

WARREN VALLEY BASIN WATERMASTER
FOR
HI-DESERT WATER DISTRICT
VS.
YUCCA VALLEY COMPANY, LTD, ET AL
CASE NO. 172103 – COUNTY OF SAN BERNARDINO

ANNUAL REPORT
OF THE
WARREN VALLEY BASIN WATERMASTER

FOR THE PERIOD
OCTOBER 1, 2022, THROUGH SEPTEMBER 30, 2023

Hi-Desert Water District
Operations Department
55439 29 Palms Hwy.
Yucca Valley, CA 92284

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FOR
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VS.
YUCCA WATER COMPANY, LTD, ET AL
CASE NO. 172103 – COUNTY OF SAN BERNARDINO

December 2023

TO: Clerk of the San Bernardino Superior Court
Desert District, Department 4
14455 Civic Drive
Victorville, CA 92392

RE: Watermaster Report for Water Year (October 1, 2022, through September 30, 2023)

Pursuant to the judgement in the case of Hi-Desert Water District vs. Yucca Water Company, Ltd., and by Order of Judge Phillip Schaefer, February 10, 1992, submitted herewith is the Annual Report of the Warren Valley Basin Watermaster for Water Year 2022-23.

The boundary of the Warren Valley Groundwater Basin (the “Basin”) and the five Hydro Geologic Subunits (HGU) described in this Annual Report of the Warren Valley Basin Watermaster, is based upon mapping and research conducted by the United States Geological Survey (USGS). In 2003, the USGS published its Water Resources Investigation Report 03-4009, “EVALUATION OF THE SOURCES AND TRANSPORT OF HIGH NITRATE CONCENTRATIONS IN GROUNDWATER, WARREN SUB-BASIN, CALIFORNIA” (the “Report”) prepared in cooperation with Hi-Desert Water District and Mojave Water Agency. The Basin’s boundary as shown within the Report, is essentially the same as delineated by Fox in August of 1991, however the Basin has been redefined as having five (5) Hydro Geologic Sub-units by the United States Geological Survey instead of three (3). These findings are based upon the knowledge of existing fault lines, which through extensive research, have been found to effectively compartmentalized each HGU within the Basin.

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FOR THE PERIOD
OCTOBER 1, 2022, THROUGH SEPTEMBER 30, 2023

TONY CULVER
ASSISTANT GENERAL MANAGER/OPERATIONS

GLENN WARE
PRODUCTION FOREMAN

HI-DESERT WATER DISTRICT
Operations Department
55439 29 Palms Hwy.
Yucca Valley, CA 92284

WATER MASTER SUMMARY OF FINDINGS

Watermaster findings for water year 2022-23 are as follows:

- The total amount of water pumped from within the Warren Valley Basin (the “Basin”) is reported to be 2,181 acre-feet (AF). This reflects a decrease from the 2021-22 water year production value of 2,393 AF. The total production is the sum of all producers that are considered “major” producers within the Basin for purposes of recording water use. This includes Hi-Desert Water District’s (HDWD) water use of 1,871 AF, Joshua Tree Retreat Center ¹(JTRC) of 9 AF, Hawks Landing at Blue Skies (HLBS) of 266 AF and Well 2W, leased by San Bernardino County of 35 AF.
- Deliveries of State Water Project (SWP) totaled 1,971 AF and were applied to the Basin via three (3) groundwater recharge basin locations. Adjusted for agreed upon losses due to evaporation of 2%, the amount accruing to the Basin was 1,932 AF. Wastewater also contributed to our recharge totals by recharging 666 AF into the East Sub-Unit.
- HDWD’s production for 2022-23 was 1,871 AF. This was a decrease of 145 AF from the previous year.
- HLBS production from within the Basin totaled 266 AF, which was 319 AF below their total annual allotment of 585 AF per year. Last years production was 322 AF.
- JTRC production from within the Basin totals 9 AF, which was 71 AF below their total annual allotment of 80 AF per year. Last years production was 26 AF.
- Taking into consideration artificial recharge, (SWP deliveries, septic effluent, treated wastewater and large irrigated fields), natural recharge and total pumpage from within the Basin, the Watermaster estimates total available Basin storage within the West, Midwest, and Mideast Sub-basins to be 69,588 AF or 27 years of storage within the upper aquifer using a current production average from within the Warren Valley Basin of 2,508 AF.

¹ Joshua Tree Retreat Center is considered a minimal producer only for purposes of assessment.

- A combination of both the upper and middle aquifers is estimated to yield approximately 105,243 AF or 41 years of storage. The estimated values are based upon United States Geological Survey studies of the Warren Valley Groundwater Basin (Nishikawa and others; 2003) and HDWD records. A spreadsheet outlining cumulative storage is available within Appendix H.
- Most wells within the District displayed an increase in water surface elevation (See Appendix E). Increases ranged between two (2) and twenty-one (21) feet. One well had a decrease of one (1) foot, while four wells displayed no change in surface elevation.

Table 1

Well ID	AF	Percent of Warren Basin Total	Percent of HDWD Total
12E	492	22.55	26.29
20W	318	14.58	16.99
14E	278	12.74	14.85
HLBS-BS1	266	12.19	N/A
9W	167	7.65	8.92
8W	148	6.78	7.91
6W	141	6.46	7.53
17E	122	5.59	6.52
9E	121	5.54	6.46
16E	84	3.85	4.48
2W	35	1.60	N/A
JTRC	9	0.41	N/A

The Warren Valley Basin Watermaster continued its program to monitor water production and water levels pursuant to the judgement.

Respectfully submitted,

WARREN VALLEY BASIN WATERMASTER

By: _____
Scot McKone, President

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1.0 INTRODUCTION

Pursuant to the Judgment in the matter of Hi-Desert Water District vs. Yucca Water Company Ltd., Case Number 172103, San Bernardino, California, dated September 16, 1977, (Judgment) Hi-Desert Water District (HDWD) through its Board of Directors was appointed by the Court as Watermaster to administer the provisions of the judgment. The Watermaster was directed to formulate a proposal for a physical solution to the continuing overdraft of the Warren Valley Basin. The Judgment did not specifically require annual reporting of water levels or water production information, but instead required only that a solution to the overdraft be developed. A solution was formulated and presented by Kennedy/Jenks/Chilton as the Warren Valley Basin Management Plan, dated January 31, 1991, which was adopted by the Watermaster on May 10, 1991. Subsequently, on February 10, 1992, Judge Phillip Schaefer of the West District for the County of San Bernardino Superior Court ordered the Warren Valley Basin Watermaster to report to the Court on an annual basis the water levels in the basin and any matters that might impact the safe yield of the basin.

In December 1997, the Watermaster petitioned the Court to modify its Order of February 10, 1992, which required the annual determination of the safe yield of the Warren Valley Basin, and instead to require that the Watermaster report to the Court annually on conditions affecting water supply, use and disposal and to implement a groundwater monitoring program for basin management. The Watermaster undertook this action because, in general, a safe yield determination is made for allocating water resources among competing claims of right. In this case, HDWD is solely responsible for purchasing supplemental water. Securing supplemental supplies and monitoring water levels to ensure that there is adequate water in storage to meet the demands of the Basin in consistent with good water management practices and is a better use of available funds than preparing safe yield determinations. The Court subsequently approved the requested change.

2.0 COMPILATION AND ANALYSIS OF BASIC DATA

The Annual Report of the Warren Valley Basin Watermaster for the water year 1992-93 established that the hydrologic reporting period for the initial and subsequent reports would be on a water year basis (i.e. October 1 through September 30 of the following year). Presented herein are data pertaining to the analysis of the following items of water supply and utilization for water year 2022-23

- Precipitation
- Water Demand and Production
- Water Deliveries from Sources located outside the Warren Valley Basin
- Existing Water Levels and Trend
- Water Recharge and Storage
- Wastewater Discharge

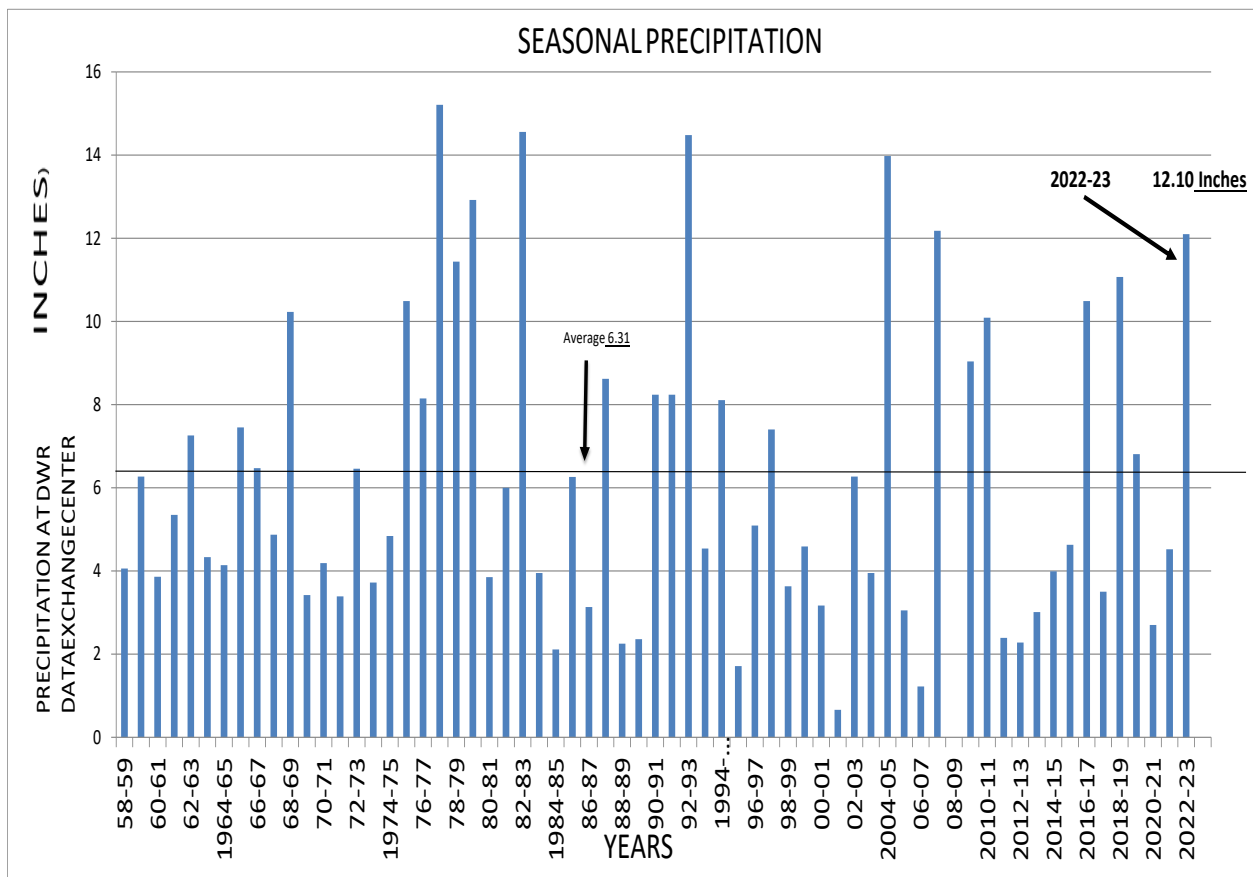
In preparation of this report, the Watermaster has considered information from various sources including the following:

