3	750	56.80
4	665	50.40
5	754	57.20
6	710	53.50
7	954	72.40
8	817	62.00
9	664	50.30
10	892	67.90
11	588	44.40
12	713	54.00
13	904	68.70
14	720	54.70
15	703	53.50
16	803	60.70
17	730	55.60
18	667	50.50
19	778	59.60
20	898	68.30
21	825	63.30
22	715	53.60
23	889	68.50
24	704	54.10
25	745	57.40
26	731	56.40
27	736	64.50
28	815	54.9
29	736	56.60
30	687	52.70
TOTAL	22,757	1733.10
AVG	759	57.77

THREE MILE RUN WELL READINGS FOR OCTOBER 2020 (all production is in 1,000 of gallons)

High Pressure Serving 2 Million Gallon Storage Tank

Well # 5

Well Depth: 303 ft | Pump HP: 20
Pump Depth: 240 ft | Pump Rate: 180 gpm

Day	Gallons Produced	Hours Run	Pumping Level	Static Level
1	128.00	12.10	126.00	96.00
2	148.00	13.90	126.00	96.00
3	144.00	13.70	127.00	97.00
4	169.00	16.00	126.00	96.00
5	161.00	15.30	127.00	96.00
6	171.00	16.30	126.00	97.00
7	162.00	15.30	127.00	97.00
8	150.00	14.20	127.00	97.00
9	138.00	13.10	127.00	97.00
10	155.00	14.70	127.00	97.00
11	153.00	14.60	127.00	98.00
12	164.00	15.60	126.00	97.00
13	163.00	15.40	128.00	97.00
14	150.00	14.30	128.00	97.00
15	157.00	15.00	127.00	97.00
16	117.00	11.00	128.00	97.00
17	150.00	14.30	127.00	98.00
18	165.00	15.70	126.00	98.00
19	159.00	15.00	128.00	97.00
20	155.00	14.90	126.00	97.00
21	145.00	13.70	128.00	98.00
22	156.00	14.90	128.00	97.00
23	144.00	13.70	128.00	97.00
24	136.00	12.90	127.00	97.00
25	159.00	15.10	128.00	97.00
26	152.00	14.50	127.00	97.00
27	130.00	12.30	128.00	97.00
28	146.00	13.80	128.00	97.00
29	126.00	12.00	127.00	97.00
30	126.00	12.10	126.00	97.00
31	148.00	14.00	126.00	97.00
TOTAL	4,627	439.4		
AVG	149.26	14.17	127.03	97.00

Well # 6

Well Depth: 300 ft | Pump HP: 40
Pump Depth: 260 ft | Pump Rate: 350 gpm

Day	Gallons Produced	Hours Run	Pumping Level	Static Level
1	191.00	12.20	81.00	41.00
2	219.00	13.90	81.00	41.00
3	216.00	13.80	80.00	40.00
4	251.00	16.00	79.00	40.00
5	241.00	15.40	82.00	41.00
6	253.00	16.10	80.00	42.00
7	244.00	15.60	81.00	41.00
8	222.00	14.20	82.00	42.00
9	204.00	13.10	82.00	42.00
10	228.00	14.60	82.00	42.00
11	230.00	14.70	81.00	44.00
12	244.00	15.70	80.00	42.00
13	238.00	15.20	82.00	42.00
14	224.00	14.30	82.00	42.00
15	237.00	15.10	82.00	41.00
16	175.00	11.10	82.00	41.00
17	222.00	14.20	83.00	43.00
18	247.00	15.80	80.00	43.00
19	238.00	15.10	82.00	41.00
20	231.00	14.70	71.00	41.00
21	219.00	14.00	82.00	42.00
22	231.00	14.70	81.00	41.00
23	216.00	13.80	82.00	41.00
24	205.00	13.00	81.00	40.00
25	237.00	15.10	81.00	41.00
26	230.00	14.60	79.00	41.00
27	193.00	12.20	81.00	40.00
28	220.00	14.00	81.00	40.00
29	189.00	12.00	80.00	39.00
30	189.00	12.00	78.00	40.00
31	224.00	13.90	77.00	39.00
TOTAL	6,908	440.1		
AVG	222.84	14.20	80.58	41.16

Well # 4

Chlorine & Aqua Mag Treatment Site

Day	Chlorine Residual	Precip.
1	0.93	
2	0.93	
3	0.93	
4	0.93	
5	0.98	
6	0.98	
7	0.98	
8	0.98	
9	0.98	
10	0.98	
11	0.98	
12	0.98	
13	0.98	
14	0.98	
15	1.03	
16	1.03	
17	1.04	
18	1.03	
19	1.03	
20	1.03	
21	1.03	
22	1.03	
23	1.03	
24	0.95	
25	0.95	
26	0.95	
27	0.95	
28	0.95	
29	1.02	
30	1.02	
31	1.02	
TOTAL		3.60
AVG	0.99	

Well # 7

Well Depth: 420 ft | Pump HP: 30
Pump Depth: 240 ft | Pump Rate: 360 gpm

Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	160.00	12.40	195.00	105.00	0.91
2	179.00	13.80	195.00	105.00	0.93
3	180.00	13.90	195.00	102.00	0.93
4	207.00	16.00	195.00	102.00	0.91
5	196.00	15.10	196.00	103.00	0.98
6	211.00	16.30	195.00	104.00	0.97
7	199.00	15.40	196.00	105.00	0.97
8	184.00	14.20	196.00	103.00	0.96
9	168.00	13.10	197.00	103.00	0.96
10	192.00	14.90	197.00	103.00	0.99
11	189.00	14.60	197.00	103.00	0.95
12	200.00	15.40	197.00	103.00	0.97
13	195.00	15.20	197.00	103.00	1.02
14	187.00	14.40	197.00	103.00	0.94
15	197.00	15.30	196.00	104.00	1.04
16	142.00	10.90	196.00	103.00	1.04
17	186.00	14.40	196.00	105.00	0.84
18	204.00	15.80	195.00	104.00	1.07
19	193.00	14.90	197.00	103.00	1.10
20	188.00	14.50	196.00	102.00	1.15
21	182.00	14.10	197.00	104.00	0.87
22	193.00	15.00	196.00	102.00	1.15
23	175.00	13.50	196.00	105.00	1.08
24	171.00	13.10	196.00	102.00	1.13
25	195.00	15.00	196.00	102.00	1.08
26	186.00	14.40	194.00	102.00	1.07
27	163.00	12.50	195.00	101.00	1.03
28	178.00	13.70	196.00	101.00	1.08
29	156.00	12.00	195.00	100.00	1.14
30	159.00	12.20	193.00	101.00	1.04
31	183.00	14.00	193.00	100.00	1.06
TOTAL	5,698	440.0			
AVG	183.81	14.19	195.74	102.84	1.01

TOTAL THREE MILE RUN WELL PRODUCTION

Day	Gallons Produced	Hours Run
1	479	36.70
2	546	41.60
3	540	41.40
4	627	48.00
5	598	45.80
6	635	48.70
7	605	46.30
8	556	42.60
9	510	39.30
10	575	44.20
11	572	43.90
12	608	46.70
13	596	45.80
14	561	43.00
15	591	45.40
16	434	33.00
17	558	42.90
18	616	47.30
19	590	45.00
20	574	44.10
21	546	41.80
22	580	44.60
23	535	41.00
24	512	39.00
25	591	45.20
26	568	43.50
27	486	37.00
28	544	41.50
29	471	36.00
30	474	36.30
31	555	41.90
TOTAL	17,233	1319.50
AVG	555.90	42.56

PERKIOMEN WELL READINGS FOR OCTOBER 2020 (all production is in 1,000 of gallons)

Low Pressure Serving 1.2 Million Gallon Reservoir

Well # 10

Well Depth: 420 feet
Pump Depth: 240 feet
Pump HP: 30
Pump Rate: 250 gpm

Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	129.00	9.90	174.00	69.00	0.89
2	120.00	9.20	174.00	68.00	0.90
3	146.00	11.20	173.00	68.00	0.91
4	154.00	11.90	172.00	69.00	0.96
5	152.00	11.70	174.00	68.00	1.15
6	142.00	11.00	172.00	69.00	1.07
7	144.00	10.90	173.00	69.00	0.81
8	136.00	10.50	174.00	68.00	0.91
9	126.00	9.70	173.00	68.00	0.79
10	150.00	11.60	173.00	69.00	0.81
11	137.00	10.50	172.00	69.00	0.85
12	146.00	11.20	174.00	68.00	0.95
13	132.00	10.10	174.00	68.00	0.83
14	134.00	10.30	174.00	68.00	0.80
15	135.00	10.30	174.00	68.00	0.92
16	125.00	9.60	174.00	68.00	0.88
17	145.00	11.10	173.00	68.00	0.90
18	145.00	11.10	173.00	69.00	0.94
19	146.00	11.20	175.00	67.00	1.03
20	124.00	9.50	174.00	68.00	0.88
21	128.00	9.80	173.00	67.00	0.88
22	125.00	9.60	174.00	68.00	0.88
23	121.00	9.20	173.00	67.00	0.90
24	100.00	7.70	173.00	67.00	0.88
25	160.00	12.30	173.00	66.00	0.87
26	98.00	7.40	174.00	67.00	1.06
27	76.00	5.80	172.00	68.00	1.07
28	78.00	5.90	171.00	67.00	0.98
29	66.00	5.00	170.00	66.00	1.01
30	86.00	6.50	170.00	64.00	1.07
31	74.00	5.60	169.00	63.00	1.02
TOTAL	3,880	297.3			
AVG	125.16	9.59	172.94	67.61	0.93

Well # 11

Well Depth: 311 feet
Pump Depth: 240 feet
Pump HP: 30
Pump Rate: 465 gpm

Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	0.00	0.00	0	0.00	0.80
2	0.00	0.00	0	0.00	0.80
3	0.00	0.00	0	0.00	0.79
4	0.00	0.00	0	0.00	0.80
5	0.00	0.00	0	0.00	0.80
6	0.00	0.00	0	0.00	0.74
7	0.00	0.00	0	0.00	0.80
8	0.00	0.00	0	0.00	0.75
9	0.00	0.00	0	0.00	0.73
10	0.00	0.00	0	0.00	0.70
11	0.00	0.00	0	0.00	0.78
12	0.00	0.00	0	0.00	0.74
13	0.00	0.00	0	0.00	0.78
14	41.00	21.40	0	0.00	1.00
15	0.00	0.00	0	0.00	0.81
16	0.00	0.00	0	0.00	0.89
17	0.00	0.00	0	0.00	0.87
18	0.00	0.00	0	0.00	0.96
19	0.00	0.00	0	0.00	0.96
20	19.00	1.10	0	0.00	0.96
21	0.00	0.00	0	0.00	1.07
22	0.00	0.00	0	0.00	1.07
23	9.00	0.50	0	0.00	1.00
24	0.00	0.00	0	0.00	0.86
25	0.00	0.00	0	0.00	0.71
26	76.00	4.60	0	0.00	1.16
27	87.00	5.30	0	0.00	1.31
28	86.00	5.20	0	0.00	1.23
29	78.00	4.70	0	0.00	0.90
30	99.00	6.10	0	0.00	0.84
31	86.00	5.20	0	0.00	0.91
TOTAL	581	54.1			
AVG	18.74	1.75	0.00	0.00	0.89

TOTAL PERKIOMEN WELL PRODUCTION

Day	Gallons Produced	Hours Run
1	129	9.9
2	120	9.2
3	146	11.2
4	154	11.9
5	152	11.7
6	142	11.0
7	144	10.9
8	136	10.5
9	126	9.7
10	150	11.6
11	137	10.5
12	146	11.2
13	132	10.1
14	175	31.7
15	135	10.3
16	125	9.6
17	145	11.1
18	145	11.1
19	146	11.2
20	143	10.6
21	128	9.8
22	125	9.6
23	130	9.7
24	100	7.7
25	160	12.3
26	174	12.0
27	163	11.1
28	164	11.1
29	144	9.7
30	185	12.6
31	160	10.8
TOTAL	4,461	351.4
AVG	143.90	11.34

OVERALL TOTAL

Day	Gallons Produced	Hours Run
1	608	46.60
2	666	50.80
3	686	52.60
4	781	59.90
5	750	57.50
6	777	59.70
7	749	57.20
8	692	53.10
9	636	49.00
10	725	55.80
11	709	54.40
12	754	57.90
13	728	55.90
14	736	74.70
15	726	55.70
16	559	42.60
17	703	54.00
18	761	58.40
19	736	56.20
20	717	54.70
21	674	51.60
22	705	54.20
23	665	50.70
24	612	46.70
25	751	57.50
26	742	55.50
27	649	48.10
28	708	52.6
29	615	45.70
30	659	48.90
31	715	52.70
TOTAL	21,694	1670.90
AVG	700	53.90

THREE MILE RUN WELL READINGS FOR NOVEMBER 2020 (all production is in 1,000 of gallons)

High Pressure Serving 2 Million Gallon Storage Tank

Well # 5				
Well Depth: 303 ft Pump Depth: 240 ft		Pump HP: 20 Pump Rate: 180 gpm		
Day	Gallons Produced	Hours Run	Pumping Level	Static Level
1	144.00	13.60	126.00	96.00
2	138.00	13.10	126.00	97.00
3	149.00	14.10	126.00	95.00
4	102.00	9.70	125.00	94.00
5	151.00	14.30	123.00	95.00
6	104.00	9.80	124.00	94.00
7	134.00	12.70	123.00	93.00
8	131.00	12.30	123.00	93.00
9	155.00	14.70	122.00	93.00
10	113.00	10.60	123.00	93.00
11	129.00	12.20	122.00	93.00
12	138.00	13.00	123.00	93.00
13	113.00	10.60	122.00	92.00
14	129.00	12.10	122.00	91.00
15	135.00	12.70	120.00	91.00
16	185.00	17.40	120.00	91.00
17	155.00	14.60	122.00	91.00
18	117.00	11.00	122.00	91.00
19	136.00	12.70	119.00	90.00
20	98.00	9.20	120.00	89.00
21	127.00	12.00	119.00	89.00
22	167.00	15.60	117.00	89.00
23	130.00	12.20	119.00	88.00
24	123.00	11.50	118.00	88.00
25	119.00	11.20	117.00	89.00
26	138.00	12.80	117.00	89.00
27	127.00	11.90	112.00	87.00
28	123.00	11.50	117.00	87.00
29	131.00	12.10	116.00	86.00
30	128.00	11.90	116.00	86.00
TOTAL	3,969	373.1		
AVG	132.30	12.44	120.70	91.10

Well # 6				
Well Depth: 300 ft Pump Depth: 260 ft		Pump HP: 40 Pump Rate: 350 gpm		
Day	Gallons Produced	Hours Run	Pumping Level	Static Level
1	222.00	13.80	77.00	38.00
2	208.00	13.00	75.00	33.00
3	230.00	14.10	75.00	32.00
4	160.00	9.80	74.00	31.00
5	231.00	14.20	71.00	32.00
6	162.00	9.90	73.00	30.00
7	207.00	12.70	71.00	29.00
8	202.00	12.30	71.00	29.00
9	242.00	14.80	70.00	30.00
10	174.00	10.70	72.00	30.00
11	201.00	12.20	70.00	29.00
12	216.00	13.20	72.00	31.00
13	175.00	10.60	71.00	27.00
14	201.00	12.10	69.00	26.00
15	215.00	12.90	68.00	24.00
16	289.00	17.40	66.00	24.00
17	238.00	14.30	70.00	24.00
18	185.00	11.10	70.00	25.00
19	213.00	12.80	66.00	23.00
20	158.00	9.40	67.00	23.00
21	197.00	11.80	66.00	23.00
22	181.00	10.80	65.00	23.00
23	206.00	12.20	67.00	24.00
24	192.00	11.50	65.00	21.00
25	188.00	11.20	65.00	23.00
26	217.00	12.90	64.00	23.00
27	199.00	11.80	66.00	21.00
28	195.00	11.60	65.00	20.00
29	205.00	12.20	65.00	20.00
30	204.00	12.00	65.00	20.00
TOTAL	6,113	369.3		
AVG	203.77	12.31	69.03	26.27

Well # 4		
Chlorine & Aqua Mag Treatment Site		
Day	Chlorine Residual	Precip.
1	1.02	
2	1.02	
3	1.02	
4	0.96	
5	0.96	
6	0.96	
7	1.12	
8	0.96	
9	0.96	
10	0.96	
11	0.96	
12	0.96	
13	0.96	
14	1.06	
15	1.06	
16	1.06	
17	1.05	
18	1.05	
19	1.14	
20	1.14	
21	1.16	
22	1.14	
23	1.18	
24	1.14	
25	1.15	
26	1.14	
27	1.14	
28	1.14	
29	1.14	
30	1.14	
TOTAL		3.65
AVG	1.06	

