

# Avondale Irrigation District

WATER RIGHT PUMPING CAPACITY SUPPORTING INFORMATION

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## Contents

EXECUTIVE SUMMARY .....	2
GENERAL INFORMATION.....	2
History .....	2
Extent of the Pumping System .....	2
Water Rights.....	4
WATER USE DATA.....	4
Pumping Variables.....	4
Pump Starts .....	4
Pumping Hours .....	5
System Variable Conclusion .....	5
Historic Data .....	6
Summary .....	7
Final Conclusion.....	7
APPENDIX .....	8
August 2, 1989.....	9
August 7, 1990.....	10
August 27, 1992.....	11
August 4, 1995.....	12
August 5, 1995.....	13
July 28, 2009.....	14

## EXECUTIVE SUMMARY

The purpose of this report is to provide supporting information based on actual flow records to the Idaho Department of Water Resources (IDWR). It has come to the attention of Avondale Irrigation District (AID) that water right beneficial use flow data was stated incorrectly during field examinations. The error has caused the district to lose in excess of four (4) cubic feet per second (cfs) on priority dates that date back as far as twenty-three years.

## GENERAL INFORMATION

### History

The Miles pump station was constructed in 1976-1977, and consists of three wells and a main pump station facility. The three pumps direct water to a common pump station located on the center of the property. At the time of construction, one 20" flow meter was installed to record the overall production of the wells, and is still in use today. In 2012, along with new SCADA telemetry, individual flow meters were installed to help increase efficiency and provide individual pump accuracy. The 20" flow meter still records overall flow of all production leaving the facility.

### Extent of the Pumping System

The existing Miles pump station system has not changed since it was put in to use in 1977. The #2 motor has been changed out twice due to lightning strikes, however the pumping components themselves are original. As typical of deep well turbine pumping systems, water is exhausted into a concrete flushing basin when the pumps come on and go off line. This procedure is accomplished with the use of cla-valves and is typical for reducing water hammer in the distribution system.

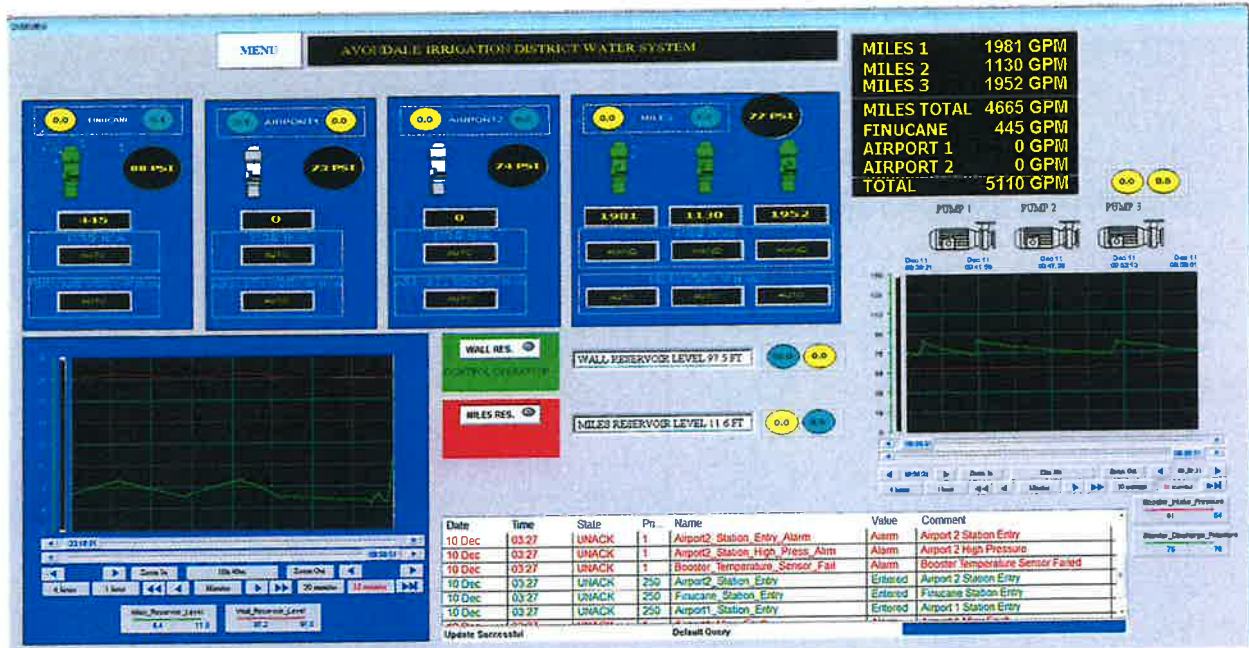
NAME	CASING SIZE	CAPACITY	HORSE POWER	DEPTH	YEAR ADDED
Miles #1	20"	2000 GPM	350	340'	March 1977
Miles #2	16"	1200 GPM	200	417'	January 1977
Miles #3	20"	2000 GPM	350	340'	January 1977