- Records and data on file at the office of the Hi-Desert Water District (HDWD)
- Records and data on file at the office of the Mojave Water Agency (MWA)
- Records and data on file at the State Water Resources Control Board
- Climatological records from the Department of Water Resources, California Data Exchange Center
- United States Geological Survey (USGS)
- Records maintained at the Joshua Tree Retreat Center, Joshua Tree CA
- Wastewater

Water production and water level data are collected as part of the ongoing groundwater monitoring program administered by HDWD. The hydrographs included within this report are prepared using data collected from wells that are considered representative of the water level trends throughout the Warren Valley Basin.

3.0 PRECIPITATION

The average precipitation recorded at the California Department of Forestry (CAL FIRE) Yucca Valley station for water years 1957-58 through 2022-23 was 6.31 inches. This amount represents the Base Period average against which subsequent seasonal precipitation amounts are compared. Precipitation during 2022-23, shown on Table 1, was 12.10 inches which was 191.76% of the Sixty-five-year Base Period average. The heaviest precipitation (in inches) occurred within the month of January (3.03), followed by August (2.76), and March (2.37) accounting for 67% of the total for the year.



4.0 WATER DEMAND AND PRODUCTION

Other extractions from within the Basin totaled 310 AF. JTRC water production accounted for 9 AF of this value, the golf course (HLBS), accounted for 266 AF and San Bernardino County Well 2W, accounted for the remaining 35 AF. The County has a maximum usage of 50 AF at Well 2W per year, both JTRC and HLBS remained below their water allotments of 80 and 585 AF respectively. HLBS, considered a major producer by the Judgment, paid their applicable fees to the Watermaster for the extracted water. JTRC continues to be a minimal producer for purposes of assessment as it is not required to submit payment to the Watermaster for extracted water so long as such extraction does not exceed 80 AF per year.

4.1 WATER FROM SOURCES LOCATED OUTSIDE THE WARREN VALLEY BASIN

During water year 2022-23, deliveries distributed to the HDWD service area from outside the Warren Basin accounted for 934 AF. These deliveries were from the mainstream Well 24E, which is located within the Ames/Means Basin. Deliveries of the State Water Project (SWP) water to the Basin for groundwater recharge totaled 1,971 AF during the 2022-23 water year. Adjusted for agreed upon losses due to evaporation of 2%, the amount accruing to the Basin was 1932 AF.

Table 2 below outlines water extractions and deliveries of those producers required to report to the Watermaster.

Table 2

Water Year	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23
Joshua Tree Retreat Center (AF)	65	67	39	35	18	26	9
Hawks Landing at Blue Skies (AF)	275	341	274	294	339	322	266
Hi-Desert Water District (AF)	2153	2214	2547	2221	2174	2016	1871
Well 2W - Pioneertown Leased County of San Bernardino	0	0	12	34	26	29	35
Subtotal Warren Valley Basin (AF)	2493	2622	2872	2584	2557	2393	2181
Bighorn Desert View Intertie (AF)	0	0	0	0	0	0	0
Mainstream Well 24E (AF)	669	680	240	709	779	861	934
Subtotal Ames Means Basin (AF)	669	680	240	709	779	861	934
Total All Basins (AF)	3162	3302	3112	3293	3336	3254	3115

5.0 STATE OF THE WARREN VALLEY BASIN

The Warren Valley Sub-basin (the “Basin”) is compartmentalized by fault lines into five (5) hydrogeologic subunits (HGU) that make up the largest water bearing formations of the Basin. These HGU’s are referred to as the west, mid-west, mid-east, east, and northeast HGU’s. Major producers within the Basin include Hi-Desert Water District (HDWD), which currently extracts water from within the west, mid-west, and mid-east HGU’s; Hawks Landing at Blue Skies (HLBS), positioned over the west HGU; and Joshua Tree Retreat Center (JTRC), which primarily extracts groundwater from within the east HGU. The location and approximate boundaries of these HGU’s are shown on Plate 1 with groundwater well locations included.

Hydrographs of water surface elevations which include water quality analysis for nitrogen as (N03-N), total dissolved solids, (TDS), and water production data within each of the HGU’s are shown within Appendix G. Each of these graph trend changes are associated with groundwater extractions and recharge within the Basin and are explained below. The locations of these wells are shown within Appendix C.

5.1 WEST HYDROGEOLOGIC SUB-UNIT

When compared to last year’s data, seven (7) wells water levels within the West HGU increased on average of 5.43 feet (*2W, 3W, 5W, 8W, 9W, 10W, and 11W). Wells 6W, 20W). BS #1, owned by HLBS, was sounded four times (Oct., Jan., April, and July) over the 2022-23 water year. It had an increase of four (4) feet. The staff at HLBS have been very cooperative and accommodating in providing HDWD staff access to the premises.

Table 3 outlines groundwater surface elevations taken from wells within the west HGU during 2022-23.

(*2W is leased to San Bernardino County)

Table 3

Well ID	Groundwater Surface Elevation (2022-23)	Groundwater Surface Elevations (2021-22)	Increase (ft.) 2021-22 / 2022-23	Groundwater Surface Elevation (1992)	Increase (ft.) 1992-93 / 2022-23
1W	NR	NR	NR	NR	NR
2W	3006	3001	+5	NR	NR
3W	3098	3093	+5	2944	154
5W	3113	3111	+2	2908	205
6W	3116	3116	0	2942	174
8W	3107	3100	+7	2957	150
9W	3106	3104	+2	2932	174
10W	3109	3102	+7	2944	165
11W	3090	3080	+10	N/A	N/A
20W	3112	3112	0	N/A	N/A

Water extractions from within the West HGU totaled 1025 AF. The extracted water was replenished by State Water Project (SWP) deliveries to HDWD's Site 3 (groundwater recharge facility) totaling 1,091 AF. The West HGU gained 282 AF in 2022-23 when comparing extractions to replenishments.

All active production wells within the Warren Basin were analyzed for nitrate as nitrogen (N03-N) and Total Dissolved solids (TDS). HDWD tests all wells for Nitrate and TDS. These wells are sampled once per semester throughout the water year, for the Watermaster. In addition to the samples taken for the Watermaster, HDWD tests all wells for Nitrate and TDS monthly and wells at the two blending facilities are sampled weekly throughout the year. Concentrations of each constituent within these wells remained below the SWRCB's and the Environment Protection Agency's (EPA) primary and secondary maximum contaminant levels (MCL). In October of 2019 Well 11W N03-N levels reached the MCL of 10 mg/L. Well 11W has been inactive since October 2019.

This year within the West HGU, NO3-N samples at Well 11W were taken the first semester with the well flushing. NO3-N results were 8.9. Samples were not taken the second semester. Well 11W was made inactive in June of 2023, per State recommendations. Moving forward, we will continue to monitor Well 11W for NO3-N in January and July for the Watermaster and our records. The elevated NO3-N levels at Well 11W are attributed to the solute transport of nitrates throughout the saturated zone of the aquifer due to seepage infiltration.

Well 20W displayed a slight decrease of NO3-N levels of 0.2 mg/L in the first semester and a slight increase of 0.3 mg/L in the second semester. Well 9W was down for rehab during the first semester but displayed an increase of 1.3 mg/L in the second semester.

All other wells remained relatively consistent with the historical levels showing slight variations as seen in Table 4.

Table 4

Well ID	2022-23 Nitrogen N03-N Results (mg/L) MCL = 10 Semester 1 / Semester 2	2021-22 Nitrogen N03-N Results (mg/L) MCL = 10 Semester 1 / Semester 2	2005 Nitrogen N03-N Results (mg/L) MCL = 10 Semester 1 / Semester 2
6W	1.2 / 1.3	1.2 / 1.2	5.1 / 4.5
8W	3.1 / 3.5	3.1 / 3.6	2.4 / 2.4
9W	** / 2.1	2.2 / .78	1.7 / 3.1
11W	8.9 / **	8.2 / 8.0	5.4 / 8.3
20W	2.8 / 3.0	3 / 2.7	NA

TDS levels within the West HGU were consistent with those of historical records, compared to last year's numbers. There were slight increases and decreases at most wells from 10 to 20 mg/L. Well 9W, which was only sampled the 2nd semester had a decrease of 40 mg/L.

Table 5 displays the TDS results for those wells within the west HGU.

Table 5

Well ID	2022-23 TDS Results (mg/L) Secondary MCL = 1000, Semester 1 / Semester 2	2021-22 TDS Results (mg/L) Secondary MCL = 1000, Semester 1 / Semester 2	2005 TDS Results (mg/L) Secondary MCL = 1000, Semester 1 / Semester 2
6W	250 / 270	250 / 260	160 / 170
8W	180 / 200	190 / 190	150 / 180
9W	** / 220	210 / 260	190 / 180
11W	280/**	260 / 280	260 / 260
20W	190 / 200	200 / 190	NA

5.2 MID-WEST HYDROGEOLOGIC SUB-UNIT

The sites monitored within the Mid-West HGU during the 2022-23 water year displayed an average increase of nine (9) feet in water surface elevation. All sites increased in surface water levels.