Well # 7					
Well Depth: 420 ft Pump Depth: 240 ft			Pump HP: 30 Pump Rate: 360 gpm		
Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	179.00	13.50	193.00	100.00	1.06
2	173.00	13.20	193.00	100.00	1.13
3	186.00	14.20	192.00	97.00	1.07
4	128.00	9.60	192.00	96.00	1.07
5	190.00	14.20	191.00	96.00	1.07
6	131.00	9.80	191.00	96.00	1.02
7	172.00	12.90	190.00	93.00	1.12
8	168.00	12.50	190.00	93.00	1.04
9	193.00	14.40	189.00	93.00	1.07
10	143.00	10.70	191.00	92.00	1.03
11	165.00	12.10	188.00	91.00	1.06
12	185.00	13.70	189.00	91.00	1.00
13	146.00	10.60	191.00	90.00	0.99
14	209.00	12.00	190.00	89.00	0.91
15	174.00	12.60	189.00	88.00	0.98
16	27.00	2.00	188.00	88.00	0.69
17	0.00	0.00	189.00	81.00	0.80
18	158.00	10.90	185.00	74.00	0.95
19	183.00	12.80	181.00	74.00	1.05
20	131.00	9.10	182.00	75.00	1.11
21	173.00	12.10	182.00	76.00	1.15
22	222.00	15.50	182.00	76.00	1.22
23	174.00	12.20	183.00	76.00	1.23
24	164.00	11.50	183.00	77.00	1.33
25	163.00	11.40	182.00	78.00	1.31
26	182.00	12.70	182.00	78.00	1.24
27	171.00	11.90	183.00	76.00	1.33
28	166.00	11.60	182.00	76.00	1.31
29	174.00	12.20	182.00	76.00	1.26
30	169.00	11.80	182.00	75.00	1.24
TOTAL	4,799	343.7			
AVG	159.97	11.46	186.90	85.37	1.09

TOTAL THREE MILE RUN WELL PRODUCTION		
Day	Gallons Produced	Hours Run
1	545	40.90
2	519	39.30
3	565	42.40
4	390	29.10
5	572	42.70
6	397	29.50
7	513	38.30
8	501	37.10
9	590	43.90
10	430	32.00
11	495	36.50
12	539	39.90
13	434	31.80
14	539	36.20
15	524	38.20
16	501	36.80
17	393	28.90
18	460	33.00
19	532	38.30
20	387	27.70
21	497	35.90
22	570	41.90
23	510	36.60
24	479	34.50
25	470	33.80
26	537	38.40
27	497	35.60
28	484	34.70
29	510	36.50
30	501	35.70
TOTAL	14,881	1086.10
AVG	496.03	36.20

PERKIOMEN WELL READINGS FOR NOVEMBER 2020 (all production is in 1,000 of gallons)

Low Pressure Serving 1.2 Million Gallon Reservoir

Well # 10

Well Depth: 420 feet | **Pump HP: 30**
Pump Depth: 240 feet | **Pump Rate: 250 gpm**

Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	99.00	7.50	169.00	64.00	1.01
2	76.00	5.70	169.00	64.00	1.03
3	97.00	7.20	168.00	60.00	1.11
4	56.00	4.20	168.00	60.00	1.15
5	68.00	5.10	167.00	61.00	1.01
6	63.00	4.70	168.00	60.00	0.95
7	73.00	5.50	167.00	60.00	0.96
8	111.00	8.40	167.00	61.00	0.92
9	76.00	5.60	168.00	62.00	0.97
10	81.00	6.70	168.00	60.00	1.07
11	70.00	4.70	168.00	61.00	1.17
12	74.00	5.50	167.00	60.00	0.95
13	55.00	4.10	168.00	60.00	1.09
14	76.00	5.80	167.00	58.00	0.83
15	108.00	8.10	167.00	58.00	0.79
16	98.00	7.40	167.00	59.00	0.82
17	112.00	8.40	168.00	59.00	0.80
18	83.00	6.40	169.00	59.00	0.76
19	91.00	6.80	167.00	58.00	0.77
20	66.00	5.00	166.00	57.00	1.13
21	74.00	5.50	165.00	58.00	0.96
22	109.00	8.20	166.00	58.00	0.86
23	73.00	5.50	167.00	57.00	1.13
24	68.00	5.10	166.00	59.00	0.86
25	93.00	7.00	135.00	58.00	0.83
26	87.00	6.60	165.00	58.00	0.95
27	71.00	5.30	166.00	59.00	0.84
28	83.00	6.30	166.00	57.00	0.83
29	92.00	7.00	166.00	57.00	0.81
30	84.00	6.30	166.00	56.00	1.01
TOTAL	2,467	185.6			
AVG	82.23	6.19	166.03	59.27	0.95

Well # 11

Well Depth: 311 feet | **Pump HP: 30**
Pump Depth: 240 feet | **Pump Rate: 465 gpm**

Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	114.00	7.00	0	0.00	0.86
2	88.00	5.30	0	0.00	0.89
3	112.00	6.70	0	0.00	0.96
4	65.00	4.00	0	0.00	1.07
5	79.00	4.80	0	0.00	0.91
6	106.00	6.50	0	0.00	0.88
7	85.00	5.20	0	0.00	0.86
8	127.00	7.80	0	0.00	0.87
9	92.00	5.50	0	0.00	0.93
10	95.00	5.80	0	0.00	0.97
11	76.00	4.70	0	0.00	1.04
12	84.00	5.00	0	0.00	0.91
13	65.00	4.00	0	0.00	1.00
14	88.00	5.40	0	0.00	0.88
15	125.00	7.60	0	0.00	0.86
16	112.00	6.80	0	0.00	0.89
17	127.00	7.90	0	0.00	0.89
18	96.00	5.80	0	0.00	0.90
19	105.00	6.40	0	0.00	0.87
20	76.00	4.70	0	0.00	1.04
21	85.00	5.00	0	0.00	0.88
22	126.00	7.80	0	0.00	0.86
23	84.00	5.20	0	0.00	0.98
24	77.00	4.70	0	0.00	0.85
25	108.00	6.60	0	0.00	0.87
26	100.00	6.10	0	0.00	0.92
27	82.00	5.10	0	0.00	0.89
28	95.00	5.80	0	0.00	0.88
29	112.00	6.80	0	0.00	0.86
30	90.00	5.50	0	0.00	1.01
TOTAL	2,876	175.5			
AVG	95.87	5.85	0.00	0.00	0.92

TOTAL PERKIOMEN WELL PRODUCTION

Day	Gallons Produced	Hours Run
1	213	14.5
2	164	11.0
3	209	13.9
4	121	8.2
5	147	9.9
6	169	11.2
7	158	10.7
8	238	16.2
9	168	11.1
10	176	12.5
11	146	9.4
12	158	10.5
13	120	8.1
14	164	11.2
15	233	15.7
16	210	14.2
17	239	16.3
18	179	12.2
19	196	13.2
20	142	9.7
21	159	10.5
22	235	16.0
23	157	10.7
24	145	9.8
25	201	13.6
26	187	12.7
27	153	10.4
28	178	12.1
29	204	13.8
30	174	11.8
TOTAL	5,343	361.1
AVG	178.10	12.04

OVERALL TOTAL

Day	Gallons Produced	Hours Run
1	758	55.40
2	683	50.30
3	774	56.30
4	511	37.30
5	719	52.60
6	566	40.70
7	671	49.00
8	739	53.30
9	758	55.00
10	606	44.50
11	641	45.90
12	697	50.40
13	554	39.90
14	703	47.40
15	757	53.90
16	711	51.00
17	632	45.20
18	639	45.20
19	728	51.50
20	529	37.40
21	656	46.40
22	805	57.90
23	667	47.30
24	624	44.30
25	671	47.40
26	724	51.10
27	650	46.00
28	662	46.8
29	714	50.30
30	675	47.50
TOTAL	20,224	1447.20
AVG	674	48.24

THREE MILE RUN WELL READINGS FOR DECEMBER 2020 (all production is in 1,000 of gallons)

High Pressure Serving 2 Million Gallon Storage Tank

Well # 5

Well Depth: 303 ft | Pump Depth: 240 ft | Pump HP: 20 | Pump Rate: 180 gpm

Day	Gallons Produced	Hours Run	Pumping Level	Static Level
1	127.00	11.90	115.00	86.00
2	144.00	13.40	115.00	85.00
3	129.00	12.00	114.00	85.00
4	107.00	10.00	114.00	85.00
5	135.00	12.50	113.00	85.00
6	138.00	12.80	113.00	84.00
7	121.00	11.20	113.00	83.00
8	137.00	12.70	113.00	84.00
9	131.00	12.00	112.00	83.00
10	112.00	10.40	112.00	82.00
11	130.00	12.00	110.00	82.00
12	124.00	11.50	111.00	82.00
13	148.00	13.70	111.00	82.00
14	128.00	11.80	111.00	82.00
15	128.00	11.80	111.00	81.00
16	118.00	10.90	111.00	81.00
17	121.00	11.30	110.00	81.00
18	135.00	12.40	109.00	81.00
19	128.00	11.80	109.00	80.00
20	132.00	12.00	110.00	80.00
21	147.00	13.70	109.00	80.00
22	86.00	13.40	110.00	81.00
23	185.00	11.50	110.00	81.00
24	142.00	13.10	110.00	82.00
25	166.00	15.30	110.00	81.00
26	130.00	11.90	109.00	80.00
27	147.00	13.70	110.00	80.00
28	146.00	13.20	108.00	80.00
29	146.00	13.60	109.00	79.00
30	121.00	11.00	109.00	79.00
31	125.00	11.60	108.00	79.00
TOTAL	4,114	380.1		
AVG	132.71	12.26	110.94	81.81

Well # 6

Well Depth: 300 ft | Pump Depth: 260 ft | Pump HP: 40 | Pump Rate: 350 gpm

Day	Gallons Produced	Hours Run	Pumping Level	Static Level
1	202.00	11.80	62.00	18.00
2	225.00	13.30	64.00	17.00
3	206.00	12.10	61.00	17.00
4	170.00	9.90	63.00	17.00
5	215.00	12.60	61.00	18.00
6	220.00	12.80	62.00	15.00
7	192.00	11.20	62.00	15.00
8	218.00	12.80	61.00	16.00
9	208.00	12.00	60.00	16.00
10	178.00	10.50	61.00	15.00
11	205.00	11.90	60.00	16.00
12	198.00	11.60	62.00	16.00
13	233.00	13.70	62.00	16.00
14	204.00	11.90	63.00	17.00
15	200.00	11.80	63.00	17.00
16	185.00	10.70	63.00	17.00
17	194.00	11.40	62.00	17.00
18	212.00	12.50	61.00	18.00
19	202.00	11.80	60.00	17.00
20	207.00	12.20	62.00	17.00
21	233.00	13.50	61.00	18.00
22	228.00	13.60	64.00	18.00
23	196.00	11.50	64.00	18.00
24	219.00	12.90	63.00	20.00
25	262.00	15.30	63.00	17.00
26	206.00	12.10	61.00	15.00
27	234.00	13.70	63.00	16.00
28	228.00	13.30	59.00	16.00
29	230.00	13.40	62.00	15.00
30	194.00	11.30	62.00	15.00
31	195.00	11.50	61.00	15.00
TOTAL	6,499	380.6		
AVG	209.65	12.28	61.87	16.61

Well # 4

Chlorine & Aqua Mag Treatment Site

Day	Chlorine Residual	Precip.
1	1.14	
2	1.14	
3	1.14	
4	1.14	
5	1.22	
6	1.21	
7	1.21	
8	1.21	
9	1.15	
10	1.14	
11	1.14	
12	1.21	
13	1.19	
14	1.18	
15	1.18	
16	1.18	
17	1.19	
18	1.19	
19	1.19	
20	1.19	
21	1.19	
22	1.18	
23	1.18	
24	1.20	
25	1.20	
26	1.09	
27	1.09	
28	1.09	
29	1.09	
30	0.97	
31	0.97	
TOTAL		7.85
AVG	1.15	

Well # 7

Well Depth: 420 ft | Pump Depth: 240 ft | Pump HP: 30 | Pump Rate: 360 gpm

Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	173.00	12.00	181.00	75.00	1.20
2	193.00	13.50	182.00	75.00	1.21
3	171.00	12.00	181.00	75.00	1.22
4	144.00	10.00	182.00	74.00	1.18
5	181.00	12.60	180.00	75.00	1.19
6	185.00	12.80	181.00	73.00	1.22
7	162.00	11.20	181.00	73.00	1.17
8	184.00	12.70	180.00	74.00	1.21
9	175.00	12.10	180.00	73.00	1.16
10	151.00	10.40	180.00	71.00	1.12
11	174.00	11.90	179.00	72.00	1.14
12	168.00	11.60	180.00	70.00	1.11
13	200.00	13.60	180.00	70.00	1.07
14	171.00	11.80	180.00	70.00	1.00
15	174.00	11.90	179.00	70.00	1.08
16	164.00	11.30	179.00	70.00	1.08
17	161.00	11.00	179.00	72.00	1.14
18	181.00	12.30	178.00	70.00	1.10
19	174.00	11.80	177.00	68.00	1.08
20	176.00	12.00	178.00	67.00	1.09
21	202.00	13.80	177.00	68.00	1.08
22	195.00	13.30	179.00	68.00	1.07
23	169.00	11.50	179.00	69.00	1.09
24	184.00	12.60	179.00	71.00	1.07
25	227.00	15.60	178.00	68.00	1.11
26	179.00	12.30	179.00	69.00	1.04
27	199.00	13.60	180.00	70.00	1.02
28	161.00	13.30	178.00	70.00	1.07
29	194.00	13.30	179.00	69.00	1.04
30	164.00	11.20	179.00	69.00	1.06
31	171.00	11.70	179.00	68.00	1.12
TOTAL	5,507	380.7			
AVG	177.65	12.28	179.45	70.84	1.11

TOTAL THREE MILE RUN WELL PRODUCTION

Day	Gallons Produced	Hours Run
1	502	35.70
2	562	40.20
3	506	36.10
4	421	29.90
5	531	37.70
6	543	38.40
7	475	33.60
8	539	38.20
9	514	36.10
10	441	31.30
11	509	35.80
12	490	34.70
13	581	41.00
14	503	35.50
15	502	35.50
16	467	32.90
17	476	33.70
18	528	37.20
19	504	35.40
20	515	36.20
21	582	41.00
22	509	40.30
23	550	34.50
24	545	38.60
25	655	46.20
26	515	36.30
27	580	41.00
28	535	39.80
29	570	40.30
30	479	33.50
31	491	34.80
TOTAL	16,120	1141.40
AVG	520.00	36.82

PERKIOMEN WELL READINGS FOR DECEMBER 2020 (all production is in 1,000 of gallons)

Low Pressure Serving 1.2 Million Gallon Reservoir

Well # 10

Well Depth: 420 feet | **Pump HP: 30**
Pump Depth: 240 feet | **Pump Rate: 250 gpm**

Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	81.00	6.00	165.00	56.00	0.85
2	83.00	6.20	166.00	56.00	0.94
3	90.00	6.80	165.00	56.00	0.81
4	68.00	5.10	166.00	57.00	1.04
5	73.00	5.40	164.00	56.00	0.91
6	98.00	7.30	165.00	55.00	0.82
7	82.00	6.10	166.00	55.00	0.98
8	74.00	5.50	165.00	56.00	0.79
9	86.00	6.40	165.00	56.00	0.93
10	63.00	4.70	166.00	55.00	1.06
11	63.00	4.70	165.00	57.00	0.87
12	76.00	5.60	165.00	55.00	1.00
13	118.00	8.80	165.00	55.00	1.04
14	66.00	5.00	166.00	55.00	1.30
15	69.00	5.10	166.00	57.00	1.08
16	70.00	5.20	166.00	57.00	0.88
17	92.00	6.90	165.00	55.00	0.96
18	67.00	5.10	165.00	57.00	0.88
19	81.00	6.00	166.00	57.00	0.87
20	121.00	9.10	166.00	58.00	0.85
21	102.00	7.70	166.00	57.00	1.02
22	145.00	11.00	168.00	57.00	0.87
23	132.00	10.00	169.00	60.00	0.92
24	134.00	10.20	169.00	61.00	0.93
25	134.00	10.20	171.00	58.00	1.06
26	120.00	9.10	168.00	59.00	0.78
27	168.00	12.90	170.00	59.00	0.79
28	111.00	8.50	171.00	59.00	0.95
29	147.00	11.20	170.00	60.00	0.80
30	132.00	10.10	170.00	61.00	0.78
31	105.00	8.00	170.00	60.00	0.82
TOTAL	3,051	229.9			
AVG	98.42	7.42	166.77	57.16	0.92

Well # 11

Well Depth: 311 feet | **Pump HP: 30**
Pump Depth: 240 feet | **Pump Rate: 465 gpm**