The flows used in the above and below charts are based on original test flow data.

Miles #1	<u>Static Water Level:</u> 293'	<u>Pump Rating:</u>	2000 gpm @ 509 TDH
Miles #2	<u>Static Water Level:</u> 292'	<u>Pump Rating:</u>	1200 gpm @ 499 TDH
Miles #3	<u>Static Water Level:</u> 293'	<u>Pump Rating:</u>	2000 gpm @ 509 TDH

Although today's pumping rates are not under scrutiny per the examination license amounts, it is important to recognize what they are. The installation of SCADA in 2012 added individual meters to the wells giving us electronic data for each well individually. No modifications have been made to any of the wells or pumping components since the examination, so it can be assumed that pumping capacity has remained the same or possibly even diminished. For the pumps to have become more efficient is not reasonable. The below picture depicts all three of our Miles pumps operating simultaneously, which should give us the most resistance and lowest flow rates. It is important to note that the combined rate

shown for the Miles pump station indicates the reading of the original twenty-inch flow meter and not the mathematically combined rate of the three individual pumps. It is also important to note that our tank is within two-feet of the shut off point, giving us our highest total diversified head (tdh).



## Water Rights

A review of AID's existing water right licenses has led to a discrepancy that AID feels is shorting them in excess of 4 cfs. During license review for water rights 95-8687, 95-8774, 95-8909, and 95-8867, well production values for the Miles pump station were misinterpreted. All three wells were credited with that value of 1,000 gpm per well, or a total of 3,000 gpm (6.69 cfs) for the facility. In reality, the facility pumps closer to 5,200 gpm (11.6 cfs) as was credited under water rights 95-7558, 95-8144, and 95-8321 in 1983 and 1989. The chart below depicts AID's current water right status.

Location	Water Right Number	Point of Diversion	Diversion Rate	Use	Status	Priority Date	Licensed Date
Miles	95-7558	NW1/4SE14 Sec14 Twp51N R04W	8.2 cfs	Irrigation	Active	9/29/1975	7/5/1983
			2.0 cfs	Domestic	Active	09/29/0975	7/5/1983
Miles	95-8144	NW1/4SE1/4 Sec 14 TWP 51N R04W	2.0 cfs	Municipal	Active	12/2/1981	3/24/1989
All	95-8321	NW1/4SE1/4 Sec 14 TWP 51N R04W	0.18 cfs	Irrigation	Active	5/31/1983	2/17/1989
			0.02 cfs	Stockwater	Active	5/31/1983	2/17/1989
			0.04 cfs	Domestic	Active	5/31/1983	2/17/1989
Combined to produce no more than			11.81				
All	95-8687	NW1/4SW1/4 Sec 24 Twp 51N R04W	1.31 cfs	Municipal	Active	3/21/1991	3/12/2009
All	95-8774	NE1/4NE1/4SE1/4 Sec 15 TWP 51N R04W	3.0 cfs	Municipal	Active	10/20/1992	3/12/2009
All	95-8909	SW1/4NW1/4 Sec 15 TWP 51N R04W	3.0 cfs	Municipal	Active	3/8/1995	3/1282009
All	95-8867	NW1/4SW1/4 Sec 24 Twp 51N R04W	2.0 cfs	Municipal	Active	5/13/1994	3/12/2009
Total			9.31				
ALL RIGHTS NOT TO EXCEED			13.94				

## WATER USE DATA

Avondale Irrigation District has pumping data that extends back to when the pumps were installed. In an attempt to provide accurate beneficial use production rates, the district has researched existing pumping data from the time of and throughout the examination periods. It is important to realize when reviewing the data that there are multiple variables that all dictate the pumping figures.