Table 6 below displays groundwater surface elevation data along with historical information:

Table 6

Well ID	Groundwater Surface Elevation (2022-23)	Groundwater Surface Elevation (2021-22)	Increase (ft.) 2021-22 / 2022-23	Groundwater Surface Elevation (1992)	Increase (ft.) 1992-93 / 2021-22
7E	3072	3067	5	2793	279
9E	3075	3068	7	2796	279
12E	3078	3066	12	2786	292
16E	3107	3096	11	2747	360
17E	3076	3066	10	2799	277

Water extractions from within the Mid-West HGU totaled 819 AF. The extracted water was replenished by State Water Project (SWP) deliveries totaling 497 AF. The Mid-West HGU lost 322 AF in 2022-23 when comparing extractions to replenishments.

Nitrate and TDS samples were taken from wells located within the Mid-West HGU on a semester basis. Nitrate levels within the Mid-West HGU remained relatively consistent throughout the 2022-23 water year.

Well 9E showed an increase of .5 mg/L of N03-N for both semesters. Well 12E showed an increase of .5 in the second semester. Well 16E showed a decrease of .8 in the second semester. Additional samples taken weekly remained relatively consistent with the previous year's readings.

Table 7

Well ID	2022-23 Nitrogen N03-N Results (mg/L) MCL = 10 Semester 1 / Semester 2	2021-22 Nitrogen N03-N Results (mg/L) MCL = 10 Semester 1 / Semester 2	2005 Nitrogen N03-N Results (mg/L) MCL = 10 Semester 1 / Semester 2
9E	3.1 / 3.4	2.6 / 2.9	1.1 / 2.2
12E	2.2 / 2.9	** / 2.4	6.1 / 6.8
16E	3.9 / 4.1	4.0 / 4.9	4.6 / 4.6
17E	4.4 / 4.8	4.1 / 4.6	NR / 7.7

TDS sampling shows Well 9E had a slight increase in the 1st semester of 20 mg/L and a slight increase of 10 mg/L in the second semester. TDS results remained relatively consistent at the other wells within the Mid-West HGU. Results have been provided in Table 8.

Table 8

Well ID	2022-23 TDS Results (mg/L) Secondary MCL = 1000, Semester 1 / Semester 2	2021-22 TDS Results (mg/L) Secondary MCL = 1000, Semester 1 / Semester 2	2005 TDS Results (mg/L) Secondary MCL = 1000, Semester 1 / Semester 2
9E	300 / 310	280 / 300	160 / 170
12E	290 / 310	*** / 310	150 / 180
16E	230 / 240	230 / 240	190 / 180
17E	300 / 310	300 / 320	260 / 260

5.3 MID-EAST HYDROGEOLOGIC SUB-UNIT

During the 2022-23 water year, groundwater surface elevations increased by an average of sixteen (16) feet. Site 7 is being utilized within this report to track changes within the Mid-East HGU due to the low number of active production wells within this HGU. Due to an obstruction at Well 18E, we are unable to obtain water sounding levels.

Table 9

Well ID	Groundwater Surface Elevation (2022-23)	Groundwater Surface Elevation (2021-22)	Increase (ft.) 2021-22 / 2022-23	Groundwater Surface Elevation (2007/08)	Increase (ft.) 2007/08 - 2022/23
Site 7	3066	3055	11	3021.5	44.5
14E	3051	3030	21	3002	49
18E	N/R	N/R	N/R	2982	52 (2017-18)

Water extractions from within the Mid-East HGU totaled 278 AF. The extracted water was replenished by SWP water deliveries to Site 7 (groundwater recharge facility) totaling 383 AF leaving a surplus of 105 AF.

Well 14E is the only active well in the Mid-East HGU. Nitrate sample results for Well 14E show a slight decrease of 0.1 mg/L in the 1st semester and a slight increase of 0.1 mg/L in the 2nd semester.

Table 10

Well ID	2022-23 Nitrogen N03-N Results (mg/L) MCL = 10 Semester 1 / Semester 2	2021-22 Nitrogen N03-N Results (mg/L) MCL = 10 Semester 1 / Semester 2	2005 Nitrogen N03-N Results (mg/L) MCL = 10 Semester 1 / Semester 2
14E	1.5 / 1.8	1.6 / 1.7	2.2 / 3.2
18E	NR	NR	2.1 / 2.5

TDS samples within the Mid-East HGU taken from Well 14E showed a slight increase of 10 mg/L for the 1st and 2nd semesters. Sample results for the 2022-23 water years are seen below in Table 11.

Table 11

Well ID	2022-23 TDS Results (mg/L) Secondary MCL = 1000, Semester 1 / Semester 2	2021-22 TDS Results (mg/L) Secondary MCL = 1000, Semester 1 / Semester 2	2005 TDS Results (mg/L) Secondary MCL = 1000, Semester 1 / Semester 2
14E	250 / 240	240 / 230	NR / NR
18E	N/R	NR	160 / NR

5.4 NORTH-EAST HYDROGEOLOGIC SUB-UNIT

There are currently no major producers extracting water from within the North-East HGU. HDWD possesses one well that is monitored for groundwater surface elevations; Well 11E. Well 11E's groundwater surface elevation was recorded to be 2,945 feet above sea level for the 2022-23 water year. There was no change in the water surface elevation from the previous year.

Due to the lack of active production wells within the North-East HGU, water quality analyses have not been performed.

5.5 EAST HYDROGEOLOGIC SUB-UNIT

Due to the lack of historical information, HDWD staff continues to utilize groundwater surface elevations from a monitoring well referred to as Well 21E. A reading of 2,899 feet above sea level (obtained in September of 2023) represents a four (4) foot increase when compared to the 2,895-measurement recorded in September of 2022.

5.6 RECLAMATION FACILITY

In September 2019 the Reclamation Facility started recharging in the East Hydrogeologic Sub-Unit. During the 2022-23 water year, there was 666.2 AF recharged. In the future this water will be extracted and pumped to the west, where it will be recharged into basins with production wells.

Appendix A																	
PRECIPITATION AT YUCCA VALLEY																	
(INCHES)																	
WATER																	
YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP					TOTAL
1957-58	1.19	0.22	0.69	0.54	2.59	2.64	2.61	0.14	0.06	0.20	0.09	0.14	6.77	164.11%	100.00%		11.11
58-59	0.32	0.32	0.00	0.87	2.10	0.00	0.04	0.00	0.00	0.13	0.02	0.26	6.77	59.97%	100.00%		4.06
1959-60	0.37	1.83	1.36	1.26	0.15	0.00	0.59	0.00	0.00	0.05	0.00	0.66	6.77	92.61%	100.00%		6.27
60-61	0.17	0.78	0.45	0.50	0.00	0.01	0.00	0.00	0.00	0.00	1.95	0.00	6.77	57.02%	100.00%		3.86
61-62	0.00	0.58	1.26	0.90	1.97	0.45	0.00	0.19	0.00	0.00	0.00	0.00	6.77	79.03%	100.00%		5.35
62-63	1.02	0.00	0.27	0.66	1.13	0.02	0.02	0.00	0.00	0.00	1.30	2.84	6.77	107.24%	100.00%		7.26
63-64	1.40	1.04	0.04	0.41	0.01	0.97	0.19	0.00	0.00	0.20	0.05	0.02	6.77	63.96%	100.00%		4.33
1964-65	0.00	1.22	0.00	0.03	0.00	0.94	1.54	0.02	0.00	0.22	0.17	0.00	6.77	61.15%	100.00%		4.14
65-66	0.00	4.00	2.56	0.16	0.34	0.29	0.00	0.00	0.00	0.01	0.00	0.09	6.77	110.04%	100.00%		7.45
66-67	0.78	0.52	2.23	0.48	0.00	0.00	1.02	0.00	0.00	0.00	0.38	1.06	6.77	95.57%	100.00%		6.47
67-68	0.00	0.86	1.50	0.10	0.03	1.30	0.34	0.00	0.00	0.74	0.00	0.00	6.77	71.94%	100.00%		4.87
68-69	0.00	0.00	0.00	3.50	3.96	0.00	0.00	1.50	0.00	1.27	0.00	0.00	6.77	151.11%	100.00%		10.23
1969-70	0.00	0.96	0.00	0.00	1.48	0.76	0.00	0.00	0.00	0.22	0.00	0.00	6.77	50.52%	100.00%		3.42
70-71	0.22	1.03	1.24	0.00	0.21	0.05	0.20	0.37	0.00	0.18	0.69	0.00	6.77	61.89%	100.00%		4.19
71-72	0.27	0.08	2.12	0.00	0.00	0.00	0.12	0.00	0.22	0.00	0.57	0.01	6.77	50.07%	100.00%		3.39
72-73	0.43	1.81	0.07	0.32	1.80	1.91	0.00	0.00	0.00	0.00	0.12	0.00	6.77	95.42%	100.00%		6.46
73-74	0.00	0.14	0.00	2.88	0.00	0.64	0.00	0.06	0.00	0.00	0.00	0.00	6.77	54.95%	100.00%		3.72
1974-75	1.00	0.25	0.95	0.00	0.28	0.82	0.78	0.00	0.00	0.00	0.00	0.76	6.77	71.49%	100.00%		4.84
75-76	0.07	0.13	0.00	0.00	3.52	2.13	0.13	0.06	0.00	0.00	0.12	4.33	6.77	154.95%	100.00%		10.49
76-77	0.00	0.21	0.00	1.74	0.00	0.37	0.01	1.22	0.11	0.12	4.33	0.04	6.77	120.38%	100.00%		8.15
77-78	0.00	0.00	1.68	5.55	2.28	4.95	0.44	0.16	0.00	0.00	0.00	0.15	6.77	224.67%	100.00%		15.21
78-79	0.17	1.90	1.06	2.22	1.18	2.49	0.00	0.00	0.00	1.53	0.79	0.10	6.77	168.98%	100.00%		11.44
1979-80	0.10	0.00	0.01	3.91	5.91	1.85	0.18	0.70	0.11	0.15	0.00	0.00	6.77	190.84%	100.00%		12.92
80-81	0.33	0.00	0.00	1.11	0.48	1.51	0.00	0.24	0.00	0.00	0.00	0.18	6.77	56.87%	100.00%		3.85
81-82	0.00	0.47	0.00	0.23	1.47	1.52	0.55	1.21	0.00	0.00	0.35	0.20	6.77	88.63%	100.00%		6.00
82-83	0.00	1.42	2.67	1.60	2.50	1.25	0.16	0.00	0.00	0.00	4.27	0.69	6.77	215.07%	100.00%		14.56
83-84	0.79	0.02	0.59	0.00	0.00	0.00	0.00	0.00	0.00	1.36	0.33	0.86	6.77	58.35%	100.00%		3.95
1984-85	0.00	0.23	0.57	0.33	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.48	6.77	31.17%	100.00%		2.11
85-86	0.00	1.36	0.64	0.28	1.83	1.43	0.07	0.00	0.00	0.14	0.42	0.09	6.77	92.47%	100.00%		6.26
86-87	0.00	0.64	0.06	0.45	0.18	1.09	0.08	0.18	0.00	0.00	0.00	0.45	6.77	46.23%	100.00%		3.13
87-88	1.71	0.77	1.37	1.47	0.68	0.32	0.78	0.00	0.00	0.00	1.52	0.00	6.77	127.33%	100.00%		8.62
88-89	0.00	0.00	0.82	0.94	0.06	0.27	0.00	0.03	0.00	0.00	0.00	0.13	6.77	33.23%	100.00%		2.25
1989-90	0.02	0.00	0.37	0.44	0.93	0.13	0.20	0.00	0.00	0.00	0.27	0.00	6.77	34.86%	100.00%		2.36
90-91	0.01	0.00	0.03	0.00	2.75	4.53	0.00	0.00	0.00	0.79	0.00	0.13	6.77	121.71%	100.00%		8.24
91-92	0.00	0.00	0.90	0.40	3.65	2.34	0.33	0.32	0.00	0.05	0.25	0.00	6.77	121.71%	100.00%		8.24
92-93	0.46	0.00	2.05	6.27	5.61	0.08	0.00	0.00	0.01	0.00	0.00	0.00	6.77	213.88%	100.00%		14.48
93-94	0.02	0.31	0.15	0.18	2.41	0.87	0.27	0.02	0.00	0.00	0.31	0.00	6.77	67.06%	100.00%		4.54
1994-95	0.00	0.00	0.76	4.40	1.25	1.38	0.09	0.10	0.06	0.01	0.01	0.05	6.77	119.79%	100.00%		8.11
95-96	0.00	0.00	0.22	0.95	0.43	0.11	0.00	0.00	0.00	0.00	0.00	0.00	6.77	25.26%	100.00%		1.71
96-97	0.23	0.65	0.67	1.30	0.00	0.00	0.11	0.00	0.00	0.41	0.00	1.72	6.77	75.18%	100.00%		5.09
97-98	0.08	0.31	0.79	0.54	3.55	0.82	0.07	0.40	0.00	0.00	0.38	0.46	6.77	109.31%	100.00%		7.40
98-99	0.07	0.43	0.12	0.07	0.35	0.01	0.64	0.01	0.00	0.76	0.83	0.34	6.77	53.62%	100.00%		3.63
1999-00	0.00	0.00	0.00	0.00	2.03	1.93	0.23	0.00	0.00	0.00	0.18	0.22	6.77	67.80%	100.00%		4.59
00-01	0.06	0.00	0.00	1.01	1.43	0.24	0.43	0.00	0.00	0.00	0.00	0.00	6.77	46.82%	100.00%		3.17
01-02	0.00	0.20	0.34	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.05	6.77	9.75%	100.00%		0.66
02-03	0.00	0.35	0.36	0.14	1.50	1.32	0.39	0.01	0.00	0.40	1.74	0.06	6.77	92.61%	100.00%		6.27
03-04	0.00	1.18	0.70	0.18	1.47	0.33	0.06	0.00	0.00	0.03	0.10	0.00	6.77	58.35%	100.00%		3.95
2004-05	1.96	0.25	3.00	3.41	2.78	0.24	0.24	0.00	0.00	0.72	1.25	0.13	6.77	206.50%	100.00%		13.98
05-06	1.57	0.00	0.01	0.40	0.39	0.32	0.17	0.00	0.00	0.19	0.00	0.00	6.77	45.05%	100.00%		3.05