Day	Gallons Produced	Hours Run	Pumping Level	Static Level	Chlorine Residual
1	91.00	5.60	0	0.00	0.88
2	96.00	5.90	0	0.00	0.95
3	105.00	6.30	0	0.00	0.88
4	79.00	4.80	0	0.00	1.02
5	84.00	5.20	0	0.00	0.92
6	117.00	7.10	0	0.00	0.89
7	90.00	5.50	0	0.00	0.97
8	78.00	4.70	0	0.00	0.83
9	106.00	6.50	0	0.00	0.83
10	74.00	4.60	0	0.00	1.00
11	77.00	4.60	0	0.00	0.85
12	88.00	5.40	0	0.00	0.87
13	138.00	8.40	0	0.00	0.84
14	74.00	4.50	0	0.00	0.99
15	80.00	4.90	0	0.00	0.83
16	88.00	5.30	0	0.00	0.79
17	100.00	6.10	0	0.00	0.94
18	77.00	4.80	0	0.00	0.87
19	93.00	5.60	0	0.00	0.85
20	143.00	8.80	0	0.00	0.83
21	43.00	2.60	0	0.00	0.96
22	0.00	0.00	0	0.00	0.70
23	0.00	0.00	0	0.00	0.71
24	0.00	0.00	0	0.00	0.76
25	0.00	0.00	0	0.00	0.79
26	0.00	0.00	0	0.00	0.85
27	0.00	0.00	0	0.00	0.97
28	0.00	0.00	0	0.00	1.21
29	0.00	0.00	0	0.00	0.83
30	0.00	0.00	0	0.00	0.81
31	0.00	0.00	0	0.00	0.82
TOTAL	1,921	117.2			
AVG	61.97	3.78	0.00	0.00	0.88

TOTAL PERKIOMEN WELL PRODUCTION

Day	Gallons Produced	Hours Run
1	172	11.6
2	179	12.1
3	195	13.1
4	147	9.9
5	157	10.6
6	215	14.4
7	172	11.6
8	152	10.2
9	192	12.9
10	137	9.3
11	140	9.3
12	164	11.0
13	256	17.2
14	140	9.5
15	149	10.0
16	158	10.5
17	192	13.0
18	144	9.9
19	174	11.6
20	264	17.9
21	145	10.3
22	145	11.0
23	132	10.0
24	134	10.2
25	134	10.2
26	120	9.1
27	168	12.9
28	111	8.5
29	147	11.2
30	132	10.1
31	105	8.0
TOTAL	4,972	347.1
AVG	160.39	11.20

OVERALL TOTAL

Day	Gallons Produced	Hours Run
1	674	47.30
2	741	52.30
3	701	49.20
4	568	39.80
5	688	48.30
6	758	52.80
7	647	45.20
8	691	48.40
9	706	49.00
10	578	40.60
11	649	45.10
12	654	45.70
13	837	58.20
14	643	45.00
15	651	45.50
16	625	43.40
17	668	46.70
18	672	47.10
19	678	47.00
20	779	54.10
21	727	51.30
22	654	51.30
23	682	44.50
24	679	48.80
25	789	56.40
26	635	45.40
27	748	53.90
28	646	48.3
29	717	51.50
30	611	43.60
31	596	42.80
TOTAL	21,092	1488.50
AVG	680	48.02

APPENDIX B

WATER ACCOUNTING
PERKASIE REGIONAL AUTHORITY

AWWA Free Water Audit Software v5.0

This spreadsheet-based water audit tool is designed to help quantify and track water losses associated with water distribution systems and identify areas for improved efficiency and cost recovery. It provides a "top-down" summary water audit format, and is not meant to take the place of a full-scale, comprehensive water audit format.

Auditors are strongly encouraged to refer to the most current edition of AWWA M36 Manual for Water Audits for detailed guidance on the water auditing process and targetting loss reduction levels

The spreadsheet contains several separate worksheets. Sheets can be accessed using the tabs towards the bottom of the screen, or by clicking the buttons below.

Please begin by providing the following information

Name of Contact Person:	Nick Fretz
Email Address:	nick.fretz@perkasieauthority.com
Telephone (incl Ext.):	215-257-3654
Name of City / Utility:	Perkasie Regional Authority
City/Town/Municipality:	Perkasie
State / Province:	Pennsylvania (PA)
Country:	USA
Year:	2020
Start Date:	01/2020 Enter MM/YYYY numeric format
End Date:	12/2020 Enter MM/YYYY numeric format
Audit Preparation Date:	3/12/2021
Volume Reporting Units:	Million gallons (US)
PWSID / Other ID:	1090046

The following guidance will help you complete the Audit

All audit data are entered on the ***Reporting Worksheet***

- Value can be entered by user
- Value calculated based on input data
- These cells contain recommended default values

Use of Option (Radio) Buttons: Pcnt: 0.25% Value:

Select the default percentage by choosing the option button on the left

To enter a value, choose this button and enter a value in the cell to the right

The following worksheets are available by clicking the buttons below or selecting the tabs along the bottom of the page

Instructions
The current sheet. Enter contact information and basic audit details (year, units etc)

Reporting Worksheet
Enter the required data on this worksheet to calculate the water balance and data grading

Comments
Enter comments to explain how values were calculated or to document data sources

Performance Indicators
Review the performance indicators to evaluate the results of the audit

Water Balance
The values entered in the Reporting Worksheet are used to populate the Water Balance

Dashboard
A graphical summary of the water balance and Non-Revenue Water components

Grading Matrix
Presents the possible grading options for each input component of the audit

Service Connection Diagram
Diagrams depicting possible customer service connection line configurations

Definitions
Use this sheet to understand the terms used in the audit process

Loss Control Planning
Use this sheet to interpret the results of the audit validity score and performance indicators

Example Audits
Reporting Worksheet and Performance Indicators examples are shown for two validated audits

Acknowledgements
Acknowledgements for the AWWA Free Water Audit Software v5.0

If you have questions or comments regarding the software please contact us via email at: wlc@awwa.org

AWWA Free Water Audit Software:
Reporting Worksheet

WAS v5.0

? Click to access definition
+ Click to add a comment

Water Audit Report for: Perkasie Regional Authority (1090046)
Reporting Year: 2020 | 1/2020 - 12/2020

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

Master Meter and Supply Error Adjustments

WATER SUPPLIED

<---------- Enter grading in column 'E' and 'J' ---------->

					Pcnt:	Value:	
Volume from own sources:	10	264.336	MG/Yr	9		1.000	MG/Yr
Water imported:			MG/Yr				MG/Yr
Water exported:			MG/Yr				MG/Yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

WATER SUPPLIED: 263.336 MG/Yr

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

				Pcnt:	Value:	
Billed metered:	10	227.288	MG/Yr			
Billed unmetered:	n/a		MG/Yr			
Unbilled metered:	10	6.450	MG/Yr			
Unbilled unmetered:	10	5.376	MG/Yr		5.376	MG/Yr

Unbilled Unmetered volume entered is greater than the recommended default value

Use buttons to select percentage of water supplied **OR** value

AUTHORIZED CONSUMPTION: ? 239.114 MG/Yr

WATER LOSSES (Water Supplied - Authorized Consumption)

24.222 MG/Yr

Apparent Losses

				Pcnt:	Value:	
Unauthorized consumption:	10	0.001	MG/Yr		0.001	MG/Yr
Customer metering inaccuracies:	10	0.001	MG/Yr		0.001	MG/Yr
Systematic data handling errors:	10	0.001	MG/Yr		0.001	MG/Yr

Apparent Losses: ? 0.003 MG/Yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: ? 24.219 MG/Yr

WATER LOSSES: 24.222 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: ? 36.048 MG/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	10	61.1	miles	
Number of active AND inactive service connections:	10	4,295		
Service connection density:		70	conn./mile main	
Are customer meters typically located at the curbstop or property line?		No		
Average length of customer service line:	9	25.0	ft	(length of service line, beyond the property boundary, that is the responsibility of the utility)
Average operating pressure:	10	65.0	psi	

COST DATA

Total annual cost of operating water system:	10	$2,160,243	$/Year	
Customer retail unit cost (applied to Apparent Losses):	9	$7.00	$/1000 gallons (US)	
Variable production cost (applied to Real Losses):	10	$425.00	$/Million gallons	☑ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

*** YOUR SCORE IS: 99 out of 100 ***

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Customer retail unit cost (applied to Apparent Losses)
2: Average length of customer service line
3: Master meter error adjustment

AWWA Free Water Audit Software:
System Attributes and Performance Indicators

Water Audit Report for: Perkasie Regional Authority (1090046)
Reporting Year: 2020 | 1/2020 - 12/2020

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 99 out of 100 ***

System Attributes:

	Apparent Losses:	0.003	MG/Yr
+	Real Losses:	24.219	MG/Yr
=	Water Losses:	24.222	MG/Yr
?	Unavoidable Annual Real Losses (UARL):	26.75	MG/Yr
	Annual cost of Apparent Losses:	$21	
	Annual cost of Real Losses:	$169,533	Valued at Customer Retail Unit Cost

Return to Reporting Worksheet to change this assumpiton

Performance Indicators:

Financial:	Non-revenue water as percent by volume of Water Supplied:	13.7%	
	Non-revenue water as percent by cost of operating system:	11.7%	Real Losses valued at Customer Retail Unit Cost
Operational Efficiency:	Apparent Losses per service connection per day:	0.00	gallons/connection/day
	Real Losses per service connection per day:	15.45	gallons/connection/day
	Real Losses per length of main per day*:	N/A	
	Real Losses per service connection per day per psi pressure:	0.24	gallons/connection/day/psi
	From Above, Real Losses = Current Annual Real Losses (CARL):	24.22	million gallons/year
?	Infrastructure Leakage Index (ILI) [CARL/UARL]:	0.91	

* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline

AWWA Free Water Audit Software:
User Comments

Use this worksheet to add comments or notes to explain how an input value was calculated, or to document the sources of the information used.

General Comment:	DOCKET NO. D-1997-012 CP-4

Audit Item	Comment
Volume from own sources:	
Vol. from own sources: Master meter error adjustment:	
Water imported:	
Water imported: master meter error adjustment:	
Water exported:	
Water exported: master meter error adjustment:	
Billed metered:	
Billed unmetered:	
Unbilled metered:	
Unbilled unmetered:	

Audit Item	Comment
Unauthorized consumption:	
Customer metering inaccuracies:	
Systematic data handling errors:	
Length of mains:	
Number of active AND inactive service connections:	
Average length of customer service line:	
Average operating pressure:	
Total annual cost of operating water system:	
Customer retail unit cost (applied to Apparent Losses):	
Variable production cost (applied to Real Losses):	

AWWA Free Water Audit Software: Water Balance

WAS v5.0

Water Audit Report for:	**Perkasie Regional Authority (1090046)**	
Reporting Year:	**2020**	**1/2020 - 12/2020**
Data Validity Score:	**99**	

Water Exported
0.000

Billed Water Exported

Own Sources
(Adjusted for known errors)
263.336

Water Supplied
263.336

Authorized Consumption
239.114

Billed Authorized Consumption
227.288

Billed Metered Consumption (water exported is removed)
227.288

Billed Unmetered Consumption
0.000

Revenue Water
227.288

Unbilled Authorized Consumption
11.826

Unbilled Metered Consumption
6.450

Unbilled Unmetered Consumption
5.376

Non-Revenue Water (NRW)
36.048

Water Losses
24.222

Apparent Losses
0.003

Unauthorized Consumption
0.001

Customer Metering Inaccuracies
0.001

Systematic Data Handling Errors
0.001

Real Losses
24.219

Leakage on Transmission and/or Distribution Mains
Not broken down

Leakage and Overflows at Utility's Storage Tanks
Not broken down

Leakage on Service Connections
Not broken down

Water Imported
0.000

AWWA Free Water Audit Software:
Dashboard

The graphic below is a visual representation of the Water Balance with bar heights propotional to the volume of the audit components

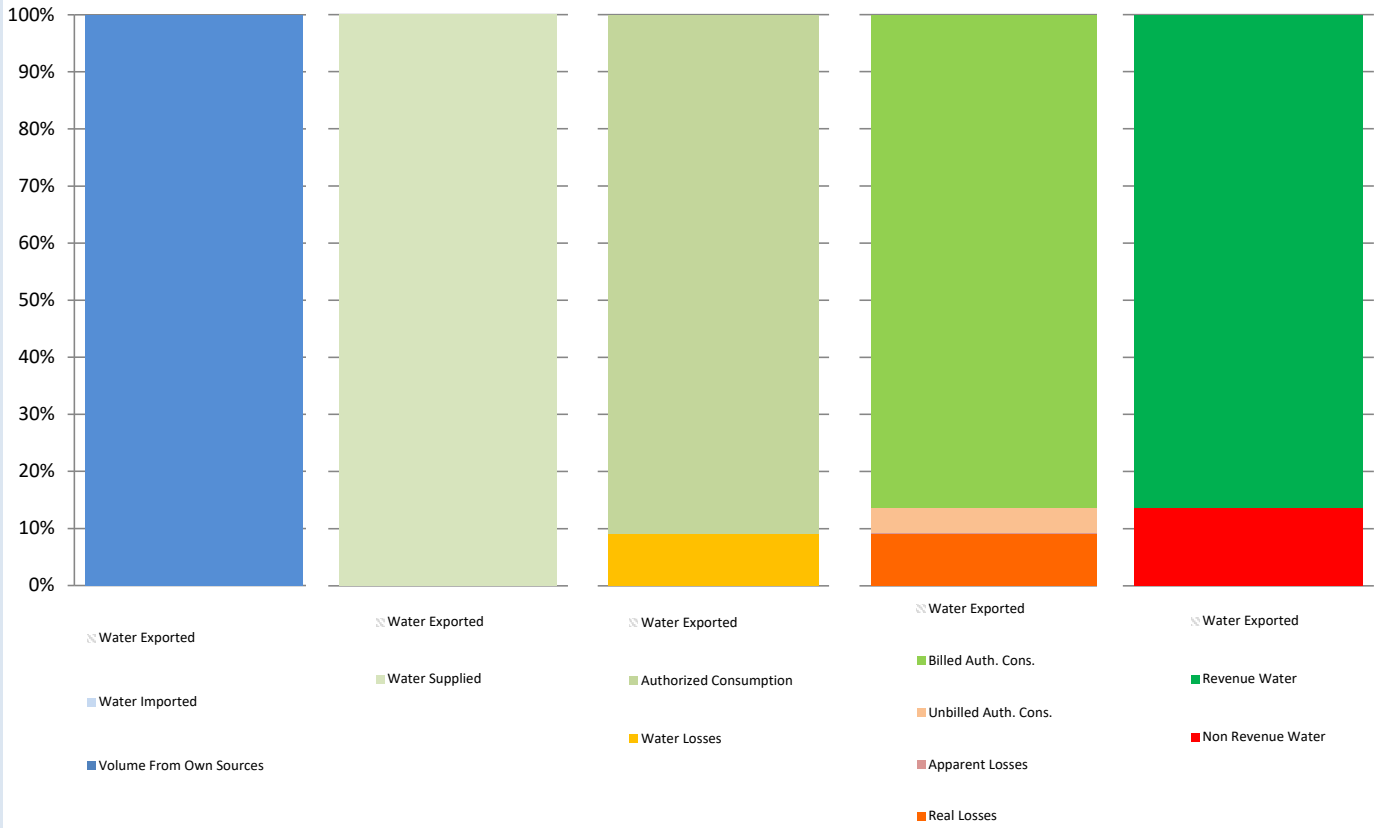
Water Audit Report for: **Perkasie Regional Authority (1090046)**

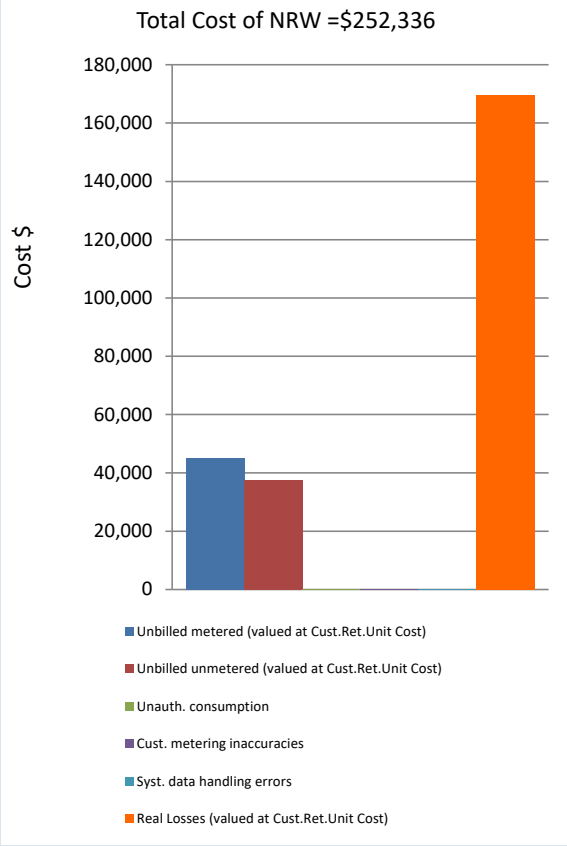
Reporting Year: **2020** **1/2020 - 12/2020**