### Pumping Variables

Actual on-site pumping data differs from historic pumping records due to variables that do not have to be accounted for when you are on-site. An on-site visit allows the examiner to physically watch the flow meter while also verifying that only one pump at a time is running, which is much easier than trying to depict the same information from historic pumping records.

### Pump Starts

Each and every time a pump cycles or starts and then stops, a series of events must take place. Initially the distribution system recognizes the need for water so the pump is called to start. When the pump starts, the cycle counter turns over showing the pump has cycled and the pump hour meter begins.

Now that the motor has been energized, water must climb from the pumping bowl level, up the casing, across the pump yard to the main pumping station, and then exit to the outside concrete flushing structure. Once water has made its way to the flushing structure, the cla-valve in the pumping station can begin to close. Depending on the size of the incoming pipe, size of the cla-valve, amount of water, and amount of pressure, the time of this process can vary. Slowly, the cla-valve closes, which in turn begins to increase pressure on the back of the check valve, slowly building as the cla-valve continues to close. Eventually, the cla-valve closes completely and all water from the pump is now being diverted into the distribution system. This is the classic scenario for avoiding water hammer in the distribution system and is used on most deep turbine pumps. Because of the piping schematics of the pump station, water does not pass through the flow meter until the cla-valve has closed and the check has opened. The important aspect of this is that thousands of gallons of water are being pumped into the flushing basin and never pass through the flow meter, and this process happens at the start and end of each pumping cycle. So one pump cycle equates to two instances where water is exhausted to the flushing basin without passing through the flow meter.

### Pumping Hours

When reviewing the pumping hours, you need to realize a couple of important facts. The first fact is that the pumping hour meter is designed to operate in tenths, which means that it only turns over every six minutes. The second fact to remember is that the hour meter starts when the motor starts and does not recognize whether water is being exhausted to the flushing basin, or if it is flowing into the distribution system, only that the motor is running.

### System Variable Conclusion

The realization is this: Each and every time a pump cycles, the hour meter is running, however all of the water being pumped is not passing through the flow meter. The larger the pump, the more gallons per minute that is exhausted outside. The more cycles you have in a day, the more water you have exhausted to the flushing basin that never reach the flow meter and cannot be accounted for, however the hour meter does not indicate that. So, the equation of water pumped divided by minutes ran is not completely accurate if you are reviewing pumping records, because all water is not metered and the hour meter only turns over in tenths. A pump that is capable of pumping 2,000 gpm can pump 12,000 gallons per one hour meter click and if this is happening on both ends of the cycle it is easy to recognize the amount of pumped water that is not accounted for on the flow meter due to the hour meter increments. When you add the hour meter inaccuracy to the cla-valve flushing of the pump you get a scenario that makes it difficult to accurately gauge pump efficiency based solely on pumping records. When you are calculating flow while on-site however, the cycles and starts do not necessarily matter because you can physically watch the meter which clearly indicates the amount of gallons per minute that flow to distribution.

The reason this is important, is because IDWR has asked for pumping data from the time of the examination to show flow rates during those periods. It is impossible to indicate exact flow rates due to the variables, however data can show that much more cfs was pumped than ever accounted for and if the pumping variables are recognized, the original cfs estimates make much more sense.

## Historic Data

In the chart below, you will see an overview of historic summarized data collected from hand written records days that span over twenty years, with an explanation of the charts values. Each day represented is individually detailed in the Appendix.

Pumping Date	Total Minutes	Total Starts	Total Gallongae	Pumps Operating	Average GPM	Calculated Gallonage	% Actual
8/2/1989	1,488	7	2,860,000	1, 2, 3	1,922	2,864,466	0%
8/7/1990	2,562	13	4,550,000	1, 2, 3	1,776	4,550,862	0%
8/27/1992	744	6	840,000	2	1,129	840,720	-1%
8/4/1995	1,332	8	2,550,000	1, 3	1,914	2,601,630	-2%
8/5/1995	1,074	7	2,050,000	3	1,909	2,096,448	-2%
7/28/2009	1,080	11	1,910,000	1, 2, 3	1,769	1,969,482	-3%
<b>Total</b>	<b>8,280</b>	<b>52</b>	<b>14,760,000</b>		<b>1,783</b>	<b>14,923,608</b>	<b>-1%</b>