06-07	0.06		0.00		0.03		0.09		0.03		0.01		0.12		0.00		0.00		0.45		0.03		0.40	6.77	18.02%	100.00%	1.22		
07-08	0.00		1.85		0.53		2.61		0.59		0.00		0.00		6.52		0.00		0.01		0.04		0.03	6.77	179.91%	100.00%	12.18		
08-09	0.00		0.45		1.77		0.01		1.40		0.00		0.00		0.09		0.00		0.00		0.03		0.00	6.77	55.39%	100.00%	3.75		
09-10	0.00		0.20		1.30		5.47		0.84		0.03		0.11		0.00		0.00		0.02		0.97		0.10	6.77	133.53%	100.00%	9.04		
2010-11	0.76		0.02		5.43		0		2.43		0.48		0.04		0		0		0.87		0		0.06	6.77	149.04%	100.00%	10.09		
2011-12	0.00		0.24		0.18		0.00		0.30		0.72		0.42		0.00		0.00		0.29		0.24		0.00	6.77	35.30%	100.00%	2.39		
2012-13	0.01		0.04		0.19		0.64		0.08		0.06		0.00		0.01		0.00		0.57		0.60		0.08	6.77	33.68%	100.00%	2.28		
2013-14	0.12		0.21		0.34		0.00		1.30		0.40		0.13		0.00		0.00		0.05		0.25		0.21	6.77	44.46%	100.00%	3.01		
2014-15	0.00		0.00		0.95		0.70		0.73		0.41		0.00		0.00		0.01		0.78		0.00		0.41	6.77	58.94%	100.00%	3.99		
2015-16	0.58		0.02		0.02		2.07		0.65		0.06		0.61		0.00		0.05		0.00		0.00		0.57	6.77	68.39%	100.00%	4.63		
2016-17	0.25		0.16		2.95		4.78		1.36		0.00		0.00		0.00		0.00		0.01		0.46		0.52	6.77	154.95%	100.00%	10.49		
2017-18	0.00		0.00		0.07		1.60		0.04		0.49		0.00		0.23		0.00		1.07		0.00		0.00	6.77	51.70%	100.00%	3.50		
2018-19	2.03		0.18		0.48		1.86		4.59		0.44		0.03		0.58		0.00		0.03		0.00		0.85	6.77	163.52%	100.00%	11.07		
2019-20	0.00		0.87		1.91		0.00		0.07		1.96		1.90		0.00		0.00		0.00		0.10		0.00	6.77	100.59%	100.00%	6.81		
2020-21	0.00		0.35		0.33		1.06		0.06		0.00		0.00		0.00		0.08		0.41		0.00		0.41	6.77	39.88%	100.00%	2.70		
2021-22	0.18		0.00		2.57		0.00		0.07		0.11		0.06		0.00		0.00		0.02		0.90		0.61	6.77	66.77%	100.00%	4.52		
2022-23	0.84		0.83		0.49		3.03		1.09		2.37		0.00		0.04		0.00		0.10		2.76		0.55	6.77	178.73%	100.00%	12.10		



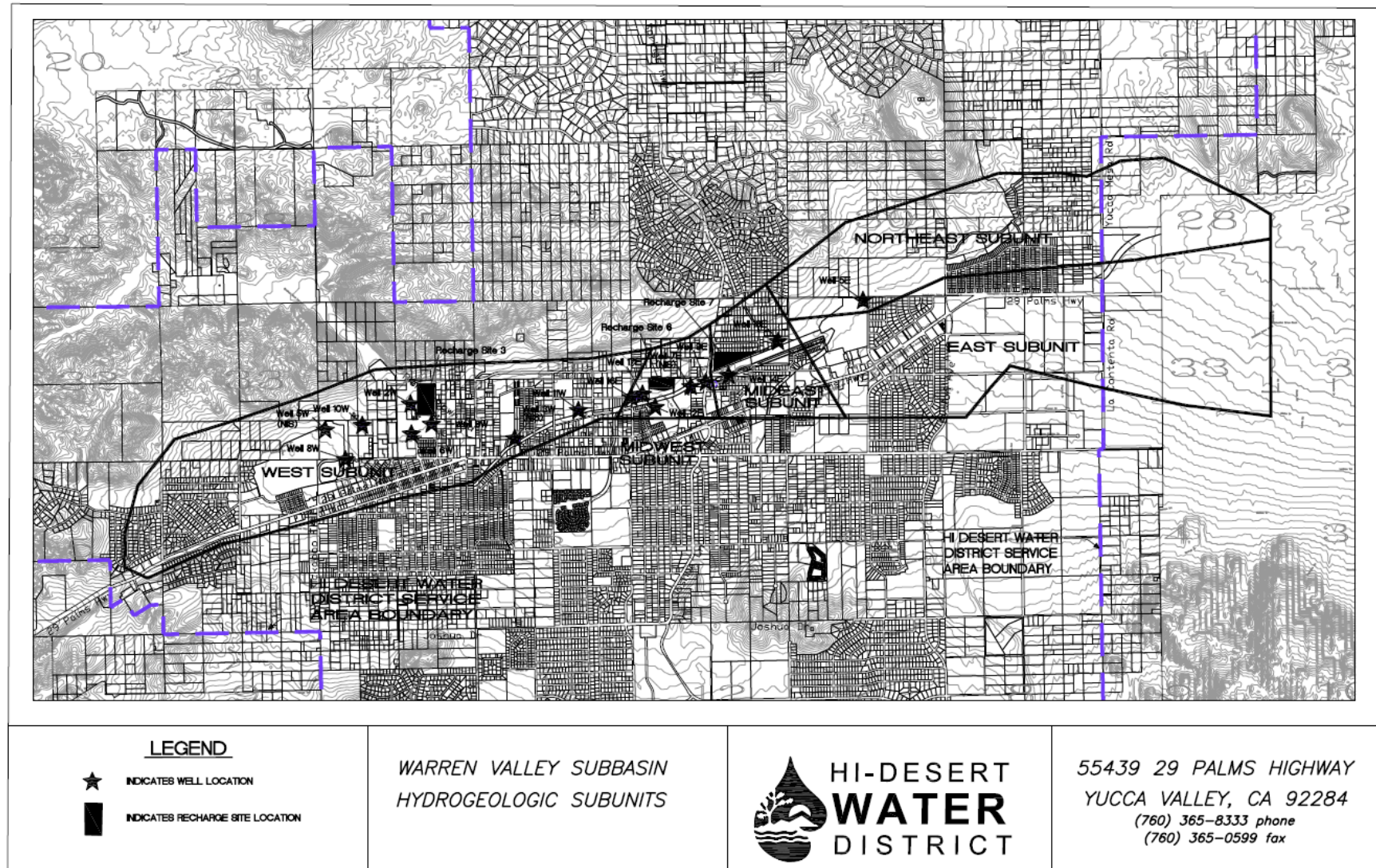
Appendix B
SUMMARY OF WATER PRODUCTION
WATER YEAR 2022-23
 (All Amounts in Acre-Feet)