Data Validity Score: **99**

○ Show me the VOLUME of Non-Revenue Water

◉ Show me the COST of Non-Revenue Water





AWWA Free Water Audit Software: Grading Matrix

WAS 5.0

The grading assigned to each audit component and the corresponding recommended improvements and actions are highlighted in yellow. Audit accuracy is likely to be improved by prioritizing those items shown in red

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
WATER SUPPLIED											
Volume from own sources:	Select this grading only if the water utility purchases/imports all of its water resources (i.e. has no sources of its own)	Less than 25% of water production sources are metered, remaining sources are estimated. No regular meter accuracy testing or electronic calibration conducted.	25% - 50% of treated water production sources are metered; other sources estimated. No regular meter accuracy testing or electronic calibration conducted.	Conditions between 2 and 4	50% - 75% of treated water production sources are metered, other sources estimated. Occasional meter accuracy testing or electronic calibration conducted.	Conditions between 4 and 6	At least 75% of treated water production sources are metered, or at least 90% of the source flow is derived from metered sources. Meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually, with less than 10% found outside of +/- 3% accuracy. Procedures are reviewed by a third party knowledgeable in the M36 methodology.
Improvements to attain higher data grading for "Volume from own Sources" component:		to qualify for 2: Organize and launch efforts to collect data for determining volume from own sources	to qualify for 4: Locate all water production sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered water production sources and replace any obsolete/defective meters.		to qualify for 6: Formalize annual meter accuracy testing for all source meters; specify the frequency of testing. Complete installation of meters on unmetered water production sources and complete replacement of all obsolete/defective meters.		to qualify for 8: Conduct annual meter accuracy testing and calibration of related instrumentation on all meter installations on a regular basis. Complete project to install new, or replace defective existing, meters so that entire production meter population is metered. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Maintain annual meter accuracy testing and calibration of related instrumentation for all meter installations. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to further improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Volume from own sources master meter and supply error adjustment:	Select n/a only if the water utility fails to have meters on its sources of supply	Inventory information on meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined	No automatic datalogging of production volumes; daily readings are scribed on paper records without any accountability controls. Flows are not balanced across the water distribution system: tank/storage elevation changes are not employed in calculating the "Volume from own sources" component and archived flow data is adjusted only when grossly evident data error occurs.	Conditions between 2 and 4	Production meter data is logged automatically in electronic format and reviewed at least on a monthly basis with necessary corrections implemented. "Volume from own sources" tabulations include estimate of daily changes in tanks/storage facilities. Meter data is adjusted when gross data errors occur, or occasional meter testing deems this necessary.	Conditions between 4 and 6	Hourly production meter data logged automatically & reviewed on at least a weekly basis. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and/or error is confirmed by meter accuracy testing. Tank/storage facility elevation changes are automatically used in calculating a balanced "Volume from own sources" component, and data gaps in the archived data are corrected on at least a weekly basis.	Conditions between 6 and 8	Continuous production meter data is logged automatically & reviewed each business day. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Tank/storage facility elevation changes are automatically used in "Volume from own sources" tabulations and data gaps in the archived data are corrected on a daily basis.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically balances flows from all sources and storages; results are reviewed each business day. Tight accountability controls ensure that all data gaps that occur in the archived flow data are quickly detected and corrected. Regular calibrations between SCADA and sources meters ensures minimal data transfer error.
Improvements to attain higher data grading for "Master meter and supply error adjustment" component:		to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature.	to qualify for 4: Install automatic datalogging equipment on production meters. Complete installation of level instrumentation at all tanks/storage facilities and include tank level data in automatic calculation routine in a computerized system. Construct a computerized listing or spreadsheet to archive input volumes, tank/storage volume changes and import/export flows in order to determine the composite "Water Supplied" volume for the distribution system. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps.		to qualify for 6: Refine computerized data collection and archive to include hourly production meter data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Use daily net storage change to balance flows in calculating "Water Supplied" volume. Necessary corrections to data errors are implemented on a weekly basis.		to qualify for 8: Ensure that all flow data is collected and archived on at least an hourly basis. All data is reviewed and detected errors corrected each business day. Tank/storage levels variations are employed in calculating balanced "Water Supplied" component. Adjust production meter data for gross error and inaccuracy confirmed by testing.		to qualify for 10: Link all production and tank/storage facility elevation change data to a Supervisory Control & Data Acquisition (SCADA) System, or similar computerized monitoring/control system, and establish automatic flow balancing algorithm and regularly calibrate between SCADA and source meters. Data is reviewed and corrected each business day.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters. Continue to replace or repair meters as they perform outside of desired accuracy limits. Stay abreast of new and more accurate water level instruments to better record tank/storage levels and archive the variations in storage volume. Keep current with SCADA and data management systems to ensure that archived data is well-managed and error free.
Water Imported:	Select n/a if the water utility's supply is exclusively from its own water resources (no bulk purchased/ imported water)	Less than 25% of imported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of imported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of imported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of imported water sources are metered, meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually for all meter installations. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Imported Volume" component: (*Note: usually the water supplier selling the water - "the Exporter" - to the utility being audited is responsible to maintain the metering installation measuring the imported volume. The utility should coordinate carefully with the Exporter to ensure that adequate meter upkeep takes place and an accurate measure of the Water Imported volume is quantified.*)		to qualify for 2: Review bulk water purchase agreements with partner suppliers; confirm requirements for use and maintenance of accurate metering. Identify needs for new or replacement meters with goal to meter all imported water sources.	To qualify for 4: Locate all imported water sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered imported water interconnections and replace obsolete/defective meters.		to qualify for 6: Formalize annual meter accuracy testing for all imported water meters, planning for both regular meter accuracy testing and calibration of the related instrumentation. Continue installation of meters on unmetered imported water interconnections and replacement of obsolete/defective meters.		to qualify for 8: Complete project to install new, or replace defective, meters on all imported water interconnections. Maintain annual meter accuracy testing for all imported water meters and conduct calibration of related instrumentation at least annually. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Conduct meter accuracy testing for all meters on a semi-annual basis, along with calibration of all related instrumentation. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Continue to conduct calibration of related instrumentation on a semi-annual basis. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Water imported master meter and supply error adjustment:	Select n/a if the Imported water supply is unmetered, with Imported water quantities estimated on the billing invoices sent by the Exporter to the purchasing Utility.	Inventory information on imported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined Written agreement(s) with water Exporter(s) are missing or written in vague language concerning meter management and testing.	No automatic datalogging of imported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Imported supply metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis by the Exporter with necessary corrections implemented. Meter data is adjusted by the Exporter when gross data errors are detected. A coherent data trail exists for this process to protect both the selling and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly Imported supply metered data is logged automatically & reviewed on at least a weekly basis by the Exporter. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error confirmed by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling and the purchasing Utility.	Conditions between 6 and 8	Continuous Imported supply metered flow data is logged automatically & reviewed each business day by the Importer. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the Exporter. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling and purchasing Utility at least once every five years.
Improvements to attain higher data grading for "Water imported master meter and supply error adjustment" component:		to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the selling and purchasing Utility.	to qualify for 4: Install automatic datalogging equipment on Imported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the Exporters to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.		to qualify for 6: Refine computerized data collection and archive to include hourly Imported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.		to qualify for 8: Ensure that all Imported supply metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.		to qualify for 10: Conduct accountability checks to confirm that all Imported supply metered data is reviewed and corrected each business day by the Exporter. Results of all meter accuracy tests and data corrections should be available for sharing between the Exporter and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreement between the selling and the purchasing Utility; at least every five years.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the Exporter to help identify meter replacement needs. Keep communication lines with Exporters open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.
Water Exported:	Select n/a if the water utility sells no bulk water to neighboring water utilities (no exported water sales)	Less than 25% of exported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of exported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of exported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Exported Volume" component: *(Note: usually, if the water utility being audited sells (Exports) water to a neighboring purchasing Utility, it is the responsibility of the utility exporting the water to maintain the metering installation measuring the Exported volume. The utility exporting the water should ensure that adequate meter upkeep takes place and an accurate measure of the Water Exported volume is quantified.)*		to qualify for 2: Review bulk water sales agreements with purchasing utilities; confirm requirements for use & upkeep of accurate metering. Identify needs to install new, or replace defective meters as needed.	To qualify for 4: Locate all exported water sources on maps and in field, launch meter accuracy testing for existing meters, begin to install meters on unmetered exported water interconnections and replace obsolete/defective meters		to qualify for 6: Formalize annual meter accuracy testing for all exported water meters. Continue installation of meters on unmetered exported water interconnections and replacement of obsolete/defective meters.		to qualify for 8: Complete project to install new, or replace defective, meters on all exported water interconnections. Maintain annual meter accuracy testing for all exported water meters. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Water exported master meter and supply error adjustment:	Select n/a only if the water utility fails to have meters on its exported supply interconnections.	Inventory information on exported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined Written agreement(s) with the utility purchasing the water are missing or written in vague language concerning meter management and testing.	No automatic datalogging of exported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Exported metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis, with necessary corrections implemented. Meter data is adjusted by the utility selling (exporting) the water when gross data errors are detected. A coherent data trail exists for this process to protect both the utility exporting the water and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly exported supply metered data is logged automatically & reviewed on at least a weekly basis by the utility selling the water. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error found by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling (exporting) utility and the purchasing Utility.	Conditions between 6 and 8	Continuous exported supply metered flow data is logged automatically & reviewed each business day by the utility selling (exporting) the water. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and any error confirmed by meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling (exporting) Utility and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the utility selling (exporting) the water. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling Utility and purchasing Utility at least once every five years.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Water exported master meter and supply error adjustment" component:		to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the utility selling (exporting) the water and the purchasing Utility.	to qualify for 4: Install automatic datalogging equipment on exported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the purchasing utilities to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.		to qualify for 6: Refine computerized data collection and archive to include hourly exported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.		to qualify for 8: Ensure that all exported metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.		to qualify for 10: Conduct accountability checks to confirm that all exported metered flow data is reviewed and corrected each business day by the utility selling the water. Results of all meter accuracy tests and data corrections should be available for sharing between the utility and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreements with the purchasing utilities; at least every five years.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the purchasing utilities to help identify meter replacement needs. Keep communication lines with the purchasing utilities open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.
AUTHORIZED CONSUMPTION											
Billed metered:	n/a (not applicable). Select n/a only if the entire customer population is not metered and is billed for water service on a flat or fixed rate basis. In such a case the volume entered must be zero.	Less than 50% of customers with volume-based billings from meter readings; flat or fixed rate billing exists for the majority of the customer population	At least 50% of customers with volume-based billing from meter reads; flat rate billing for others. Manual meter reading is conducted, with less than 50% meter read success rate, remaining accounts' consumption is estimated. Limited meter records, no regular meter testing or replacement. Billing data maintained on paper records, with no auditing.	Conditions between 2 and 4	At least 75% of customers with volume-based, billing from meter reads; flat or fixed rate billing for remaining accounts. Manual meter reading is conducted with at least 50% meter read success rate; consumption for accounts with failed reads is estimated. Purchase records verify age of customer meters; only very limited meter accuracy testing is conducted. Customer meters are replaced only upon complete failure. Computerized billing records exist, but only sporadic internal auditing conducted.	Conditions between 4 and 6	At least 90% of customers with volume-based billing from meter reads; consumption for remaining accounts is estimated. Manual customer meter reading gives at least 80% customer meter reading success rate; consumption for accounts with failed reads is estimated. Good customer meter records exist, but only limited meter accuracy testing is conducted. Regular replacement is conducted for the oldest meters. Computerized billing records exist with annual auditing of summary statistics conducted by utility personnel.	Conditions between 6 and 8	At least 97% of customers exist with volume-based billing from meter reads. At least 90% customer meter reading success rate; or at least 80% read success rate with planning and budgeting for trials of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) in one or more pilot areas. Good customer meter records. Regular meter accuracy testing guides replacement of statistically significant number of meters each year. Routine auditing of computerized billing records for global and detailed statistics occurs annually by utility personnel, and is verified by third party at least once every five years.	Conditions between 8 and 10	At least 99% of customers exist with volume-based billing from meter reads. At least 95% customer meter reading success rate; or minimum 80% meter reading success rate, with Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) trials underway. Statistically significant customer meter testing and replacement program in place on a continuous basis. Computerized billing with routine, detailed auditing, including field investigation of representative sample of accounts undertaken annually by utility personnel. Audit is conducted by third party auditors at least once every three years.
Improvements to attain higher data grading for "Billed Metered Consumption" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	to qualify for 2: Conduct investigations or trials of customer meters to select appropriate meter models. Budget funding for meter installations. Investigate volume based water rate structures.	to qualify for 4: Purchase and install meters on unmetered accounts. Implement policies to improve meter reading success. Catalog meter information during meter read visits to identify age/model of existing meters. Test a minimal number of meters for accuracy. Install computerized billing system.		to qualify for 6: Purchase and install meters on unmetered accounts. Eliminate flat fee billing and establish appropriate water rate structure based upon measured consumption. Continue to achieve verifiable success in removing manual meter reading barriers. Expand meter accuracy testing. Launch regular meter replacement program. Launch a program of annual auditing of global billing statistics by utility personnel.		to qualify for 8: Purchase and install meters on unmetered accounts. If customer meter reading success rate is less than 97%, assess cost-effectiveness of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system for portion or entire system; or otherwise achieve ongoing improvements in manual meter reading success rate to 97% or higher. Refine meter accuracy testing program. Set meter replacement goals based upon accuracy test results. Implement annual auditing of detailed billing records by utility personnel and implement third party auditing at least once every five years.		to qualify for 10: Purchase and install meters on unmetered accounts. Launch Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system trials if manual meter reading success rate of at least 99% is not achieved within a five-year program. Continue meter accuracy testing program. Conduct planning and budgeting for large scale meter replacement based upon meter life cycle analysis using cumulative flow target. Continue annual detailed billing data auditing by utility personnel and conduct third party auditing at least once every three years.		to maintain 10: Continue annual internal billing data auditing, and third party auditing at least every three years. Continue customer meter accuracy testing to ensure that accurate customer meter readings are obtained and entered as the basis for volume based billing. Stay abreast of improvements in Automatic Meter Reading (AMR) and Advanced Metering Infrastructure (AMI) and information management. Plan and budget for justified upgrades in metering, meter reading and billing data management to maintain very high accuracy in customer metering and billing.
Billed unmetered:	Select n/a if it is the policy of the water utility to meter all customer connections and it has been confirmed by detailed auditing that all customers do indeed have a water meter; i.e. no intentionally unmetered accounts exist	Water utility policy does not require customer metering; flat or fixed fee billing is employed. No data is collected on customer consumption. The only estimates of customer population consumption available are derived from data estimation methods using average fixture count multiplied by number of connections, or similar approach.	Water utility policy does not require customer metering; flat or fixed fee billing is employed. Some metered accounts exist in parts of the system (pilot areas or District Metered Areas) with consumption read periodically or recorded on portable dataloggers over one, three, or seven day periods. Data from these sample meters are used to infer consumption for the total customer population. Site specific estimation methods are used for unusual buildings/water uses.	Conditions between 2 and 4	Water utility policy does require metering and volume based billing in general. However, a liberal amount of exemptions and a lack of clearly written and communicated procedures result in up to 20% of billed accounts believed to be unmetered by exemption; or the water utility is in transition to becoming fully metered, and a large number of customers remain unmetered. A rough estimate of the annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 4 and 6	Water utility policy does require metering and volume based billing but established exemptions exist for a portion of accounts such as municipal buildings. As many as 15% of billed accounts are unmetered due to this exemption or meter installation difficulties. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 6 and 8	Water utility policy does require metering and volume based billing for all customer accounts. However, less than 5% of billed accounts remain unmetered because meter installation is hindered by unusual circumstances. The goal is to minimize the number of unmetered accounts. Reliable estimates of consumption are obtained for these unmetered accounts via site specific estimation methods.	Conditions between 8 and 10	Water utility policy does require metering and volume based billing for all customer accounts. Less than 2% of billed accounts are unmetered and exist because meter installation is hindered by unusual circumstances. The goal exists to minimize the number of unmetered accounts to the extent that is economical. Reliable estimates of consumption are obtained at these accounts via site specific estimation methods.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Billed Unmetered Consumption" component:		to qualify for 2: Conduct research and evaluate cost/benefit of a new water utility policy to require metering of the customer population; thereby greatly reducing or eliminating unmetered accounts. Conduct pilot metering project by installing water meters in small sample of customer accounts and periodically reading the meters or datalogging the water consumption over one, three, or seven day periods.	to qualify for 4: Implement a new water utility policy requiring customer metering. Launch or expand pilot metering study to include several different meter types, which will provide data for economic assessment of full scale metering options. Assess sites with access difficulties to devise means to obtain water consumption volumes. Begin customer meter installation.		to qualify for 6: Refine policy and procedures to improve customer metering participation for all but solidly exempt accounts. Assign staff resources to review billing records to identify errant unmetered properties. Specify metering needs and funding requirements to install sufficient meters to significant reduce the number of unmetered accounts		to qualify for 8: Push to install customer meters on a full scale basis. Refine metering policy and procedures to ensure that all accounts, including municipal properties, are designated for meters. Plan special efforts to address "hard-to-access" accounts. Implement procedures to obtain a reliable consumption estimate for the remaining few unmetered accounts awaiting meter installation.		to qualify for 10: Continue customer meter installation throughout the service area, with a goal to minimize unmetered accounts. Sustain the effort to investigate accounts with access difficulties, and devise means to install water meters or otherwise measure water consumption.		to maintain 10: Continue to refine estimation methods for unmetered consumption and explore means to establish metering, for as many billed remaining unmetered accounts as is economically feasible.
Unbilled metered:	select n/a if all billing-exempt consumption is unmetered.	Billing practices exempt certain accounts, such as municipal buildings, but written policies do not exist; and a reliable count of unbilled metered accounts is unavailable. Meter upkeep and meter reading on these accounts is rare and not considered a priority. Due to poor recordkeeping and lack of auditing, water consumption for all such accounts is purely guesstimated.	Billing practices exempt certain accounts, such as municipal buildings, but only scattered, dated written directives exist to justify this practice. A reliable count of unbilled metered accounts is unavailable. Sporadic meter replacement and meter reading occurs on an as-needed basis. The total annual water consumption for all unbilled, metered accounts is estimated based upon approximating the number of accounts and assigning consumption from actively billed accounts of same meter size.	Conditions between 2 and 4	Dated written procedures permit billing exemption for specific accounts, such as municipal properties, but are unclear regarding certain other types of accounts. Meter reading is given low priority and is sporadic. Consumption is quantified from meter readings where available. The total number of unbilled, unmetered accounts must be estimated along with consumption volumes.	Conditions between 4 and 6	Written policies regarding billing exemptions exist but adherence in practice is questionable. Metering and meter reading for municipal buildings is reliable but sporadic for other unbilled metered accounts. Periodic auditing of such accounts is conducted. Water consumption is quantified directly from meter readings where available, but the majority of the consumption is estimated.	Conditions between 6 and 8	Written policy identifies the types of accounts granted a billing exemption. Customer meter management and meter reading are considered secondary priorities, but meter reading is conducted at least annually to obtain consumption volumes for the annual water audit. High level auditing of billing records ensures that a reliable census of such accounts exists.	Conditions between 8 and 10	Clearly written policy identifies the types of accounts given a billing exemption, with emphasis on keeping such accounts to a minimum. Customer meter management and meter reading for these accounts is given proper priority and is reliably conducted. Regular auditing confirms this. Total water consumption for these accounts is taken from reliable readings from accurate meters.
Improvements to attain higher data grading for "Unbilled Metered Consumption" component:		to qualify for 2: Reassess the water utility's policy allowing certain accounts to be granted a billing exemption. Draft an outline of a new written policy for billing exemptions, with clear justification as to why any accounts should be exempt from billing, and with the intention to keep the number of such accounts to a minimum.	to qualify for 4: Review historic written directives and policy documents allowing certain accounts to be billing-exempt. Draft an outline of a written policy for billing exemptions, identify criteria that grants an exemption, with a goal of keeping this number of accounts to a minimum. Consider increasing the priority of reading meters on unbilled accounts at least annually.		to qualify for 6: Draft a new written policy regarding billing exemptions based upon consensus criteria allowing this occurrence. Assign resources to audit meter records and billing records to obtain census of unbilled metered accounts. Gradually include a greater number of these metered accounts to the routes for regular meter reading.		to qualify for 8: Communicate billing exemption policy throughout the organization and implement procedures that ensure proper account management. Conduct inspections of accounts confirmed in unbilled metered status and verify that accurate meters exist and are scheduled for routine meter readings. Gradually increase the number of unbilled metered accounts that are included in regular meter reading routes.		to qualify for 10: Ensure that meter management (meter accuracy testing, meter replacement) and meter reading activities for unbilled accounts are accorded the same priority as billed accounts. Establish ongoing annual auditing process to ensure that water consumption is reliably collected and provided to the annual water audit process.		to maintain 10: Reassess the utility's philosophy in allowing any water uses to go "unbilled". It is possible to meter and bill all accounts, even if the fee charged for water consumption is discounted or waived. Metering and billing all accounts ensures that water consumption is tracked and water waste from plumbing leaks is detected and minimized.
Unbilled unmetered:		Extent of unbilled, unmetered consumption is unknown due to unclear policies and poor recordkeeping. Total consumption is quantified based upon a purely subjective estimate.	Clear extent of unbilled, unmetered consumption is unknown, but a number of events are randomly documented each year, confirming existence of such consumption, but without sufficient documentation to quantify an accurate estimate of the annual volume consumed.	Conditions between 2 and 4	Extent of unbilled, unmetered consumption is partially known, and procedures exist to document certain events such as miscellaneous fire hydrant uses. Formulae is used to quantify the consumption from such events (time running multiplied by typical flowrate, multiplied by number of events).	Default value of 1.25% of system input volume is employed	Coherent policies exist for some forms of unbilled, unmetered consumption but others await closer evaluation. Reasonable recordkeeping for the managed uses exists and allows for annual volumes to be quantified by inference, but unsupervised uses are guesstimated.	Conditions between 6 and 8	Clear policies and good recordkeeping exist for some uses (ex: water used in periodic testing of unmetered fire connections), but other uses (ex: miscellaneous uses of fire hydrants) have limited oversight. Total consumption is a mix of well quantified use such as from formulae (time running multiplied by typical flow, multiplied by number of events) or temporary meters, and relatively subjective estimates of less regulated use.	Conditions between 8 and 10	Clear policies exist to identify permitted use of water in unbilled, unmetered fashion, with the intention of minimizing this type of consumption. Good records document each occurrence and consumption is quantified via formulae (time running multiplied by typical flow, multiplied by number of events) or use of temporary meters.
Improvements to attain higher data grading for "Unbilled Unmetered Consumption" component:		to qualify for 5: Utilize the accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use. to qualify for 2: Establish a policy regarding what water uses should be allowed to remain as unbilled and unmetered. Consider tracking a small sample of one such use (ex: fire hydrant flushing).	to qualify for 5: Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use. to qualify for 4: Evaluate the documentation of events that have been observed. Meet with user groups (ex: for fire hydrants - fire departments, contractors to ascertain their need and/or volume requirements for water from fire hydrants).		to qualify for 5: Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process, and should focus on other components since the volume of unbilled, unmetered consumption is usually a relatively small quantity component, and other larger-quantity components should take priority.	to qualify for 6 or greater: Finalize policy and begin to conduct field checks to better establish and quantify such usage. Proceed if top-down audit exists and/or a great volume of such use is suspected.	to qualify for 8: Assess water utility policy and procedures for various unmetered usages. For example, ensure that a policy exists and permits are issued for use of fire hydrants by persons outside of the utility. Create written procedures for use and documentation of fire hydrants by water utility personnel. Use same approach for other types of unbilled, unmetered water usage.		to qualify for 10: Refine written procedures to ensure that all uses of unbilled, unmetered water are overseen by a structured permitting process managed by water utility personnel. Reassess policy to determine if some of these uses have value in being converted to billed and/or metered status.		to maintain 10: Continue to refine policy and procedures with intention of reducing the number of allowable uses of water in unbilled and unmetered fashion. Any uses that can feasibly become billed and metered should be converted eventually.
APPARENT LOSSES											