*(Calculated Gallonage is derived from current SCADA data usage of individual pumps. #1=1,981 gpm, #2=1,130 gpm, #3=1,952 gpm)*

The chart above is a clear representation of actual days of pumping from periods during the examination periods. The chart also indicates capacities both before and after examination periods to show consistency throughout the history of the pumps. Calculated amounts are shown to be within +/- 3 percent, which is as accurate as the tolerance of most distribution meters, however licensed capacities are only at 44% of actual pumping rates.

### Pumping Date

The date of the pumping event

### Total Minutes

Total combined minutes that pumps operated for this day. It is not limited to a single pump and is clarified in the "Pumps Operating" column.

### Total Starts

Total number of combined starts by all pumps operating for this day.

### Total Gallonage

Total amount of combined gallons pumped by all pumps operating on this day.

### Pumps Operating

Defines which pump/pumps operated on this day.

### Average GPM

Average combined gallons per minute pumped for this day. Averages vary depending on the pump/pumps that ran, hours pumped and pump cycles.

### *Calculated Gallonage*

Calculated Gallonage is equal to what the pump is expected to pump. Values for pumping capacity were taken directly off current SCADA totals as depicted in the screenshot above. This is meant to show that the pumps are pumping the same now as when the examinations took place. Calculated Gallonage does not account for gallons lost during pump cycling. Calculated gpm used is Miles #1 = 1,981, Miles #2 = 1,130, and Miles #3 = 1,952.

### *% Actual*

Percentage difference between actual and calculated.

### *Summary*

To summarize, pumping values from 1990 to 2009 (all pre SCADA) have been submitted to show actual pumping amounts on examination period dates, to support possible cfs misinterpretation of the Miles pump station pumps. Pumping cycle and hour meter variables have been identified and explained in an effort to account for pumping station discrepancies.

### *Final Conclusion*

The data presented both above and in the Appendix indicate that pumping rates based a wide range of data appear consistent with calculated known pumping capacities. When actual pumping capacities are compared with licensed capacities, it is clear that an error was made during the examination. Avondale Irrigation District respectfully requests licenses 95-8867, 95-8687, 958774, and 95-8909 be amended per data submitted or per a reexamination process.

APPENDIX

August 2, 1989

Miles Pump Station

Date	08/02/89	08/03/89		Actual	Calculated	Licensed
#1 Starts	1730	1733	TOTAL #1 STARTS	3		
#1 Hours	13275.3	13297.6	TOTAL #1 HOURS	22.3	2,650,578	1,338,000
#2 Starts	32042	32044	TOTAL #2 STARTS	2		
#2 Hours	32680.5	32682.1	TOTAL #2 HOURS	1.6	108,480	96,000
#3 Starts	5648	5650	TOTAL #3 STARTS	2		
#3 Hours	12150.1	12151.0	TOTAL #3 HOURS	0.9	105,408	54,000
Meter Read (X 10K)	15319	15605	TOTAL USAGE	2,860,000	2,864,466	1,488,000

PERCENTAGE DIFFERENCE IN PUMPING 0% 48%

OPERATING PUMPS	ALL
COMBINED TOTAL MINUTES	1488
TOTAL STARTS	7
COMBINED TOTAL USAGE	2,860,000
COMBINED TOTAL GPM AVERAGE	1,922

Pump Info	HP	Static Lvl	Estimated GPM
#1	350	293'	1,981
#2	200	292'	1,130
#3	350	293'	1,952

August 7, 1990

Miles Pump Station

Date	08/07/90	08/08/90		Actual	Calculated	Licensed
#1 Starts	2080	2080	TOTAL #1 STARTS	0		
#1 Hours	14125.6	14147.5	TOTAL #1 HOURS	21.9	2,603,034	1,314,000
#2 Starts	35642	35647	TOTAL #2 STARTS	5		
#2 Hours	35891.3	35901.2	TOTAL #2 HOURS	9.9	671,220	594,000
#3 Starts	5991	5999	TOTAL #3 STARTS	8		
#3 Hours	12743.9	12754.8	TOTAL #3 HOURS	10.9	1,276,608	654,000
Meter Read (X 10K)	53595	54050	TOTAL USAGE	4,550,000	4,550,862	2,562,000