Hi-Desert Water District Wells	TOTAL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5E*	0	0	0	0	0	0	0	0	0	0	0	0	0
7E*	0	0	0	0	0	0	0	0	0	0	0	0	0
9E	121	14	13	12	12	11	12	11	10	12	12	1	0
12E	492	58	55	52	40	31	31	33	41	43	48	32	28
14E	278	28	26	25	24	22	23	23	24	24	24	19	18
16E	84	10	9	9	7	5	6	6	7	7	8	5	5
17E	122	12	14	12	10	8	9	8	10	11	12	8	7
18E*	0	0	0	0	0	0	0	0	0	0	0	0	0
3W*	0	0	0	0	0	0	0	0	0	0	0	0	0
5W*	0	0	0	0	0	0	0	0	0	0	0	0	0
6W	141	13	13	13	11	11	12	12	13	14	15	11	2
8W	148	13	13	13	8	14	13	13	13	13	13	12	11
9W	167	0	0	0	0	0	0	0	0	0	48	67	52
10W*	0	0	0	0	0	0	0	0	0	0	0	0	0
11W	0	0	0	0	0	0	0	0	0	0	0	0	0
20W	318	34	0	0	0	0	0	32	54	53	55	46	44
SUBTOTAL	1,871												
Well 2W Leased - S.B. County													
2W	35	3	2	3	2	3	4	2	3	3	4	3	3
SUBTOTAL	35												
MESA 10E*	0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
MAINSTREAM 24E	934	68	74	72	79	73	82	81	80	82	81	80	79
BIGHORN DESERT VIEW INTERTIE	0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SUBTOTAL	934												
Hawks Landing													
BS #1 & #17	266	23	23	7	1	13	5	15	30	35	52	37	26
SUBTOTAL	266												
Joshua Tree Retreat Center													
JTRC #3	9	0	0	0	2	0	0	2	0	0	3		2
JTRC Farm	0	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
SUBTOTAL	9												
Grand Total	3,115												

NOTES:

*Well is either inactive or a monitoring well.

Appendix C: Warren Valley Sub-Basin Map





APPENDIX D
Annual Well Averages
Warren Valley Basin Watermaster
(Feet above Means Sea Level)
2005 - 2023

																				Total Water level increase in feet Oct 95/Sept 23	Current water level increase in feet Since 2006
	WELL	05/06	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16-17	17-18	18-19	19/20	20-21	21-22	22-23		
West Sub-unit Recharge Site 3	1W	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	2W	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	3W	3033.08	3035.08	3029.29	3038.00	3040.00	3049.00	3059.66	3066.92	3070.75	3067.50	3069.50	3077.50	3086.50	3095.83	3095.00	3093.83	3094.08	3092.83	153.67	57.75
	4W	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	5W*	2993.84	3022.84	3055.58	3078.00	3080.00	3099.00	3106.16	3107.75	3106.50	3098.50	3097.50	3103.50	3109.50	3105.50	3112.20	3113.33	3113.25	3113.42	169.04	90.58
	6W*	3001.15	3029.15	3069.09	3079.00	3083.00	3092.00	3098.00	3100.08	3100.90	3092.90	3093.90	3101.90	3107.90	3103.90	3113.49	3112.90	3116.48	3116.40	180.57	87.25
	7W	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
	8W~	3003.04	3010.37	3015.28	3086.00	3074.00	3094.00	3103.83	3090.33	3093.71	3086.71	3086.71	3086.71	3095.71	3096.71	3103.96	3102.71	3102.63	3101.38	163.77	91.01
	9W~	2984.31	2949.48	2944.66	2998.00	3066.00	3085.00	3093.50	3097.17	3097.65	3090.65	3090.65	3097.65	3104.65	3098.65	3103.74	3150.23	3106.40	3187.90	239.08	238.42
	10W	2986.92	3021.18	3048.91	3063.00	3064.00	3086.00	3094.58	3098.00	3096.35	3089.35	3089.35	3094.35	3100.35	3095.35	3105.52	3103.68	3104.43	3103.85	841.63	82.67
	11W	3016.95	2973.45	2944.83	2935.00	2960.00	2977.00	3013.75	3028.83	3022.29	3045.29	3054.29	3058.29	3048.29	3064.29	3086.79	3081.29	3080.46	3081.87	183.38	108.42
	20W	NR	NR	NR	NR	NR	NR	NR	3106.25	3105.00	3097.00	3097.00	3105.00	3113.00	3107.00	3112.50	3114.17	3113.25	3133.00	NR	NR
Midwest Sub-unit Recharge Site 6	7E*	2949.68	2949.36	2951.72	2960.00	3000.00	3005.00	3006.83	3007.50	3013.78	3013.78	3025.78	3037.78	3044.78	3166.95	3080.78	3074.86	3066.78	3068.11	211.37	118.75
	12E*	3124.89	3061.89	3023.16	3028.00	3026.00	3028.00	3036.83	3045.83	3051.81	3043.81	3048.81	3061.81	3071.81	3074.06	3075.21	3070.64	3065.81	3067.48	203.74	5.59
	16E	3063.64	3044.47	3037.00	3048.00	3046.00	3043.00	3050.08	3056.25	3067.39	3062.39	3070.39	3083.39	3091.39	3096.89	3100.31	3097.56	3096.39	3098.72	264.32	54.25
	17E	3052.16	3029.41	3019.41	3026.00	3026.00	3027.00	3032.75	3042.67	3049.91	3043.91	3048.91	3062.91	3070.91	3075.41	3075.25	3069.33	3065.91	3068.58	186.17	39.17
	9E	3054.43	3036.93	3024.83	3021.00	3025.00	3030.00	3037.83	3045.33	3051.27	3048.27	3052.27	3063.27	3077.27	3079.02	3076.97	3070.35	3068.27	3083.52	221.86	46.59
Mideast Sub-unit Recharge Site 7	14E~	2994.06	2997.00	3010.00	3044.00	3031.00	3042.83	3019.66	3036.83	3017.40	3017.40	3021.40	3030.40	3037.40	3045.40	3048.60	3040.15	3030.40	3039.98	124.86	42.98
	18E*	2983.74	3016.08	3000.41	2973.00	3015.00	3039.00	3024.41	3030.67	3021.08	3023.08	3022.08	3036.08	NR	NR	NR	NR	NR	NR	NR	NR
Northeast Sub-unit No Recharge Site	5E*~	2971.60	2995.10	2971.91	2954.00	3055.00	3058.00	3072.00	3072.58	3074.10	3074.10	3074.10	3074.10	NR	NR	2971.60	NR	NR	NR	NR	NR
	11E	NR	NR	NR	NR	NR	NR	2941.00	2942.00	2943.00	2942.00	2942.00	2943.00	2944.00	2944.33	NR	2945.83	2945.00	2944.67	NR	NR
East Sub-unit	21E	NR	NR	NR	NR	NR	NR	2885.00	2884.83	2886.00	2885.00	2886.00	2887.00	2887.00	2888.33	NR	2891.25	2895.00	2897.17	NR	NR
Reclamation Recharge	Total 28 year well level average increase / In feet																			241.80	
	Total 17 year well level average increase / In feet																				81.80

Well 14E= Inconsistent Readings, Sept-18 only reliable month.

Well 18E= Unable to sound after Oct. 2017 due to obstructions in well. Well is inactive.

NR = No Reading Available



APPENDIX E
Groundwater Surface
Elevations

Hi Desert Water District Wells														
2022-23	Well ID	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	Sep-23	Sep-22
	5E*	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
	7E*	3068	3064	3064	3066	3071	3070	3070	3067	3068	3067	3073	3072	3067
	9E	3068	3068	3068	3068	3068	3068	3071	3071	3071	3071	3232	3075	3068
	11E*	2944	2944	2944	2944	2945	2945	2945	2945	2945	2945	2945	2945	2945
	12E	3066	3064	3064	3064	3064	3064	3064	3069	3066	3071	3078	3078	3066
	14E	3035	3035	3035	3035	3037	3037	3037	3040	3040	3042	3051	3051	3030
	16E	3096	3096	3096	3096	3096	3098	3098	3096	3096	3098	3107	3107	3096
	17E	3066	3067	3067	3068	3069	3069	3069	3066	3067	3067	3073	3076	3066
	18E	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/A	N/R
	21E*	2895	2896	2896	2896	2898	2898	2898	2897	2896	2897	2900	2899	2895
	3W*	3093	3091	3091	3091	3091	3091	3091	3096	3093	3096	3098	3098	3093
	5W*	3112	3113	3114	3113	3115	3115	3116	3114	3114	3114	3114	3113	3111
	6W	3116	3118	3116	3118	3120	3120	3116	3116	3113	3113	3116	3116	3116
	8W	3100	3100	3100	3100	3100	3102	3100	3102	3100	3102	3107	3107	3100
	9W	3106	3106	3357	3357	3357	3357	3110	3101	3101	3104	3106	3106	3104
	10W	3102	3102	3102	3102	3102	3102	3102	3104	3104	3102	3109	3109	3102
	11W	3078	3080	3078	3078	3078	3078	3078	3083	3083	3085	3090	3090	3080
	20W	3115	3114	3112	3114	3350	3115	3115	3112	3112	3112	3113	3112	3112
	Site 3	3116	3118	3118	3117	3119	3118	3118	3116	3116	3114	3116	3115	3115
	Site 6	3070	3057	3053	3054	3073	3072	3070	3067	3055	3054	3071	3068	3069
	Site 7	3059	3060	3059	3059	3060	3060	3060	3058	3062	3060	3063	3066	3055
	BS #1	3104	N/R	N/R	3110	N/R	N/R	3111	N/R	N/R	3109	N/R	N/R	N/R
	BS #17*	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
	2W - SB	3008	3008	3007	3008	3000	3008	3007	3006	3006	3005	3005	3006	3001
	JTRC FA	2710	N/R	N/R	2713	N/R	N/R	2716	N/R	N/R	2718	N/R	N/R	N/R
	JTRC #3	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
*Depicts inactive or monitoring well														
1 Shaded data used to calculate water surface elevation increase/decrease														