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Unauthorized consumption:		Extent of unauthorized consumption is unknown due to unclear policies and poor recordkeeping. Total unauthorized consumption is guesstimated.	Unauthorized consumption is a known occurrence, but its extent is a mystery. There are no requirements to document observed events, but periodic field reports capture some of these occurrences. Total unauthorized consumption is approximated from this limited data.	conditions between 2 and 4	Procedures exist to document some unauthorized consumption such as observed unauthorized fire hydrant openings. Use formulae to quantify this consumption (time running multiplied typical flowrate, multiplied by number of events).	Default value of 0.25% of volume of water supplied is employed	Coherent policies exist for some forms of unauthorized consumption (more than simply fire hydrant misuse) but others await closer evaluation. Reasonable surveillance and recordkeeping exist for occurrences that fall under the policy. Volumes quantified by inference from these records.	Conditions between 6 and 8	Clear policies and good auditable recordkeeping exist for certain events (ex: tampering with water meters, illegal bypasses of customer meters); but other occurrences have limited oversight. Total consumption is a combination of volumes from formulae (time x typical flow) and subjective estimates of unconfirmed consumption.	Conditions between 8 and 10	Clear policies exist to identify all known unauthorized uses of water. Staff and procedures exist to provide enforcement of policies and detect violations. Each occurrence is recorded and quantified via formulae (estimated time running multiplied by typical flow) or similar methods. All records and calculations should exist in a form that can be audited by a third party.
Improvements to attain higher data grading for "Unauthorized Consumption" component:		to qualify for 5: Use accepted default of 0.25% of volume of water supplied. to qualify for 2: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)	to qualify for 5: Use accepted default of 0.25% of system input volume to qualify for 4: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)		to qualify for 5: Utilize accepted default value of 0.25% of volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process.	to qualify for 6 or greater: Finalize policy updates to clearly identify the types of water consumption that are authorized from those usages that fall outside of this policy and are, therefore, unauthorized. Begin to conduct regular field checks. Proceed if the top-down audit already exists and/or a great volume of such use is suspected.	to quality for 8: Assess water utility policies to ensure that all known occurrences of unauthorized consumption are outlawed, and that appropriate penalties are prescribed. Create written procedures for detection and documentation of various occurrences of unauthorized consumption as they are uncovered.		to qualify for 10: Refine written procedures and assign staff to seek out likely occurrences of unauthorized consumption. Explore new locking devices, monitors and other technologies designed to detect and thwart unauthorized consumption.		to maintain 10: Continue to refine policy and procedures to eliminate any loopholes that allow or tacitly encourage unauthorized consumption. Continue to be vigilant in detection, documentation and enforcement efforts.
Customer metering inaccuracies:	select n/a only if the entire customer population is unmetered. In such a case the volume entered must be zero.	Customer meters exist, but with unorganized paper records on meters; no meter accuracy testing or meter replacement program for any size of retail meter. Metering workflow is driven chaotically with no proactive management. Loss volume due to aggregate meter inaccuracy is guesstimated.	Poor recordkeeping and meter oversight is recognized by water utility management who has allotted staff and funding resources to organize improved recordkeeping and start meter accuracy testing. Existing paper records gathered and organized to provide cursory disposition of meter population. Customer meters are tested for accuracy only upon customer request.	Conditions between 2 and 4	Reliable recordkeeping exists; meter information is improving as meters are replaced. Meter accuracy testing is conducted annually for a small number of meters (more than just customer requests, but less than 1% of inventory). A limited number of the oldest meters are replaced each year. Inaccuracy volume is largely an estimate, but refined based upon limited testing data.	Conditions between 4 and 6	A reliable electronic recordkeeping system for meters exists. The meter population includes a mix of new high performing meters and dated meters with suspect accuracy. Routine, but limited, meter accuracy testing and meter replacement occur. Inaccuracy volume is quantified using a mix of reliable and less certain data.	Conditions between 6 and 8	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for various types of meters.	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Statistically significant number of meters are tested in audit year. This testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for these meters.	Good records of all active customer meters exist and include as a minimum: meter number, account number/location, type, size and manufacturer. Ongoing meter replacement occurs according to a targeted and justified basis. Regular meter accuracy testing gives a reliable measure of composite inaccuracy volume for the customer meter population. New metering technology is embraced to keep overall accuracy improving. Procedures are reviewed by a third party knowledgeable in the M36 methodology.
Improvements to attain higher data grading for "Customer meter inaccuracy volume" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	to qualify for 2: Gather available meter purchase records. Conduct testing on a small number of meters believed to be the most inaccurate. Review staffing needs of the metering group and budget for necessary resources to better organize meter management.	to qualify for 4: Implement a reliable record keeping system for customer meter histories, preferably using electronic methods typically linked to, or part of, the Customer Billing System or Customer Information System. Expand meter accuracy testing to a larger group of meters.		to qualify for 6: Standardize the procedures for meter recordkeeping within an electronic information system. Accelerate meter accuracy testing and meter replacements guided by testing results.		to qualify for 8: Expand annual meter accuracy testing to evaluate a statistically significant number of meter makes/models. Expand meter replacement program to replace statistically significant number of poor performing meters each year.		to qualify for 9: Continue efforts to manage meter population with reliable recordkeeping. Test a statistically significant number of meters each year and analyze test results in an ongoing manner to serve as a basis for a target meter replacement strategy based upon accumulated volume throughput.	to qualify for 10: Continue efforts to manage meter population with reliable recordkeeping, meter testing and replacement. Evaluate new meter types and install one or more types in 5-10 customer accounts each year in order to pilot improving metering technology.	to maintain 10: Increase the number of meters tested and replaced as justified by meter accuracy test data. Continually monitor development of new metering technology and Advanced Metering Infrastructure (AMI) to grasp opportunities for greater accuracy in metering of water flow and management of customer consumption data.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Systematic Data Handling Errors:	Note: all water utilities incur some amount of this error. Even in water utilities with unmetered customer populations and fixed rate billing, errors occur in annual billing tabulations. Enter a positive value for the volume and select a grading.	Policies and procedures for activation of new customer water billing accounts are vague and lack accountability. Billing data is maintained on paper records which are not well organized. No auditing is conducted to confirm billing data handling efficiency. An unknown number of customers escape routine billing due to lack of billing process oversight.	Policy and procedures for activation of new customer accounts and oversight of billing records exist but need refinement. Billing data is maintained on paper records or insufficiently capable electronic database. Only periodic unstructured auditing work is conducted to confirm billing data handling efficiency. The volume of unbilled water due to billing lapses is a guess.	Conditions between 2 and 4	Policy and procedures for new account activation and oversight of billing operations exist but needs refinement. Computerized billing system exists, but is dated or lacks needed functionality. Periodic, limited internal audits conducted and confirm with approximate accuracy the consumption volumes lost to billing lapses.	Conditions between 4 and 6	Policy and procedures for new account activation and oversight of billing operations is adequate and reviewed periodically. Computerized billing system is in use with basic reporting available. Any effect of billing adjustments on measured consumption volumes is well understood. Internal checks of billing data error conducted annually. Reasonably accurate quantification of consumption volume lost to billing lapses is obtained.	Conditions between 6 and 8	New account activation and billing operations policy and procedures are reviewed at least biannually. Computerized billing system includes an array of reports to confirm billing data and system functionality. Checks are conducted routinely to flag and explain zero consumption accounts. Annual internal checks conducted with third party audit conducted at least once every five years. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year.	Conditions between 8 and 10	Sound written policy and procedures exist for new account activation and oversight of customer billing operations. Robust computerized billing system gives high functionality and reporting capabilities which are utilized, analyzed and the results reported each billing cycle. Assessment of policy and data handling errors are conducted internally and audited by third party at least once every three years, ensuring consumption lost to billing lapses is minimized and detected as it occurs.
Improvements to attain higher data grading for "Systematic Data Handling Error volume" component:		to qualify for 2: Draft written policy and procedures for activating new water billing accounts and oversight of billing operations. Investigate and budget for computerized customer billing system. Conduct initial audit of billing records by flow-charting the basic business processes of the customer account/billing function.	to qualify for 4: Finalize written policy and procedures for activation of new billing accounts and overall billing operations management. Implement a computerized customer billing system. Conduct initial audit of billing records as part of this process.		to qualify for 6: Refine new account activation and billing operations procedures and ensure consistency with the utility policy regarding billing, and minimize opportunity for missed billings. Upgrade or replace customer billing system for needed functionality - ensure that billing adjustments don't corrupt the value of consumption volumes. Procedurize internal annual audit process.		to qualify for 8: Formalize regular review of new account activation process and general billing practices. Enhance reporting capability of computerized billing system. Formalize regular auditing process to reveal scope of data handling error. Plan for periodic third party audit to occur at least once every five years.		to qualify for 10: Close policy/procedure loopholes that allow some customer accounts to go unbilled, or data handling errors to exist. Ensure that billing system reports are utilized, analyzed and reported every billing cycle. Ensure that internal and third party audits are conducted at least once every three years.		to maintain 10: Stay abreast of customer information management developments and innovations. Monitor developments of Advanced Metering Infrastructure (AMI) and integrate technology to ensure that customer endpoint information is well-monitored and errors/lapses are at an economic minimum.
SYSTEM DATA											
Length of mains:		Poorly assembled and maintained paper as-built records of existing water main installations makes accurate determination of system pipe length impossible. Length of mains is guesstimated.	Paper records in poor or uncertain condition (no annual tracking of installations & abandonments). Poor procedures to ensure that new water mains installed by developers are accurately documented.	Conditions between 2 and 4	Sound written policy and procedures exist for documenting new water main installations, but gaps in management result in a uncertain degree of error in tabulation of mains length.	Conditions between 4 and 6	Sound written policy and procedures exist for permitting and commissioning new water mains. Highly accurate paper records with regular field validation; or electronic records and asset management system in good condition. Includes system backup.	Conditions between 6 and 8	Sound written policy and procedures exist for permitting and commissioning new water mains. Electronic recordkeeping such as a Geographical Information System (GIS) and asset management system are used to store and manage data.	Conditions between 8 and 10	Sound written policy exists for managing water mains extensions and replacements. Geographic Information System (GIS) data and asset management database agree and random field validation proves truth of databases. Records of annual field validation should be available for review.
Improvements to attain higher data grading for "Length of Water Mains" component:		to qualify for 2: Assign personnel to inventory current as-built records and compare with customer billing system records and highway plans in order to verify poorly documented pipelines. Assemble policy documents regarding permitting and documentation of water main installations by the utility and building developers; identify gaps in procedures that result in poor documentation of new water main installations.	to qualify for 4: Complete inventory of paper records of water main installations for several years prior to audit year. Review policy and procedures for commissioning and documenting new water main installation.		to qualify for 6: Finalize updates/improvements to written policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions.		to qualify for 8: Launch random field checks of limited number of locations. Convert to electronic database such as a Geographic Information System (GIS) with backup as justified. Develop written policy and procedures.		to qualify for 10: Link Geographic Information System (GIS) and asset management databases, conduct field verification of data. Record field verification information at least annually.		to maintain 10: Continue with standardization and random field validation to improve the completeness and accuracy of the system.
Number of active AND inactive service connections:		Vague permitting (of new service connections) policy and poor paper recordkeeping of customer connections/billings result in suspect determination of the number of service connections, which may be 10-15% in error from actual count.	General permitting policy exists but paper records, procedural gaps, and weak oversight result in questionable total for number of connections, which may vary 5-10% of actual count.	Conditions between 2 and 4	Written account activation policy and procedures exist, but with some gaps in performance and oversight. Computerized information management system is being brought online to replace dated paper recordkeeping system. Reasonably accurate tracking of service connection installations & abandonments; but count can be up to 5% in error from actual total.	Conditions between 4 and 6	Written new account activation and overall billing policies and procedures are adequate and reviewed periodically. Computerized information management system is in use with annual installations & abandonments totaled. Very limited field verifications and audits. Error in count of number of service connections is believed to be no more than 3%.	Conditions between 6 and 8	Policies and procedures for new account activation and overall billing operations are written, well-structured and reviewed at least biannually. Well-managed computerized information management system exists and routine, periodic field checks and internal system audits are conducted. Counts of connections are no more than 2% in error.	Conditions between 8 and 10	Sound written policy and well managed and audited procedures ensure reliable management of service connection population. Computerized information management system, Customer Billing System, and Geographic Information System (GIS) information agree; field validation proves truth of databases. Count of connections recorded as being in error is less than 1% of the entire population.
Improvements to attain higher data grading for "Number of Active and Inactive Service Connections" component:	**Note: The number of Service Connections does not include fire hydrant leads/lines connecting the hydrant to the water main**	to qualify for 2: Draft new policy and procedures for new account activation and overall billing operations. Research and collect paper records of installations & abandonments for several years prior to audit year.	to qualify for 4: Refine policy and procedures for new account activation and overall billing operations. Research computerized recordkeeping system (Customer Information System or Customer Billing System) to improve documentation format for service connections.		to qualify for 6: Refine procedures to ensure consistency with new account activation and overall billing policy to establish new service connections or decommission existing connections. Improve process to include all totals for at least five years prior to audit year.		to qualify for 8: Formalize regular review of new account activation and overall billing operations policies and procedures. Launch random field checks of limited number of locations. Develop reports and auditing mechanisms for computerized information management system.		to qualify for 10: Close any procedural loopholes that allow installations to go undocumented. Link computerized information management system with Geographic Information System (GIS) and formalize field inspection and information system auditing processes. Documentation of new or decommissioned service connections encounters several levels of checks and balances.		to maintain 10: Continue with standardization and random field validation to improve knowledge of system.
	Note: if customer water	Gradings 1-9 apply if customer properties are unmetered, if customer meters exist and are located inside the customer building premises, or if the water utility owns and is responsible for the entire service connection piping from the water main to the customer building. In any of these cases the average distance between the curb stop or boundary separating utility/customer responsibility for service connection piping, and the typical first point of use (ex: faucet) or the customer meter must be quantified. Gradings of 1-9 are used to grade the validity of the means to quantify this value. (See the "Service Connection Diagram" worksheet)									Either of two conditions can be met for a grading of 10:

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Average length of customer service line:	meters are located outside of the customer building next to the curb stop or boundary separating utility/customer responsibility, then the auditor should answer "Yes" to the question on the Reporting Worksheet asking about this. If the answer is Yes, the grading description listed under the Grading of 10(a) will be followed, with a value of zero automatically entered at a Grading of 10. See the Service Connection Diagram worksheet for a visual presentation of this distance.	Vague policy exists to define the delineation of water utility ownership and customer ownership of the service connection piping. Curb stops are perceived as the breakpoint but these have not been well-maintained or documented. Most are buried or obscured. Their location varies widely from site-to-site, and estimating this distance is arbitrary due to the unknown location of many curb stops.	Policy requires that the curb stop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. The piping from the water main to the curb stop is the property of the water utility; and the piping from the curb stop to the customer building is owned by the customer. Curb stop locations are not well documented and the average distance is based upon a limited number of locations measured in the field.	Conditions between 2 and 4	Good policy requires that the curb stop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. Curb stops are generally installed as needed and are reasonably documented. Their location varies widely from site-to-site, and an estimate of this distance is hindered by the availability of paper records of limited accuracy.	Conditions between 4 and 6	Clear written policy exists to define utility/customer responsibility for service connection piping. Accurate, well-maintained paper or basic electronic recordkeeping system exists. Periodic field checks confirm piping lengths for a sample of customer properties.	Conditions between 6 and 8	Clearly worded policy standardizes the location of curb stops and meters, which are inspected upon installation. Accurate and well maintained electronic records exist with periodic field checks to confirm locations of service lines, curb stops and customer meter pits. An accurate number of customer properties from the customer billing system allows for reliable averaging of this length.	Conditions between 8 and 10	a) Customer water meters exist outside of customer buildings next to the curb stop or boundary separating utility/customer responsibility for service connection piping. If so, answer "Yes" to the question on the Reporting Working asking about this condition. A value of zero and a Grading of 10 are automatically entered in the Reporting Worksheet . b). Meters exist inside customer buildings, or properties are unmetered. In either case, answer "No" to the Reporting Worksheet question on meter location, and enter a distance determined by the auditor. For a Grading of 10 this value must be a very reliable number from a Geographic Information System (GIS) and confirmed by a statistically valid number of field checks.
Improvements to attain higher data grading for "Average Length of Customer Service Line" component:		to qualify for 2: Research and collect paper records of service line installations. Inspect several sites in the field using pipe locators to locate curb stops. Obtain the length of this small sample of connections in this manner.	to qualify for 4: Formalize and communicate policy delineating utility/customer responsibilities for service connection piping. Assess accuracy of paper records by field inspection of a small sample of service connections using pipe locators as needed. Research the potential migration to a computerized information management system to store service connection data.		to qualify for 6: Establish coherent procedures to ensure that policy for curb stop, meter installation and documentation is followed. Gain consensus within the water utility for the establishment of a computerized information management system.		to qualify for 8: Implement an electronic means of recordkeeping, typically via a customer information system, customer billing system, or Geographic Information System (GIS). Standardize the process to conduct field checks of a limited number of locations.		to qualify for 10: Link customer information management system and Geographic Information System (GIS), standardize process for field verification of data.		to maintain 10: Continue with standardization and random field validation to improve knowledge of service connection configurations and customer meter locations.
Average operating pressure:		Available records are poorly assembled and maintained paper records of supply pump characteristics and water distribution system operating conditions. Average pressure is guesstimated based upon this information and ground elevations from crude topographical maps. Widely varying distribution system pressures due to undulating terrain, high system head loss and weak/erratic pressure controls further compromise the validity of the average pressure calculation.	Limited telemetry monitoring of scattered pumping station and water storage tank sites provides some static pressure data, which is recorded in handwritten logbooks. Pressure data is gathered at individual sites only when low pressure complaints arise. Average pressure is determined by averaging relatively crude data, and is affected by significant variation in ground elevations, system head loss and gaps in pressure controls in the distribution system.	Conditions between 2 and 4	Effective pressure controls separate different pressure zones; moderate pressure variation across the system, occasional open boundary valves are discovered that breech pressure zones. Basic telemetry monitoring of the distribution system logs pressure data electronically. Pressure data gathered by gauges or dataloggers at fire hydrants or buildings when low pressure complaints arise, and during fire flow tests and system flushing. Reliable topographical data exists. Average pressure is calculated using this mix of data.	Conditions between 4 and 6	Reliable pressure controls separate distinct pressure zones; only very occasional open boundary valves are encountered that breech pressure zones. Well-covered telemetry monitoring of the distribution system (not just pumping at source treatment plants or wells) logs extensive pressure data electronically. Pressure gathered by gauges/dataloggers at fire hydrants and buildings when low pressure complaints arise, and during fire flow tests and system flushing. Average pressure is determined by using this mix of reliable data.	Conditions between 6 and 8	Well-managed, discrete pressure zones exist with generally predictable pressure fluctuations. A current full-scale SCADA System or similar realtime monitoring system exists to monitor the water distribution system and collect data, including real time pressure readings at representative sites across the system. The average system pressure is determined from reliable monitoring system data.	Conditions between 8 and 10	Well-managed pressure districts/zones, SCADA System and hydraulic model exist to give very precise pressure data across the water distribution system. Average system pressure is reliably calculated from extensive, reliable, and cross-checked data. Calculations are reported on an annual basis as a minimum.
Improvements to attain higher data grading for "Average Operating Pressure" component:		to qualify for 2: Employ pressure gauging and/or datalogging equipment to obtain pressure measurements from fire hydrants. Locate accurate topographical maps of service area in order to confirm ground elevations. Research pump data sheets to find pump pressure/flow characteristics	to qualify for 4: Formalize a procedure to use pressure gauging/datalogging equipment to gather pressure data during various system events such as low pressure complaints, or operational testing. Gather pump pressure and flow data at different flow regimes. Identify faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) and plan to properly configure pressure zones. Make all pressure data from these efforts available to generate system-wide average pressure.		to qualify for 6: Expand the use of pressure gauging/datalogging equipment to gather scattered pressure data at a representative set of sites, based upon pressure zones or areas. Utilize pump pressure and flow data to determine supply head entering each pressure zone or district. Correct any faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) to ensure properly configured pressure zones. Use expanded pressure dataset from these activities to generate system-wide average pressure.		to qualify for 8: Install a Supervisory Control and Data Acquisition (SCADA) System, or similar realtime monitoring system, to monitor system parameters and control operations. Set regular calibration schedule for instrumentation to insure data accuracy. Obtain accurate topographical data and utilize pressure data gathered from field surveys to provide extensive, reliable data for pressure averaging.		to qualify for 10: Annually, obtain a system-wide average pressure value from the hydraulic model of the distribution system that has been calibrated via field measurements in the water distribution system and confirmed in comparisons with SCADA System data.		to maintain 10: Continue to refine the hydraulic model of the distribution system and consider linking it with SCADA System for real-time pressure data calibration, and averaging.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
COST DATA											
Total annual cost of operating water system:		Incomplete paper records and lack of financial accounting documentation on many operating functions makes calculation of water system operating costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to estimate the major portion of water system operating costs.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. However, gaps in data are known to exist, periodic internal reviews are conducted but not a structured financial audit.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited periodically by utility personnel, but not a Certified Public Accountant (CPA).	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited at least annually by utility personnel, and at least once every three years by third-party CPA.	Conditions between 8 and 10	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel and annually also by third-party CPA.
Improvements to attain higher data grading for "Total Annual Cost of Operating the Water System" component:		to qualify for 2: Gather available records, institute new financial accounting procedures to regularly collect and audit basic cost data of most important operations functions.	to qualify for 4: Implement an electronic cost accounting system, structured according to accounting standards for water utilities		to qualify for 6: Establish process for periodic internal audit of water system operating costs; identify cost data gaps and institute procedures for tracking these outstanding costs.		to qualify for 8: Standardize the process to conduct routine financial audit on an annual basis. Arrange for CPA audit of financial records at least once every three years.		to qualify for 10: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		to maintain 10: Maintain program, stay abreast of expenses subject to erratic cost changes and long-term cost trend, and budget/track costs proactively
Customer retail unit cost (applied to Apparent Losses):	Customer population unmetered, and/or only a fixed fee is charged for consumption.	Antiquated, cumbersome water rate structure is used, with periodic historic amendments that were poorly documented and implemented; resulting in classes of customers being billed inconsistent charges. The actual composite billing rate likely differs significantly from the published water rate structure, but a lack of auditing leaves the degree of error indeterminate.	Dated, cumbersome water rate structure, not always employed consistently in actual billing operations. The actual composite billing rate is known to differ from the published water rate structure, and a reasonably accurate estimate of the degree of error is determined, allowing a composite billing rate to be quantified.	Conditions between 2 and 4	Straight-forward water rate structure in use, but not updated in several years. Billing operations reliably employ the rate structure. The composite billing rate is derived from a single customer class such as residential customer accounts, neglecting the effect of different rates from varying customer classes.	Conditions between 4 and 6	Clearly written, up-to-date water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average residential rate using volumes of water in each rate block.	Conditions between 6 and 8	Effective water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average composite consumption rate, which includes residential, commercial, industrial, institutional (CII), and any other distinct customer classes within the water rate structure.	Conditions between 8 and 10	Current, effective water rate structure is in force and applied reliably in billing operations. The rate structure and calculations of composite rate - which includes residential, commercial, industrial, institutional (CII), and other distinct customer classes - are reviewed by a third party knowledgeable in the M36 methodology at least once every five years.
Improvements to attain higher data grading for "Customer Retail Unit Cost" component:		to qualify for 2: Formalize the process to implement water rates, including a secure documentation procedure. Create a current, formal water rate document and gain approval from all stakeholders.	to qualify for 4: Review the water rate structure and update/formalize as needed. Assess billing operations to ensure that actual billing operations incorporate the established water rate structure.		to qualify for 6: Evaluate volume of water used in each usage block by residential users. Multiply volumes by full rate structure.	Launch effort to fully meter the customer population and charge rates based upon water volumes	to qualify for 8: Evaluate volume of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		to qualify for 10: Conduct a periodic third-party audit of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		to maintain 10: Keep water rate structure current in addressing the water utility's revenue needs. Update the calculation of the customer unit rate as new rate components, customer classes, or other components are modified.
Variable production cost (applied to Real Losses):	Note: if the water utility purchases/imports its entire water supply, then enter the unit purchase cost of the bulk water supply in the Reporting Worksheet with a grading of 10	Incomplete paper records and lack of documentation on primary operating functions (electric power and treatment costs most importantly) makes calculation of variable production costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to roughly estimate the basic operations costs (pumping power costs and treatment costs) and calculate a unit variable production cost.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. Electric power and treatment costs are reliably tracked and allow accurate weighted calculation of unit variable production costs based on these two inputs and water imported purchase costs (if applicable). All costs are audited internally on a periodic basis.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Pertinent additional costs beyond power, treatment and water imported purchase costs (if applicable) such as liability, residuals management, wear and tear on equipment, impending expansion of supply, are included in the unit variable production cost, as applicable. The data is audited at least annually by utility personnel.	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent primary and secondary variable production and water imported purchase (if applicable) costs tracked. The data is audited at least annually by utility personnel, and at least once every three years by a third-party knowledgeable in the M36 methodology.	Conditions between 8 and 10	Either of two conditions can be met to obtain a grading of 10: 1) Third party CPA audit of all pertinent primary and secondary variable production and water imported purchase (if applicable) costs on an annual basis. or: 2) Water supply is entirely purchased as bulk imported water, and unit purchase cost serves as the variable production cost.
Improvements to attain higher data grading for "Variable Production Cost" component:		to qualify for 2: Gather available records, institute new procedures to regularly collect and audit basic cost data and most important operations functions.	to qualify for 4: Implement an electronic cost accounting system, structured according to accounting standards for water utilities		to qualify for 6: Formalize process for regular internal audits of production costs. Assess whether additional costs (liability, residuals management, equipment wear, impending infrastructure expansion) should be included to calculate a more representative variable production cost.		to qualify for 8: Formalize the accounting process to include direct cost components (power, treatment) as well as indirect cost components (liability, residuals management, etc.) Arrange to conduct audits by a knowledgeable third-party at least once every three years.		to qualify for 10: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		to maintain 10: Maintain program, stay abreast of expenses subject to erratic cost changes and budget/track costs proactively

Average Length of Customer Service Line

The three figures shown on this worksheet display the assignment of the Average Length of Customer Service Line, Lp, for the three most common piping configurations.