PERCENTAGE DIFFERENCE IN PUMPING 0% 44%

OPERATING PUMPS	ALL
COMBINED TOTAL MINUTES	2562
TOTAL STARTS	13
COMBINED TOTAL USAGE	4,550,000
COMBINED TOTAL GPM AVERAGE	1,776

Pump Info	HP	Static Lvl	Estimated GPM
#1	350	293'	1,981
#2	200	292'	1,130
#3	350	293'	1,952

August 27, 1992

Miles Pump Station

Date	08/27/92	08/28/92		Actual	Calculated	Licensed
#1 Starts	41	41	TOTAL #1 STARTS	0		
#1 Hours	16061.9	16061.9	TOTAL #1 HOURS	0.0	0	0
#2 Starts	38451	38457	TOTAL #2 STARTS	6		
#2 Hours	41962.6	41975.0	TOTAL #2 HOURS	12.4	840,720	744,000
#3 Starts	6613	6613	TOTAL #3 STARTS	0		
#3 Hours	13481.9	13481.9	TOTAL #3 HOURS	0.0	0	0
Meter Read (X 10K)	638428	638512	TOTAL USAGE	840,000	840,720	744,000

PERCENTAGE DIFFERENCE IN PUMPING                      0%                      12%

OPERATING PUMPS	#2
COMBINED TOTAL-MINUTES	744
TOTAL STARTS	6
COMBINED TOTAL USAGE	840,000
COMBINED TOTAL GPM AVERAGE	1,129

Pump Info	HP	Static Lvl	Estimated GPM
#1	350	293'	1,981
#2	200	292'	1,130
#3	350	293'	1,952

August 4, 1995

Miles Pump Station

Date	08/04/95	08/05/95		Actual	Calculated	Licensed
#1 Starts	337	338	TOTAL #1 STARTS	1		
#1 Hours	16454.4	16455.3	TOTAL #1 HOURS	0.9	106,974	54,000
#2 Starts	40420	40420	TOTAL #2 STARTS	0		
#2 Hours	47044.3	47044.3	TOTAL #2 HOURS	0	0	0
#3 Starts	7063	7070	TOTAL #3 STARTS	7		
#3 Hours	14262.4	14283.7	TOTAL #3 HOURS	21.3	2,494,656	1,278,000
Meter Read (X 10K)	685759	686014	TOTAL USAGE	2,550,000	2,601,630	1,332,000

PERCENTAGE DIFFERENCE IN PUMPING                    -2%                    49%

OPERATING PUMPS	#1 & #3
COMBINED TOTAL MINUTES	1332
TOTAL STARTS	8
COMBINED TOTAL USAGE	2,550,000
COMBINED TOTAL GPM AVERAGE	1,914

Pump Info	HP	Static Lvl	Estimated GPM
#1	350	293'	1,981
#2	200	292'	1,130
#3	350	293'	1,952

August 5, 1995

Miles Pump Station

Date	08/05/95	08/06/95		Actual	Calculated	Licensed
#1 Starts	338	338	TOTAL #1 STARTS	0		
#1 Hours	16455.3	16455.3	TOTAL #1 HOURS	0.0	0	0
#2 Starts	40420	40420	TOTAL #2 STARTS	0		
#2 Hours	47044.3	47044.3	TOTAL #2 HOURS	0	0	0
#3 Starts	7070	7077	TOTAL #3 STARTS	7		
#3 Hours	14283.7	14301.6	TOTAL#3 HOURS	17.9	2,096,448	1,074,000
Meter Read (X 10K)	686014	686219	TOTAL USAGE	2,050,000	2,096,448	1,074,000

PERCENTAGE DIFFERENCE IN PUMPING -2% 49%

OPERATING PUMPS	#3
COMBINED TOTAL MINUTES	1074
TOTAL STARTS	7
COMBINED TOTAL USAGE	2,050,000
COMBINED TOTAL GPM AVERAGE	1,909

Pump Info	HP	Static Lvl	Estimated GPM
#1	350	293'	1,981
#2	200	292'	1,130
#3	350	293'	1,952