APPENDIX E
Groundwater Surface
Elevations

Hi Desert Water District Wells

2021-22

Well ID	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP ₁	Sep-21
5E*	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
7E*	3068	3069	3069	3072	3073	3072	3072	3072	3067	3068	3068	3067	3070
9E	3066	3066	3066	3066	3066	3066	3232	3064	3064	3064	3064	3068	3064
11E*	2945	2945	2945	2945	2945	2945	2944	2944	2945	2945	2945	2945	2946
12E	3066	3066	3066	3066	3069	3066	3066	3066	3064	3062	3059	3066	3066
14E	3035	3035	3035	3035	3035	3040	3035	3035	3033	3028	3028	3030	3030
16E	3091	3091	3093	3098	3098	3098	3091	3091	3089	3084	3084	3096	3086
17E	3067	3070	3070	3070	3070	3066	3064	3066	3209	3060	3060	3066	3061
18E	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/A
21E*	2893	2893	2893	2893	2893	2894	2894	2894	2894	2896	2894	2895	2894
3W*	3098	3096	3096	3096	3096	3095	3093	3093	3093	3093	3093	3093	3098
5W*	3116	3117	3117	3116	3115	3115	3113	3112	3111	3111	3111	3111	3119
6W	3118	3118	3118	3120	3120	3118	3116	3116	3113	3113	3113	3116	3118
8W	3107	3107	3107	3105	3105	3102	3102	3100	3100	3100	3100	3100	3109
9W	3111	3111	3109	3109	3109	3106	3106	3104	3104	3104	3104	3104	3116
10W	3111	3107	3107	3104	3104	3104	3102	3102	3102	3102	3102	3102	3109
11W	3083	3083	3080	3080	3080	3080	3080	3080	3080	3078	3078	3080	3083
20W	3116	3116	3115	3114	3114	3114	3113	3112	3111	3111	3111	3112	3119
Site 3	3119	3119	3117	3116	3116	3117	3116	3115	3113	3114	3113	3115	3123
Site 6	3056	3056	3072	3071	3072	3072	3069	3066	3065	3066	3065	3069	3060
Site 7	3055	3055	3055	3055	3053	3053	3054	3053	3050	3054	3053	3055	3054
BS #1	3112			3107					3107			3109	3109
BS #17*	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
2W - SBC	3009	3007	3007	3007	N/R	3006	3004	3003	3004	3004	3005	3001	3010
JTRC FARM2*	0	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
JTRC #33	0	0	0	2706	0	0	2708	0	2711	0	0	2710	2705

*Depicts inactive or monitoring well

₁ Shaded data used to calculate water surface elevation increase/decrease



APPENDIX E
Groundwater Surface
Elevations

2020-21					Hi Desert Water District Wells																			
Well ID	OCT		NOV		DEC		JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP ₁	9/1/2020
5E*	N/R		N/R		N/R		N/R		N/R		N/R		N/R		N/R		N/R		N/R		N/R		N/R	N/R
7E*	3076		3076		3076		3075		3075		3075		3075		3075		3075		3076		3076		3070	3077
9E	3073		3073		3073		3071		3071		3071		3071		3071		3068		3071		3064		3064	3073
11E*	2945		2946		2946		2946		2946		2946		2946		2946		2945		2946		2946		2946	2946
12E	3071		3073		3073		3071		3073		3073		3073		3073		3069		3071		3066		3066	3071
14E	3049		3047		3044		3037		3042		3042		3042		3040		3037		3037		3030		3030	3044
16E	3098		3100		3100		3100		3100		3100		3100		3100		3098		3098		3086		3086	3098
17E	3071		3072		3073		3071		3071		3071		3071		3071		3071		3070		3060		3061	3073
18E	N/R		N/R		N/R		N/R		N/R		N/R		N/R		N/R		N/R		N/R		N/R		N/A	N/R
21E*	2890		2891		2891		2891		2891		2891		2891		2891		2891		2891		2892		2894	2890
3W*	3096		3093		3093		3092		3093		3093		3093		3093		3096		3094		3097		3098	3096
5W*	3110		3110		3111		3111		3112		3113		3114		3114		3117		3116		3119		3119	3110
6W	3109		3109		3109		3111		3111		3113		3113		3113		3116		3116		3118		3118	3109
8W	3100		3100		3100		3100		3100		3100		3100		3105		3105		3105		3112		3109	3102
9W	3101		3101		3101		3103		3103		3103		N/A		3129		N/A		3118		3118		3116	3103
10W	3102		3102		3102		3102		3102		3102		3102		3104		3102		3102		3109		3109	3102
11W	3083		3083		3080		3080		3080		3080		3080		3080		3083		3080		3080		3083	3085
20W	3108		3111		3111		3112		3113		3113		3114		3115		3117		3118		3119		3119	3108
Site 3	3112		3113		3114		3115		3116		3112		3119		3120		3121		3121		3123		3123	3111
Site 6	3074		3075		3076		3074		3074		3074		3074		3075		3056		3067		3066		3060	3065
Site 7	3072		3067		3070		3065		3063		3064		3063		3062		3062		3062		3053		3054	3073
	BS #1	3103					3107										3105						3109	3105
	BS #17*	N/R		N/R		N/R	N/R		N/R		N/R		N/R		N/R		N/R		N/R		N/R		N/R	N/R
	2W - SB	3003		3004		3006	3005		3007		3009		3011		3012		3008		3012		3011		3010	3003
	JTRC FA	2705		N/R		N/R	N/R		N/R		N/R		N/R		N/R		N/R		N/R		N/R		N/R	N/R
	JTRC #3:	#VALUE!		#VALUE!		#VALUE!	#VALUE!		#VALUE!		#VALUE!		#VALUE!		#VALUE!		#VALUE!		N/R		N/R		#VALUE!	N/R
	*Depicts inactive or monitoring well																							
	1 Shaded data used to calculate water surface elevation increase/decrease																							



APPENDIX E
Groundwater Surface
Elevations

Hi Desert Water District Wells													
2019-20	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP ₁	#####
Well ID													
5E*	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
7E*	3079	3079	3078	3081	3081	3080	3086	3084	3083	3082	3082	3077	3074
9E	3075	3075	3063	3080	3078	3080	3080	3080	3080	3078	3078	3073	3075
11E*	2945	2945	2945	2946	2945	2946	2945	2946	2946	2946	2946	2946	2944
12E	3071	3073	3075	3078	3077	3077	3077	3077	3078	3075	3075	3071	3069
14E	3047	3047	3051	3053	3056	3056	3054	3042	3040	3044	3044	3044	3049
16E	3096	3098	3098	3100	3100	3102	3105	3102	3100	3100	3100	3098	3086
17E	3068	3070	3068	3079	3077	3079	3082	3079	3078	3076	3075	3073	3070
18E	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
21E*	2890	2890	2890	2894	2889	2889	2889	2890	2890	2890	2891	2890	2888
3W*	3094	3094	3095	3094	3095	3093	3093	3098	3098	3098	3098	3096	3093
5W*	3113	3115	3115	3115	3115	3113	3113	3112	3111	3110	3110	3110	3116
6W	3118	3116	3116	3116	3116	3116	3116	3111	3111	3109	3109	3109	3113
8W	3105	3105	3105	3105	3105	3105	3105	3102	3105	3105	3102	3102	3105
9W	3106	3108	3106	3106	3106	3103	3103	3103	3101	3101	3103	3103	3110
10W	3107	3107	3107	3107	3107	3107	3104	3104	3104	3104	3102	3102	3107
11W	3078	3083	3083	3085	3087	3087	3090	3090	3090	3090	3090	3085	3080
20W	3115	3115	3115	3115	3115	3115	3114	3111	3111	3108	3108	3108	3115
Site 3	3119	3120	3120	3120	3116	3115	3117	3214	3115	3108	3111	3111	3119
Site 6	3073	3075	3078	3079	3083	3074	3083	3081	3080	3064	3065	3065	3070
Site 7	3073	3081	3079	3081	3085	3084	3079	3080	3079	3077	3071	3073	3079
BS #1	3112	N/R	N/R	3112	N/R	N/R	3110	N/R	N/R	3105	N/R	N/R	N/R
BS #17*	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
2W - SBC	N/R	N/R	N/R	3007	3006	3002	3006	3004	3001	3000	3002	3003	3010
JTRC FARM2*	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
JTRC #33	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
*Depicts inactive or monitoring well													
1 Shaded data used to calculate water surface elevation increase/decrease													




APPENDIX E
Groundwater Surface
Elevations

Hi Desert Water District Wells														
2018-19	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP ₁	9/1/2018 ₁	
Well ID														
5E*	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
7E*	N/R	N/R	N/R	N/R	N/R	N/R	N/R	3085	3075	3074	3074	3074	3074	N/R
9E	3075	3080	3080	3080	3080	3082	3080	3080	3080	3078	3075	3075	3075	3075
11E*	2944	2944	2944	2944	2945	2945	2944	2944	2945	2945	2945	2944	2944	2944
12E	3073	3073	3071	3078	3078	3078	3078	3078	3073	3071	3071	3069	3071	3071
14E	3043	3043	3044	3055	3051	3060	3045	3045	3033	3028	3044	3049	3037	3037
16E	3084	3102	3102	3100	3102	3098	3100	3100	3100	3093	3091	3086	3084	3084
17E	3069	3080	3077	3209	3209	3078	3076	3078	3079	3075	3072	3070	3069	3069
18E	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
21E*	2887	2887	2887	2888	2888	2888	2888	2888	2890	2889	2890	2890	2888	2888
3W*	3091	3097	3096	3098	3099	3099	3099	3098	3098	3094	3094	3093	3091	3091
5W*	3115	3117	3117	3117	3117	3116	3116	3116	3116	3116	3115	3116	3114	3114
6W	3117	3118	3118	3118	3118	3116	3116	3116	3116	3113	3111	3113	3116	3116
8W	3102	3102	3102	3105	3105	3107	3107	3107	3105	3105	3109	3105	3097	3097
9W	3108	3108	3108	3108	3108	3108	3108	3108	3108	3108	3108	3110	3110	3110
10W	3105	3105	3105	3104	3107	3107	3107	3107	3109	3107	3107	3107	3104	3104
11W	N/R	N/R	N/R	3085	3085	3085	3085	3083	3080	3080	3080	3080	N/R	N/R
20W	3118	3119	3118	3219	3219	3117	3117	3117	3117	3117	3115	3115	3118	3118
Site 3	3121	3122	3123	3122	3122	3120	3120	3120	3119	3119	3119	3119	3119	3119
Site 6	3072	3083	3084	3083	3084	3078	3069	3078	3062	3066	3070	3070	3072	3072
Site 7	3079	3088	3086	3085	3084	3084	3084	3085	3076	3075	3080	3079	3079	3079
BS #1	3107			3112				3112		3107			NR	NR
BS #17*	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	NR	NR
JTRC FARM2*	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	NR	NR
JTRC #33	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	N/R	N/R	#VALUE!	2684	2684
*Depicts inactive or monitoring well														
1 Shaded data used to calculate water surface elevation increase/decrease														