Figure 1 shows the configuration of the water meter outside of the customer building next to the curb stop valve. In this configuration Lp = 0 since the distance between the curb stop and the customer metering point is essentially zero.

Figure 2 shows the configuration of the customer water meter located inside the customer building, where Lp is the distance from the curb stop to the water meter.

Figure 3 shows the configuration of an unmetered customer building , where Lp is the distance from the curb stop to the first point of customer water consumption, or, more simply, the building line.

In any water system the Lp will vary notably in a community of different structures, therefore the average Lp value is used and this should be approximated or calculated if a sample of service line measurements has been gathered.

Click for more information

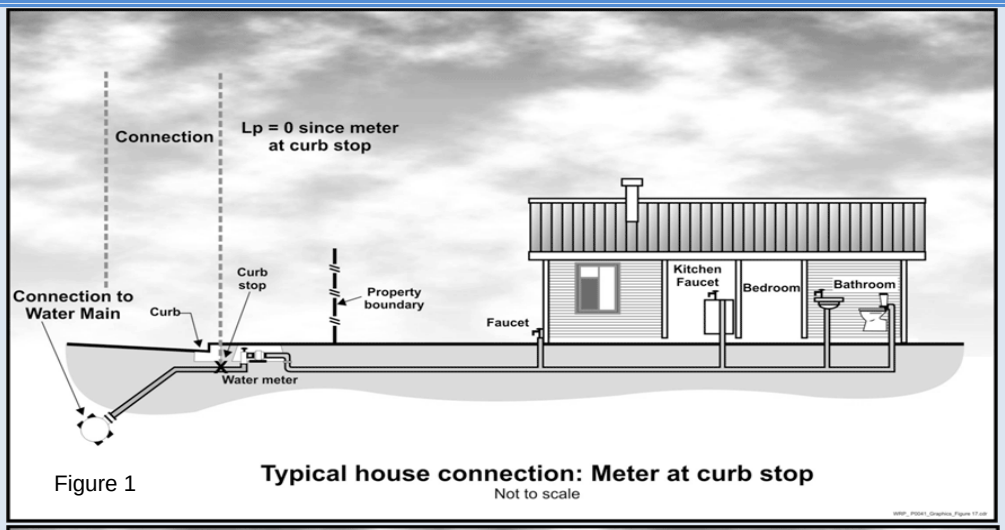


Figure 1 **Typical house connection: Meter at curb stop**
Not to scale

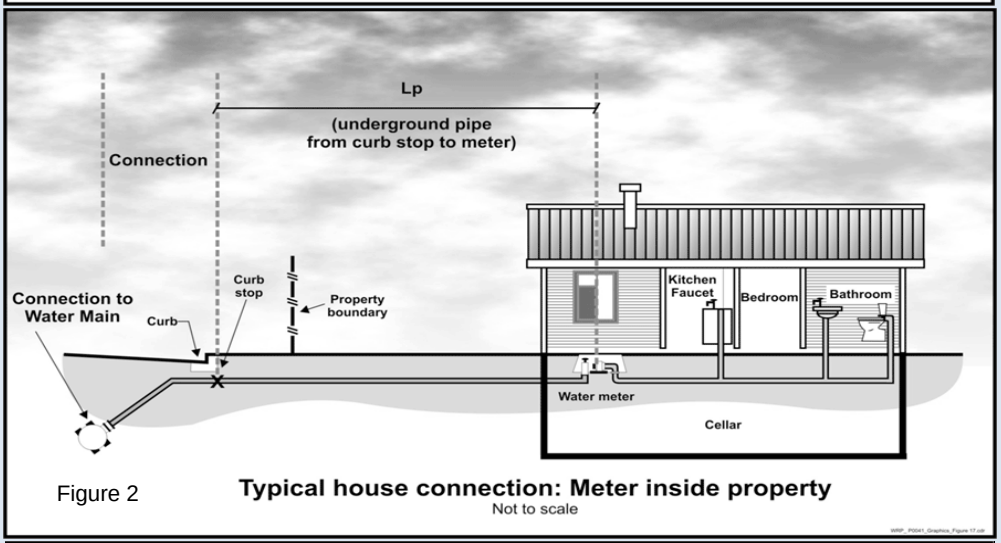


Figure 2 **Typical house connection: Meter inside property**
Not to scale

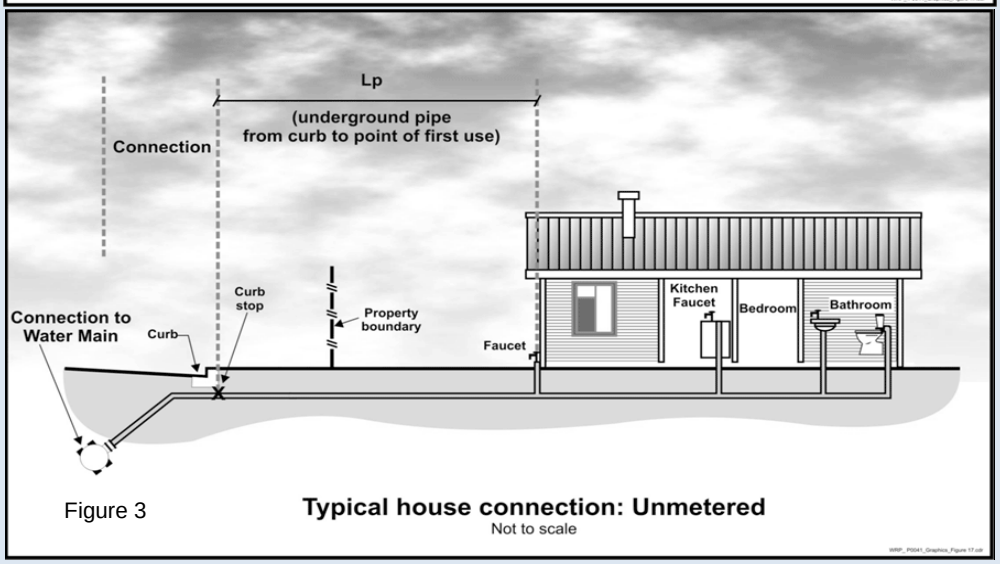
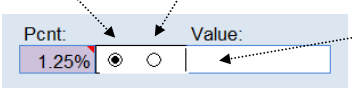


Figure 3 **Typical house connection: Unmetered**
Not to scale

Item Name	Description
Apparent Losses Find	= unauthorized consumption + customer metering inaccuracies + systematic data handling errors Apparent Losses include all types of inaccuracies associated with customer metering (worn meters as well as improperly sized meters or wrong type of meter for the water usage profile) as well as systematic data handling errors (meter reading, billing, archiving and reporting), plus unauthorized consumption (theft or illegal use). NOTE: Over-estimation of Apparent Losses results in under-estimation of Real Losses. Under-estimation of Apparent Losses results in over-estimation of Real Losses.
AUTHORIZED CONSUMPTION Find	= billed water exported + billed metered + billed unmetered + unbilled metered + unbilled unmetered consumption The volume of metered and/or unmetered water taken by registered customers, the water utility's own uses, and uses of others who are implicitly or explicitly authorized to do so by the water utility; for residential, commercial, industrial and public-minded purposes. Typical retail customers' consumption is tabulated usually from established customer accounts as billed metered consumption, or - for unmetered customers - billed unmetered consumption. These types of consumption, along with billed water exported, provide revenue potential for the water utility. **Be certain to tabulate the water exported volume as a separate component and do not "double-count" it by including in the billed metered consumption component as well as the water exported component.** Unbilled authorized consumption occurs typically in non-account uses, including water for fire fighting and training, flushing of water mains and sewers, street cleaning, watering of municipal gardens, public fountains, or similar public-minded uses. Occasionally these uses may be metered and billed (or charged a flat fee), but usually they are unmetered and unbilled. In the latter case, the water auditor may use a default value to estimate this quantity, or implement procedures for the reliable quantification of these uses. This starts with documenting usage events as they occur and estimating the amount of water used in each event. (See Unbilled unmetered consumption)
View Service Connection Diagram **Average length of customer service line** Find	This is the average length of customer service line, Lp, that is owned and maintained by the customer; from the point of ownership transfer to the customer water meter, or building line (if unmetered). The quantity is one of the data inputs for the calculation of Unavoidable Annual Real Losses (UARL), which serves as the denominator of the performance indicator: Infrastructure Leakage Index (ILI). The value of Lp is multiplied by the number of customer service connections to obtain a total length of customer owned piping in the system. The purpose of this parameter is to account for the unmetered service line infrastructure that is the responsibility of the customer for arranging repairs of leaks that occur on their lines. In many cases leak repairs arranged by customers take longer to be executed than leak repairs arranged by the water utility on utility-maintained piping. Leaks run longer - and lose more water - on customer-owned service piping, than utility owned piping. If the customer water meter exists near the ownership transfer point (usually the curb stop located between the water main and the customer premises) this distance is zero because the meter and transfer point are the same. This is the often encountered configuration of customer water meters located in an underground meter box or "pit" outside of the customer's building. The Free Water Audit Software asks a "Yes/No" question about the meter at this location. If the auditor selects "Yes" then this distance is set to zero and the data grading score for this component is set to 10. If water meters are typically located inside the customer premise/building, or properties are unmetered, it is up to the water auditor to estimate a system-wide average Lp length based upon the various customer land parcel sizes and building locations in the service area. Lp will be a shorter length in areas of high density housing, and a longer length in areas of low density housing and varied commercial and industrial buildings. General parcel demographics should be employed to obtain a composite average Lp length for the entire system. Refer to the "Service Connection Diagram" worksheet for a depiction of the service line/metering configurations that typically exist in water utilities. This worksheet gives guidance on the determination of the Average Length, Lp, for each configuration.
Average operating pressure Find	This is the average pressure in the distribution system that is the subject of the water audit. Many water utilities have a calibrated hydraulic model of their water distribution system. For these utilities, the hydraulic model can be utilized to obtain a very accurate quantity of average pressure. In the absence of a hydraulic model, the average pressure may be approximated by obtaining readings of static water pressure from a representative sample of fire hydrants or other system access points evenly located across the system. A weighted average of the pressure can be assembled; but be sure to take into account the elevation of the fire hydrants, which typically exist several feet higher than the level of buried water pipelines. If the water utility is compiling the water audit for the first time, the average pressure can be approximated, but with a low data grading. In subsequent years of auditing, effort should be made to improve the accuracy of the average pressure quantity. This will then qualify the value for a higher data grading.
Billed Authorized Consumption	All consumption that is billed and authorized by the utility. This may include both metered and unmetered consumption. See "Authorized Consumption" for more information.
Billed metered consumption Find	All metered consumption which is billed to retail customers, including all groups of customers such as domestic, commercial, industrial or institutional. **It does NOT include water supplied to neighboring utilities (water exported) which is metered and billed. Be sure to subtract any consumption for exported water sales that may be included in these billing roles. Water supplied as exports to neighboring water utilities should be included only in the Water Exported component.** The metered consumption data can be taken directly from billing records for the water audit period. The accuracy of yearly metered consumption data can be refined by including an adjustment to account for customer meter reading lag time since not all customer meters are read on the same day of the meter reading period. However additional analysis is necessary to determine the lag time adjustment value, which may or may not be significant.
Billed unmetered consumption Find	All billed consumption which is calculated based on estimates or norms from water usage sites that have been determined by utility policy to be left unmetered. This is typically a very small component in systems that maintain a policy to meter their customer population. However, this quantity can be the key consumption component in utilities that have not adopted a universal metering policy. **This component should NOT include any water that is supplied to neighboring utilities (water exported) which is unmetered but billed. Water supplied as exports to neighboring water utilities should be included only in the Water Exported component.**

Item Name	Description
Customer metering inaccuracies Find	Apparent water losses caused by the collective under-registration of customer water meters. Many customer water meters gradually wear as large cumulative volumes of water are passed through them over time. This causes the meters to under-register the flow of water. This occurrence is common with smaller residential meters of sizes 5/8-inch and 3/4 inch after they have registered very large cumulative volumes of water, which generally occurs only after periods of years. For meters sized 1-inch and larger - typical of multi-unit residential, commercial and industrial accounts - meter under-registration can occur from wear or from the improper application of the meter; i.e. installing the wrong type of meter or the wrong size of meter, for the flow pattern (profile) of the consumer. For instance, many larger meters have reduced accuracy at low flows. If an oversized meter is installed, most of the time the routine flow will occur in the low flow range of the meter, and a significant portion of it may not be registered. It is important to properly select and install all meters, but particularly large customer meters, size 1-inch and larger. The auditor has two options for entering data for this component of the audit. The auditor can enter a percentage under-registration (typically an estimated value), this will apply the selected percentage to the two categories of metered consumption to determine the volume of water not recorded due to customer meter inaccuracy. Note that this percentage is a composite average inaccuracy for all customer meters in the entire meter population. The percentage will be multiplied by the sum of the volumes in the Billed Metered and Unbilled Metered components. Alternatively, if the auditor has substantial data from meter testing activities, he or she can calculate their own loss volumes, and this volume may be entered directly. Note that a value of zero will be accepted but an alert will appear asking if the customer population is unmetered. Since all metered systems have some degree of inaccuracy, a positive value should be entered. A value of zero in this component is valid only if the water utility does not meter its customer population.
Customer retail unit cost Find	The Customer Retail Unit Cost represents the charge that customers pay for water service. This unit cost is applied routinely to the components of Apparent Loss, since these losses represent water reaching customers but not (fully) paid for. Since most water utilities have a rate structure that includes a variety of different costs based upon class of customer, a weighted average of individual costs and number of customer accounts in each class can be calculated to determine a single composite cost that should be entered into this cell. Finally, the weighted average cost should also include additional charges for sewer, storm water or biosolids processing, but only if these charges are based upon the volume of potable water consumed. For water utilities in regions with limited water resources and a questionable ability to meet the drinking water demands in the future, the Customer Retail Unit Cost might also be applied to value the Real Losses; instead of applying the Variable Production Cost to Real Losses. In this way, it is assumed that every unit volume of leakage reduced by leakage management activities will be sold to a customer. Note: the Free Water Audit Software allows the user to select the units that are charged to customers (either $/1,000 gallons, $/hundred cubic feet, or $/1,000 litres) and automatically converts these units to the units that appear in the "WATER SUPPLIED" box. The monetary units are United States dollars, $.
Infrastructure Leakage Index (ILI) Find	The ratio of the Current Annual Real Losses (Real Losses) to the Unavoidable Annual Real Losses (UARL). The ILI is a highly effective performance indicator for comparing (benchmarking) the performance of utilities in operational management of real losses.
Length of mains Find	Length of all pipelines (except service connections) in the system starting from the point of system input metering (for example at the outlet of the treatment plant). It is also recommended to include in this measure the total length of fire hydrant lead pipe. Hydrant lead pipe is the pipe branching from the water main to the fire hydrant. Fire hydrant leads are typically of a sufficiently large size that is more representative of a pipeline than a service connection. The average length of hydrant leads across the entire system can be assumed if not known, and multiplied by the number of fire hydrants in the system, which can also be assumed if not known. This value can then be added to the total pipeline length. Total length of mains can therefore be calculated as: Length of Mains, miles = (total pipeline length, miles) + [{(average fire hydrant lead length, ft) x (number of fire hydrants)} / 5,280 ft/mile] or Length of Mains, kilometres = (total pipeline length, kilometres) + [{(average fire hydrant lead length, metres) x (number of fire hydrants)} / 1,000 metres/kilometre]
NON-REVENUE WATER Find	= Apparent Losses + Real Losses + Unbilled Metered Consumption + Unbilled Unmetered Consumption. This is water which does not provide revenue potential to the utility.
Number of active AND inactive service connections Find	Number of customer service connections, extending from the water main to supply water to a customer. Please note that this includes the actual number of distinct piping connections, including fire connections, whether active or inactive. This may differ substantially from the number of customers (or number of accounts). **Note: this number does not include the pipeline leads to fire hydrants - the total length of piping supplying fire hydrants should be included in the "Length of mains" parameter.**
Real Losses Find	Physical water losses from the pressurized system (water mains and customer service connections) and the utility's storage tanks, up to the point of customer consumption. In metered systems this is the customer meter, in unmetered situations this is the first point of consumption (stop tap/tap) within the property. The annual volume lost through all types of leaks, breaks and overflows depends on frequencies, flow rates, and average duration of individual leaks, breaks and overflows.
Revenue Water	Those components of System Input Volume that are billed and have the potential to produce revenue.
Service Connection Density Find	=number of customer service connections / length of mains