APPENDIX E
Groundwater Surface
Elevations

Hi Desert Water District Wells													
2017-18	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP ₁	9/1/2017 ₁
Well ID													
5E*	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R
7E*	3044	3044	3041	3044	3044	3046	3046	3048	3046	3046	3046	N/R	3044
9E	3071	3078	3078	3078	3078	3078	3080	3075	3075	3075	3078	3075	3064
11E*	2944	2944	2944	2944	2945	2945	2944	2944	2944	2944	2944	2944	2944
12E	3063	3063	N/R	3076	3076	3076	3076	3075	3071	3069	3071	3071	3063
14E	3056	3063	3061	3059	3058	3054	3053	3080	3072	N/R	3052	3037	3028
16E	3089	3089	3089	3093	3098	3098	3098	3093	3089	3084	3086	3084	3086
17E	3064	3072	3067	3066	3077	3077	3077	3076	3071	3068	3069	3069	3065
18E	3034	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	3018
21E*	2887	2887	2887	2887	2887	2887	2888	2888	2888	2888	2888	2888	2887
3W*	3082	3084	3083	3084	3085	3088	3089	3089	3090	3091	3091	3091	3082
5W*	3106	3106	3106	3108	3108	3110	3110	3112	3113	3112	3114	3114	3105
6W	3104	3104	3104	3106	3106	3106	3106	3109	3111	3113	3113	3116	3104
8W	3097	3095	3095	3095	3095	3095	3095	3095	3095	3097	3099	3097	N/R
9W	3099	3099	3099	3103	3103	3106	3106	3110	3110	3110	3110	3110	3101
10W	3095	3095	3095	3095	3095	3095	3102	3104	3107	3107	3104	3104	3095
11W	3064	3066	3066	3043	3045	3045	3041	3034	3029	N/R	N/R	N/R	3064
20W	3107	3108	3109	3112	3113	3115	N/R	3115	3117	3116	3117	3118	3107
Site 3	3110	3110	3111	3114	3116	3116	3117	3119	3119	3120	3119	3119	3111
Site 6	3065	3075	3075	3077	3078	3078	3077	3068	3075	3072	3073	3072	3062
Site 7	3084	3088	3081	3087	3090	3091	3086	3091	3091	3083	3082	3079	3075
BS #1	3099			3102			3103				3102		NR
BS #17*	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	NR
													Jul-2011
JTRC FARM2*	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	N/R	NR
JTRC #33	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	N/R	N/R	2684
*Depicts inactive or monitoring well													
₁ Shaded data used to calculate water surface elevation increase/decrease													

			APPENDIX G								
			Table 3 - Semi Annual Nitrate and TDS Analysis								
			of the Warren Valley Basin								
Year	Semester	Well ID	Nitrate (as NO ₃ -N)		Date Sampled		T.D.S.		Date Sampled		
2023	1	2w	**	mg/L	**	**	mg/L	**			
	2		**	mg/L	**	**	mg/L	**			
	1	6w	1.2	mg/L	1/4/2023	250	mg/L	1/4/2023			
	2		1.3	mg/L	7/6/2023	270	mg/L	7/6/2023			
	1	8w	3.1	mg/L	1/4/2023	180	mg/L	1/4/2023			
	2		3.5	mg/L	7/6/2023	200	mg/L	7/6/2023			
	1	9w	**	mg/L	**	**	mg/L	**			
	2		2.1	mg/L	7/6/2023	220	mg/L	7/6/2023			
	1	10w	**	mg/L	**	**	mg/L	**			
	2		**	mg/L	**	**	mg/L	**			
	1	11w	8.9	mg/L	1/4/2023	280	mg/L	1/4/2023			
	2		**	mg/L	**	**	mg/L	**			
	1	20w	2.8	mg/L	1/4/2023	190	mg/L	1/4/2023			
	2		3	mg/L	7/6/2023	200	mg/L	7/6/2023			
	1	9e	3.1	mg/L	1/5/2023	300	mg/L	1/5/2023			
	2		3.4	mg/L	7/6/2023	310	mg/L	7/6/2023			
	1	12e	2.2	mg/L	1/5/2023	290	mg/L	1/5/2023			
	2		2.9	mg/L	7/6/2023	310	mg/L	7/6/2023			
	1	14e	1.5	mg/L	1/5/2023	250	mg/L	1/5/2023			
	2		1.8	mg/L	7/6/2023	240	mg/L	7/6/2023			
	1	16e	3.9	mg/L	1/5/2023	230	mg/L	1/5/2023			
	2		4.1	mg/L	7/6/2023	240	mg/L	7/6/2023			
	1	17e	4.4	mg/L	1/5/2023	300	mg/L	1/5/2023			
	2		4.8	mg/L	7/6/2023	310	mg/L	7/6/2023			
	1	18e	**	mg/L	**	**	mg/L	**			
	2		**	mg/L	**	**	mg/L	**			
*denotes average reduction for graphing purposes due to a lack of data											

Year	Semester	Well ID	Nitrate (as NO ₃ -N)		Date Sampled	T.D.S.	Date Sampled
2022	1	2w	**	mg/L	**	**	**
	2		**	mg/L	**	**	**
	1	6w	1.2	mg/L	1/5/2022	250	1/5/2022
	2		1.2	mg/L	7/7/2022	260	7/7/2022
	1	8w	3.1	mg/L	1/5/2022	190	1/5/2022
	2		3.6	mg/L	7/7/2022	190	7/7/2022
	1	9w	2.2	mg/L	1/5/2022	210	1/5/2022
	2		0.78	mg/L	7/7/2022	260	7/7/2022
	1	10w	**	mg/L	**	**	**
	2		**	mg/L	**	**	**
	1	11w	8.2	mg/L	1/5/2022	260	1/5/2022
	2		8	mg/L	7/7/2022	280	7/7/2022
	1	20w	3	mg/L	1/5/2022	200	1/5/2022
	2		2.7	mg/L	7/7/2022	190	7/7/2022
	1	9e	2.6	mg/L	1/6/2022	280	1/6/2022
	2		2.9	mg/L	7/7/2022	300	7/7/2022
	1	12e	Down	mg/L	1/6/2022	Down	1/6/2022
	2		2.4	mg/L	7/7/2022	310	7/7/2022
	1	14e	1.6	mg/L	1/6/2022	240	1/6/2022
	2		1.7	mg/L	7/7/2022	230	7/7/2022
	1	16e	4	mg/L	1/6/2022	230	1/6/2022
	2		4.9	mg/L	7/7/2022	240	7/7/2022
	1	17e	4.1	mg/L	1/6/2022	300	1/6/2022
	2		4.6	mg/L	7/7/2022	320	7/7/2022
	1	18e	**	mg/L	**	**	**
	2		**	mg/L	**	**	**
*denotes average reduction for graphing purposes due to a lack of data							

Year	Semester	Well ID	Nitrate (as NO ₃ -N)		Date Sampled	T.D.S.	Date Sampled
2021	1	2w	**	mg/L	**	**	**
	2		**	mg/L	**	**	**
	1	6w	0.86	mg/L	1/6/2021	240	1/7/2021
	2		0.73	mg/L	7/7/2021	280	7/8/2021
	1	8w	4.3	mg/L	1/6/2021	170	1/7/2021
	2		4.2	mg/L	7/7/2021	180	7/8/2021
	1	9w	0.9	mg/L	1/6/2021	290	1/7/2021
	2		**	mg/L	**	**	**
	1	10w	**	mg/L	**	**	**
	2		**	mg/L	**	**	**
	1	11w	**	mg/L	**	**	**
	2		**	mg/L	**	**	**
	1	20w	2.9	mg/L	1/6/2021	170	1/7/2021
	2		3.5	mg/L	7/7/2021	220	7/8/2021
	1	9e	2.8	mg/L	1/7/2021	250	1/7/2021
	2		3.2	mg/L	7/1/2021	310	7/1/2021
	1	12e	2.3	mg/L	1/7/2021	300	1/7/2021
	2		2.6	mg/L	7/1/2021	310	7/1/2021
	1	14e	1.6	mg/L	1/7/2021	240	1/7/2021
	2		1.9	mg/L	7/1/2021	240	7/1/2021
	1	16e	4.1	mg/L	1/7/2021	260	1/7/2021
	2		5.7	mg/L	7/1/2021	230	7/1/2021
	1	17e	3.6	mg/L	1/7/2021	340	1/7/2021
	2		4	mg/L	7/1/2021	320	7/8/2021
	1	18e	**	mg/L	**	**	**
	2		**	mg/L	**	**	**
	*denotes average reduction for graphing purposes due to a lack of data						

Year	Semester	Well ID	Nitrate (as NO ₃ -N)		Date Sampled	T.D.S.	Date Sampled
2020	1	2w	**	mg/L	**	**	**
	2		**	mg/L	**	**	**
	1	6w	0.74	mg/L	1/9/2020	300	1/9/2020
	2		1.5	mg/L	7/1/2020	280	7/1/2020
	1	8w	4.3	mg/L	1/9/2020	180	1/9/2020
	2		4.9	mg/L	7/1/2020	180	7/1/2020
	1	9w	2	mg/L	1/9/2020	240	1/9/2020
	2		2.6	mg/L	7/1/2020	210	7/1/2020
	1	10w	**	mg/L	**	**	**
	2		**	mg/L	**	**	**
	1	11w	**	mg/L	**	**	**
	2		**	mg/L	**	**	**
	1	20w	3.5	mg/L	1/9/2020	200	1/9/2020
	2		3.5	mg/L	7/1/2020	190	7/1/2020
	1	9e	3.1	mg/L	1/2/2020	300	1/2/2020
	2		3	mg/L	7/2/2020	310	7/2/2020
	1	12e	2.3	mg/L	1/2/2020	310	1/2/2020
	2		2.8	mg/L	7/2/2020	300	7/2/2020
	1	14e	1.2	mg/L	1/2/2020	260	1/2/2020
	2		1.6	mg/L	7/2/2020	220	7/2/2020
	1	16e	8	mg/L	1/2/2020	240	1/2/2020
	2		5.7	mg/L	7/2/2020	220	7/2/2020
	1	17e	3.3	mg/L	1/2/2020	300	1/2/2020
	2		3.9	mg/L	7/2/2020	290	7/2/2020
	1	18e	**	mg/L	**	**	**
	2		**	mg/L	**	**	**
*denotes average reduction for graphing purposes due to a lack of data							