Item Name	Description
Systematic data handling errors Find	Apparent losses caused by accounting omissions, errant computer programming, gaps in policy, procedure, and permitting/activation of new accounts; and any type of data lapse that results in under-stated customer water consumption in summary billing reports. Systematic Data Handling Errors result in a direct loss of revenue potential. Water utilities can find "lost" revenue by keying on this component. Utilities typically measure water consumption registered by water meters at customer premises. The meter should be read routinely (ex: monthly) and the data transferred to the Customer Billing System, which generates and sends a bill to the customer. Data Transfer Errors result in the consumption value being less than the actual consumption, creating an apparent loss. Such error might occur from illegible and mis-recorded hand-written readings compiled by meter readers, inputting an incorrect meter register unit conversion factor in the automatic meter reading equipment, or a variety of similar errors. Apparent losses also occur from Data Analysis Errors in the archival and data reporting processes of the Customer Billing System. Inaccurate estimates used for accounts that fail to produce a meter reading are a common source of error. Billing adjustments may award customers a rightful monetary credit, but do so by creating a negative value of consumption, thus under-stating the actual consumption. Account activation lapses may allow new buildings to use water for months without meter readings and billing. Poor permitting and construction inspection practices can result in a new building lacking a billing account, a water meter and meter reading; i.e., the customer is unknown to the utility's billing system. Close auditing of the permitting, metering, meter reading, billing and reporting processes of the water consumption data trail can uncover data management gaps that create volumes of systematic data handling error. Utilities should routinely analyze customer billing records to detect data anomalies and quantify these losses. For example, a billing account that registers zero consumption for two or more billing cycles should be checked to explain why usage has seemingly halted. Given the revenue loss impacts of these losses, water utilities are well-justified in providing continuous oversight and timely correction of data transfer errors & data handling errors. If the water auditor has not yet gathered detailed data or assessment of systematic data handling error, it is recommended that the auditor apply the default value of 0.25% of the Billed Authorized Consumption volume. However, if the auditor has investigated the billing system and its controls, and has well validated data that indicates the volume from systematic data handling error is substantially higher or lower than that generated by the default value, then the auditor should enter a quantity that was derived from the utility investigations and select an appropriate grading. Note: negative values are not allowed for this audit component. If the auditor enters zero for this component then a grading of 1 will be automatically assigned.
Total annual cost of operating the water system Find	These costs include those for operations, maintenance and any annually incurred costs for long-term upkeep of the drinking water supply and distribution system. It should include the costs of day-to-day upkeep and long-term financing such as repayment of capital bonds for infrastructure expansion or improvement. Typical costs include employee salaries and benefits, materials, equipment, insurance, fees, administrative costs and all other costs that exist to sustain the drinking water supply. Depending upon water utility accounting procedures or regulatory agency requirements, it may be appropriate to include depreciation in the total of this cost. This cost should not include any costs to operate wastewater, biosolids or other systems outside of drinking water.
Unauthorized consumption Find	Includes water illegally withdrawn from fire hydrants, illegal connections, bypasses to customer consumption meters, or tampering with metering or meter reading equipment; as well as any other ways to receive water while thwarting the water utility's ability to collect revenue for the water. Unauthorized consumption results in uncaptured revenue and creates an error that understates customer consumption. In most water utilities this volume is low and, if the water auditor has not yet gathered detailed data for these loss occurrences, it is recommended that the auditor apply a default value of 0.25% of the volume of water supplied. However, if the auditor has investigated unauthorized occurrences, and has well validated data that indicates the volume from unauthorized consumption is substantially higher or lower than that generated by the default value, then the auditor should enter a quantity that was derived from the utility investigations. Note that a value of zero will not be accepted since all water utilities have some volume of unauthorized consumption occurring in their system. Note: if the auditor selects the default value for unauthorized consumption, a data grading of 5 is automatically assigned, but not displayed on the Reporting Worksheet.
Unavoidable Annual Real Losses (UARL) Find	UARL (gallons/day)=(5.41Lm + 0.15Nc + 7.5Lc) xP, or UARL (litres/day)=(18.0Lm + 0.8Nc + 25.0Lc) xP where: Lm = length of mains (miles or kilometres) Nc = number of customer service connections Lp = the average distance of customer service connection piping (feet or metres) (see the Worksheet "Service Connection Diagram" for guidance on deterring the value of Lp) Lc = total length of customer service connection piping (miles or km) Lc = Nc X Lp (miles or kilometres) P = Pressure (psi or metres) The UARL is a theoretical reference value representing the technical low limit of leakage that could be achieved if all of today's best technology could be successfully applied. It is a key variable in the calculation of the Infrastructure Leakage Index (ILI). Striving to reduce system leakage to a level close to the UARL is usually not needed unless the water supply is unusually expensive, scarce or both. NOTE: The UARL calculation has not yet been proven as fully valid for very small, or low pressure water distribution systems. If, in gallons per day: (Lm x 32) + Nc < 3000 or P <35psi in litres per day: (Lm x 20) + Nc < 3000 or P < 25m then the calculated UARL value may not be valid. The software does not display a value of UARL or ILI if either of these conditions is true.

Item Name	Description
Unbilled Authorized Consumption	All consumption that is unbilled, but still authorized by the utility. This includes Unbilled Metered Consumption + Unbilled Unmetered Consumption. See "Authorized Consumption" for more information. For Unbilled Unmetered Consumption, the Free Water Audit Software provides the auditor the option to select a default value if they have not audited unmetered activities in detail. The default calculates a volume that is 1.25% of the Water Supplied volume. If the auditor has carefully audited the various unbilled, unmetered, authorized uses of water, and has established reliable estimates of this collective volume, then he or she may enter the volume directly for this component, and not use the default value.
Unbilled metered consumption Find	Metered consumption which is authorized by the water utility, but, for any reason, is deemed by utility policy to be unbilled. This might for example include metered water consumed by the utility itself in treatment or distribution operations, or metered water provided to civic institutions free of charge. **It does not include water supplied to neighboring utilities (water exported) which may be metered but not billed.**
Unbilled unmetered consumption Find	Any kind of Authorized Consumption which is neither billed or metered. This component typically includes water used in activities such as fire fighting, flushing of water mains and sewers, street cleaning, fire flow tests conducted by the water utility, etc. In most water utilities it is a small component which is very often substantially overestimated. **It does NOT include water supplied to neighboring utilities (water exported) which is unmetered and unbilled – an unlikely case.** This component has many sub-components of water use which are often tedious to identify and quantify. Because of this, and the fact that it is usually a small portion of the water supplied, it is recommended that the auditor apply the default value, which is 1.25% of the Water Supplied volume. Select the default percentage to enter this value. If the water utility has carefully audited the unbilled, unmetered activities occurring in the system, and has well validated data that gives a value substantially higher or lower than the default volume, then the auditor should enter their own volume. However the default approach is recommended for most water utilities. Note that a value of zero is not permitted, since all water utilities have some volume of water in this component occurring in their system.
Units and Conversions	The user may develop an audit based on one of three unit selections: 1) Million Gallons (US) 2) Megalitres (Thousand Cubic Metres) 3) Acre-feet Once this selection has been made in the instructions sheet, all calculations are made on the basis of the chosen units. Should the user wish to make additional conversions, a unit converter is provided below (use drop down menus to select units from the yellow unit boxes): Enter Units: 1 — Convert From… Million Gallons (US) = **Converts to…..** 3.06888329 Acre-feet (conversion factor = 3.06888328973723)
Use of Option Buttons	To use the default percent value choose this button To enter a value choose this button and enter the value in the cell to the right  **NOTE:** For Unbilled Unmetered Consumption, Unauthorized Consumption and Systematic Data Handling Errors, a recommended default value can be applied by selecting the Percent option. The default values are based on fixed percentages of Water Supplied or Billed Authorized Consumption and are recommended for use in this audit unless the auditor has well validated data for their system. Default values are shown by purple cells, as shown in the example above. If a default value is selected, the user does not need to grade the item; a grading value of 5 is automatically applied (however, this grade will not be displayed).
Variable production cost (applied to Real Losses) Find	The cost to produce and supply the next unit of water (e.g., $/million gallons). This cost is determined by calculating the summed unit costs for ground and surface water treatment and all power used for pumping from the source to the customer. It may also include other miscellaneous unit costs that apply to the production of drinking water. It should also include the unit cost of bulk water purchased as an import if applicable. It is common to apply this unit cost to the volume of Real Losses. However, if water resources are strained and the ability to meet future drinking water demands is in question, then the water auditor can be justified in applying the Customer Retail Rate to the Real Loss volume, rather than applying the Variable Production Cost. The Free Water Audit Software applies the Variable Production costs to Real Losses by default. However, the auditor has the option on the Reporting Worksheet to select the Customer Retail Cost as the basis for the Real Loss cost evaluation if the auditor determines that this is warranted.
Volume from own sources Find	The volume of water withdrawn (abstracted) from water resources (rivers, lakes, streams, wells, etc) controlled by the water utility, and then treated for potable water distribution. Most water audits are compiled for utility retail water distribution systems, so this volume should reflect the amount of treated drinking water that entered the distribution system. Often the volume of water measured at the effluent of the treatment works is slightly less than the volume measured at the raw water source, since some of the water is used in the treatment process. Thus, it is useful if flows are metered at the effluent of the treatment works. If metering exists only at the raw water source, an adjustment for water used in the treatment process should be included to account for water consumed in treatment operations such as filter backwashing, basin flushing and cleaning, etc. If the audit is conducted for a wholesale water agency that sells untreated water, then this quantity reflects the measure of the raw water, typically metered at the source.

Item Name	Description
Volume from own sources: Master meter and supply error adjustment Find	An estimate or measure of the degree of inaccuracy that exists in the master (production) meters measuring the annual Volume from own Sources, and any error in the data trail that exists to collect, store and report the summary production data. This adjustment is a weighted average number that represents the collective error for all master meters for all days of the audit year and any errors identified in the data trail. Meter error can occur in different ways. A meter or meters may be inaccurate by under-registering flow (did not capture all the flow), or by over-registering flow (overstated the actual flow). Data error can occur due to data gaps caused by temporary outages of the meter or related instrumentation. All water utilities encounter some degree of inaccuracy in master meters and data errors in archival systems are common; thus a value of zero should not be entered. Enter a negative percentage or value for metered data under-registration; or, enter a positive percentage or value for metered data over-registration.
Water exported Find	The Water Exported volume is the bulk water conveyed and sold by the water utility to neighboring water systems that exists outside of their service area. Typically this water is metered at the custody transfer point of interconnection between the two water utilities. Usually the meter(s) are owned by the water utility that is selling the water: i.e. the exporter. If the water utility who is compiling the annual water audit sells bulk water in this manner, they are an exporter of water. Note: The Water Exported volume is sold to wholesale customers who are typically charged a wholesale rate that is different than retail rates charged to the retail customers existing within the service area. Many state regulatory agencies require that the Water Exported volume be reported to them as a quantity separate and distinct from the retail customer billed consumption. For these reasons - and others - the Water Exported volume is always quantified separately from Billed Authorized Consumption in the standard water audit. **Be certain not to "double-count" this quantity by including it in both the Water Exported box and the Billed Metered Consumption box of the water audit Reporting Worksheet. This volume should be included only in the Water Exported box.**
Water exported: Master meter and supply error adjustment Find	An estimate or measure of the volume in which the Water Exported volume is incorrect. This adjustment is a weighted average that represents the collective error for all of the metered and archived exported flow for all days of the audit year. Meter error can occur in different ways. A meter may be inaccurate by under-registering flow (did not capture all the flow), or by over-registering flow (overstated the actual flow). Error in the metered, archived data can also occur due to data gaps caused by temporary outages of the meter or related instrumentation. All water utilities encounter some degree of error in their metered data, particularly if meters are aged and infrequently tested. Occasional errors also occur in the archived data. Thus, a value of zero should not be entered. Enter a negative percentage or value for metered data under-registration; or enter a positive percentage or value for metered data over-registration. If regular meter accuracy testing is conducted on the meter(s) - which is usually conducted by the water utility selling the water - then the results of this testing can be used to help quantify the meter error adjustment. Corrections to data gaps or other errors found in the archived data should also be included as a portion of this meter error adjustment.
Water imported Find	The Water Imported volume is the bulk water purchased to become part of the Water Supplied volume. Typically this is water purchased from a neighboring water utility or regional water authority, and is metered at the custody transfer point of interconnection between the two water utilities. Usually the meter(s) are owned by the water supplier selling the water to the utility conducting the water audit. The water supplier selling the bulk water usually charges the receiving utility based upon a wholesale water rate.
Water imported: Master meter and supply error adjustment Find	An estimate or measure of the volume in which the Water Imported volume is incorrect. This adjustment is a weighted average that represents the collective error for all of the metered and archived imported flow for all days of the audit year. Meter error can occur in different ways. A meter may be inaccurate by under-registering flow (did not capture all the flow), or by over-registering flow (overstated the actual flow). Error in the metered, archived data can also occur due to data gaps caused by temporary outages of the meter or related instrumentation. All water utilities encounter some level of meter inaccuracy, particularly if meters are aged and infrequently tested. Occasional errors also occur in the archived metered data. Thus, a value of zero should not be entered. Enter a negative percentage or value for metered data under-registration; or, enter a positive percentage or value for metered data over-registration. If regular meter accuracy testing is conducted on the meter(s) - which is usually conducted by the water utility selling the water - then the results of this testing can be used to help quantify the meter error adjustment.
WATER LOSSES Find	= apparent losses + real losses Water Losses are the difference between Water Supplied and Authorized Consumption. Water losses can be considered as a total volume for the whole system, or for partial systems such as transmission systems, pressure zones or district metered areas (DMA); if one of these configurations are the basis of the water audit.

Water Audit Report for: Perkasie Regional Authority (1090046)
Reporting Year: 2020 1/2020 - 12/2020
Data Validity Score: 99

Water Loss Control Planning Guide

	Water Audit Data Validity Level / Score				
Functional Focus Area	**Level I** (0-25)	**Level II** (26-50)	**Level III** (51-70)	**Level IV** (71-90)	**Level V** (91-100)
Audit Data Collection	Launch auditing and loss control team; address production metering deficiencies	Analyze business process for customer metering and billing functions and water supply operations. Identify data gaps.	Establish/revise policies and procedures for data collection	Refine data collection practices and establish as routine business process	Annual water audit is a reliable gauge of year-to-year water efficiency standing
Short-term loss control	Research information on leak detection programs. Begin flowcharting analysis of customer billing system	Conduct loss assessment investigations on a sample portion of the system: customer meter testing, leak survey, unauthorized consumption, etc.	Establish ongoing mechanisms for customer meter accuracy testing, active leakage control and infrastructure monitoring	Refine, enhance or expand ongoing programs based upon economic justification	Stay abreast of improvements in metering, meter reading, billing, leakage management and infrastructure rehabilitation
Long-term loss control		Begin to assess long-term needs requiring large expenditure: customer meter replacement, water main replacement program, new customer billing system or Automatic Meter Reading (AMR) system.	Begin to assemble economic business case for long-term needs based upon improved data becoming available through the water audit process.	Conduct detailed planning, budgeting and launch of comprehensive improvements for metering, billing or infrastructure management	Continue incremental improvements in short-term and long-term loss control interventions
Target-setting			Establish long-term apparent and real loss reduction goals (+10 year horizon)	Establish mid-range (5 year horizon) apparent and real loss reduction goals	Evaluate and refine loss control goals on a yearly basis
Benchmarking			Preliminary Comparisons - can begin to rely upon the Infrastructure Leakage Index (ILI) for performance comparisons for real losses (see below table)	Performance Benchmarking - ILI is meaningful in comparing real loss standing	Identify Best Practices/ Best in class - the ILI is very reliable as a real loss performance indicator for best in class service

For validity scores of 50 or below, the shaded blocks should not be focus areas until better data validity is achieved.

Once data have been entered into the Reporting Worksheet, the performance indicators are automatically calculated. How does a water utility operator know how well his or her system is performing? The AWWA Water Loss Control Committee provided the following table to assist water utilities is gauging an approximate Infrastructure Leakage Index (ILI) that is appropriate for their water system and local conditions. The lower the amount of leakage and real losses that exist in the system, then the lower the ILI value will be.

Note: this table offers an approximate guideline for leakage reduction target-setting. The best means of setting such targets include performing an economic assessment of various loss control methods. However, this table is useful if such an assessment is not possible.

General Guidelines for Setting a Target ILI (without doing a full economic analysis of leakage control options)

Target ILI Range	Financial Considerations	Operational Considerations	Water Resources Considerations
1.0 - 3.0	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability.	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand.	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop.
>3.0 -5.0	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population.	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place.	Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management, water conservation) are included in the long-term
>5.0 - 8.0	Cost to purchase or obtain/treat water is low, as are rates charged to customers.	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to supply shortages.	Water resources are plentiful, reliable, and easily extracted.
Greater than 8.0	Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		
Less than 1.0	If the calculated Infrastructure Leakage Index (ILI) value for your system is 1.0 or less, two possibilities exist. a) you are maintaining your leakage at low levels in a class with the top worldwide performers in leakage control. b) A portion of your data may be flawed, causing your losses to be greatly understated. This is likely if you calculate a low ILI value but do not employ extensive leakage control practices in your operations. In such cases it is beneficial to validate the data by performing field measurements to confirm the accuracy of production and customer meters, or to identify any other potential sources of error in the data.		