Year	Semester	Well ID	Nitrate (as NO ₃ -N)		Date Sampled	T.D.S.	Date Sampled
2019	1	2w	**	mg/L	**	**	**
	2		**	mg/L	**	**	**
	1	6w	1	mg/L	1/10/2019	340	1/10/2019
	2		0.85	mg/L	7/3/2019	330	7/3/2019
	1	8w	5.5	mg/L	1/10/2019	180	1/10/2019
	2		**	mg/L	**	**	**
	1	9w	2.5	mg/L	1/10/2019	220	1/10/2019
	2		2	mg/L	7/3/2019	260	7/3/2019
	1	10w	**	mg/L	**	**	**
	2		**	mg/L	**	**	**
	1	11w	8	mg/L	1/10/2019	290	1/10/2019
	2		7.8	mg/L	7/3/2019	270	7/3/2019
	1	20w	3.7	mg/L	1/10/2019	210	1/10/2019
	2		3.9	mg/L	7/3/2019	220	7/3/2019
	1	9e	3	mg/L	1/10/2019	300	1/10/2019
	2		2.9	mg/L	7/3/2019	300	7/3/2019
	1	12e	2.9	mg/L	1/10/2019	310	1/10/2019
	2		2.7	mg/L	7/3/2019	330	7/3/2019
	1	14e	1.8	mg/L	1/10/2019	240	1/10/2019
	2		1.5	mg/L	7/3/2019	240	7/3/2019
	1	16e	4.5	mg/L	1/10/2019	240	1/10/2019
	2		6	mg/L	7/3/2019	240	7/3/2019
	1	17e	2.4	mg/L	1/10/2019	310	1/10/2019
	2		2.8	mg/L	7/3/2019	330	7/3/2019
	1	18e	**	mg/L	**	**	**
	2		**	mg/L	**	**	**
	*denotes average reduction for graphing purposes due to a lack of data						

Year	Semester	Well ID	Nitrate (as NO ₃ -N)		Date Sampled	T.D.S.	Date Sampled
2018	1	2w	**	mg/L	**	**	**
	2		**	mg/L	**	**	**
	1	6w	1.3	mg/L	1/8/2018	320	1/8/2018
	2		0.95	mg/L	7/2/2018	330	7/2/2018
	1	8w	4.3	mg/L	1/8/2018	180	1/8/2018
	2		5	mg/L	7/2/2018	180	7/2/2018
	1	9w	1.6	mg/L	1/8/2018	260	1/8/2018
	2		1.6	mg/L	7/2/2018	270	7/2/2018
	1	10w	**	mg/L	**	**	**
	2		**	mg/L	**	**	**
	1	11w	8.7	mg/L	1/8/2018	290	1/8/2018
	2		6.8	mg/L	7/2/2018	270	7/2/2018
	1	20w	3.2	mg/L	1/8/2018	200	1/8/2018
	2		3.4	mg/L	7/2/2018	200	7/2/2018
	1	9e	3	mg/L	1/11/2018	290	1/11/2018
	2		3.3	mg/L	7/5/2018	320	7/5/2018
	1	12e	2.8	mg/L	1/11/2018	280	1/11/2018
	2		3.3	mg/L	7/5/2018	300	7/5/2018
	1	14e	1.5	mg/L	1/11/2018	250	1/11/2018
	2		1.1	mg/L	7/5/2018	280	7/5/2018
	1	16e	4	mg/L	1/11/2018	240	1/11/2018
	2		4.3	mg/L	7/5/2018	250	7/5/2018
	1	17e	2.7	mg/L	1/11/2018	300	1/11/2018
	2		2.1	mg/L	7/5/2018	330	7/5/2018
	1	18e	**	mg/L	**	**	**
	2		**	mg/L	**	**	**
*denotes average reduction for graphing purposes due to a lack of data							

Year	Semester	Well ID	Nitrate (as NO ₃ -N)		Date Sampled	T.D.S.	Date Sampled
2017	1	2w	**	mg/L	**	** mg/L	**
	2		**	mg/L	**	** mg/L	**
	1	6w	2.0	mg/L	1/4/2017	200 mg/L	1/4/2017
	2		1.8	mg/L	7/6/2017	260 mg/L	7/6/2017
	1	8w	**	mg/L	**	** mg/L	**
	2		**	mg/L	**	** mg/L	**
	1	9w	2.6	mg/L	1/4/2017	180 mg/L	1/4/2017
	2		2.4	mg/L	7/6/2017	220 mg/L	7/6/2017
	1	10w	**	mg/L	**	** mg/L	**
	2		**	mg/L	**	** mg/L	**
	1	11w	8	mg/L	1/4/2017	250 mg/L	1/4/2017
	2		7	mg/L	7/6/2017	270 mg/L	7/6/2017
	1	20w	3.4	mg/L	1/4/2017	160 mg/L	1/4/2017
	2		3.5	mg/L	7/19/2017	190 mg/L	7/6/2017
	1	9e	2.9	mg/L	1/5/2017	280 mg/L	1/5/2017
	2		3.1	mg/L	7/19/2017	310 mg/L	1/12/2017
	1	12e	3.2	mg/L	1/12/2017	330 mg/L	1/12/2017
	2		4.1	mg/L	7/6/2017	290 mg/L	7/6/2017
	1	14e	1.9	mg/L	1/5/2017	240 mg/L	1/5/2017
	2		1.5	mg/L	7/6/2017	260 mg/L	7/6/2017
	1	16e	4.2	mg/L	1/12/2017	260 mg/L	1/12/2017
	2		4.4	mg/L	7/6/2017	240 mg/L	7/6/2017
	1	17e	2.6	mg/L	1/12/2017	330 mg/L	1/12/2017
	2		2.9	mg/L	7/6/2017	300 mg/L	7/6/2017
	1	18e	**	mg/L	**	** mg/L	**
	2		**	mg/L	**	** mg/L	**
*denotes average reduction for graphing purposes due to a lack of data							

Year	Semester	Well ID	Nitrate (as NO ₃ -N)		Date Sampled	T.D.S.	Date Sampled
2016	1	2w	**	mg/L	**	**	**
	2		**	mg/L	**	**	**
	1	6w	2.3	mg/L	1/6/2016	270	1/6/2016
	2		2.2	mg/L	7/6/2016	240	7/6/2016
	1	8w	2.4	mg/L	1/6/2016	120	1/6/2016
	2		2.8	mg/L	7/6/2016	220	7/6/2016
	1	9w	2.2	mg/L	1/6/2016	220	1/6/2016
	2		2.5	mg/L	7/6/2016	240	7/6/2016
	1	10w	**	mg/L	**	**	**
	2		**	mg/L	**	**	**
	1	11w	7.5	mg/L	1/6/2016	120	1/6/2016
	2		8.1	mg/L	7/6/2016	340	7/6/2016
	1	20w	3.4	mg/L	1/6/2016	120	1/6/2016
	2		3.6	mg/L	7/6/2016	220	7/6/2016
	1	9e	3.6	mg/L	1/7/2016	340	1/7/2016
	2		3.5	mg/L	7/7/2016	250	7/7/2016
	1	12e	3.4	mg/L	1/7/2016	370	1/7/2016
	2		4	mg/L	7/7/2016	340	7/7/2016
	1	14e	1.6	mg/L	1/7/2016	330	1/7/2016
	2		1.8	mg/L	7/7/2016	230	7/7/2016
	1	16e	5.1	mg/L	1/7/2016	340	1/7/2016
	2		4.5	mg/L	7/7/2016	230	7/7/2016
	1	17e	2.2	mg/L	1/7/2016	390	1/7/2016
	2		2.8	mg/L	7/7/2016	310	7/7/2016
	1	18e	**	mg/L	**	**	**
	2		**	mg/L	**	**	**
	*denotes average reduction for graphing purposes due to a lack of data						

Year	Semester	Well ID	Nitrate (as NO ₃)	Date Sampled	T.D.S.	Date Sampled
2015	1	2w	17 mg/L	1/7/2015	180 mg/L	1/7/2015
	2		9.6 mg/L	7/6/2015	120 mg/L	7/6/2015
	1	6w	9.2 mg/L	1/7/2015	320 mg/L	1/7/2015
	2		9 mg/L	7/6/2015	210 mg/L	7/6/2015
	1	8w	13 mg/L	1/7/2015	120 mg/L	1/7/2015
	2		11 mg/L	7/6/2015	160 mg/L	7/6/2015
	1	9w	11 mg/L	1/7/2015	340 mg/L	1/7/2015
	2		9.9 mg/L	7/6/2015	210 mg/L	7/6/2015
	1	10w	** mg/L	**	** mg/L	**
	2		** mg/L	**	** mg/L	**
	1	11w	38 mg/L	1/7/2015	330 mg/L	1/7/2015
	2		32 mg/L	7/6/2015	260 mg/L	7/6/2015
	1	20w	18 mg/L	1/7/2015	240 mg/L	1/7/2015
	2		17 mg/L	7/6/2015	190 mg/L	7/6/2015
	1	9e	14 mg/L	1/8/2015	310 mg/L	1/8/2015
	2		12 mg/L	7/2/2015	280 mg/L	7/2/2015
	1	12e	16 mg/L	1/8/2015	290 mg/L	1/8/2015
	2		17 mg/L	7/2/2015	250 mg/L	7/2/2015
	1	14e	7.2 mg/L	1/8/2015	280 mg/L	1/8/2015
	2		7.6 mg/L	7/2/2015	240 mg/L	7/2/2015
	1	16e	22 mg/L	1/8/2015	130 mg/L	1/8/2015
	2		19 mg/L	7/2/2015	250 mg/L	7/2/2015
	1	17e	9.7 mg/L	1/8/2015	240 mg/L	1/8/2015
	2		7.7 mg/L	7/2/2015	320 mg/L	7/2/2015
	1	18e	** mg/L	**	** mg/L	**
	2		** mg/L	**	** mg/L	**
*denotes average reduction for graphing purposes due to a lack of data						

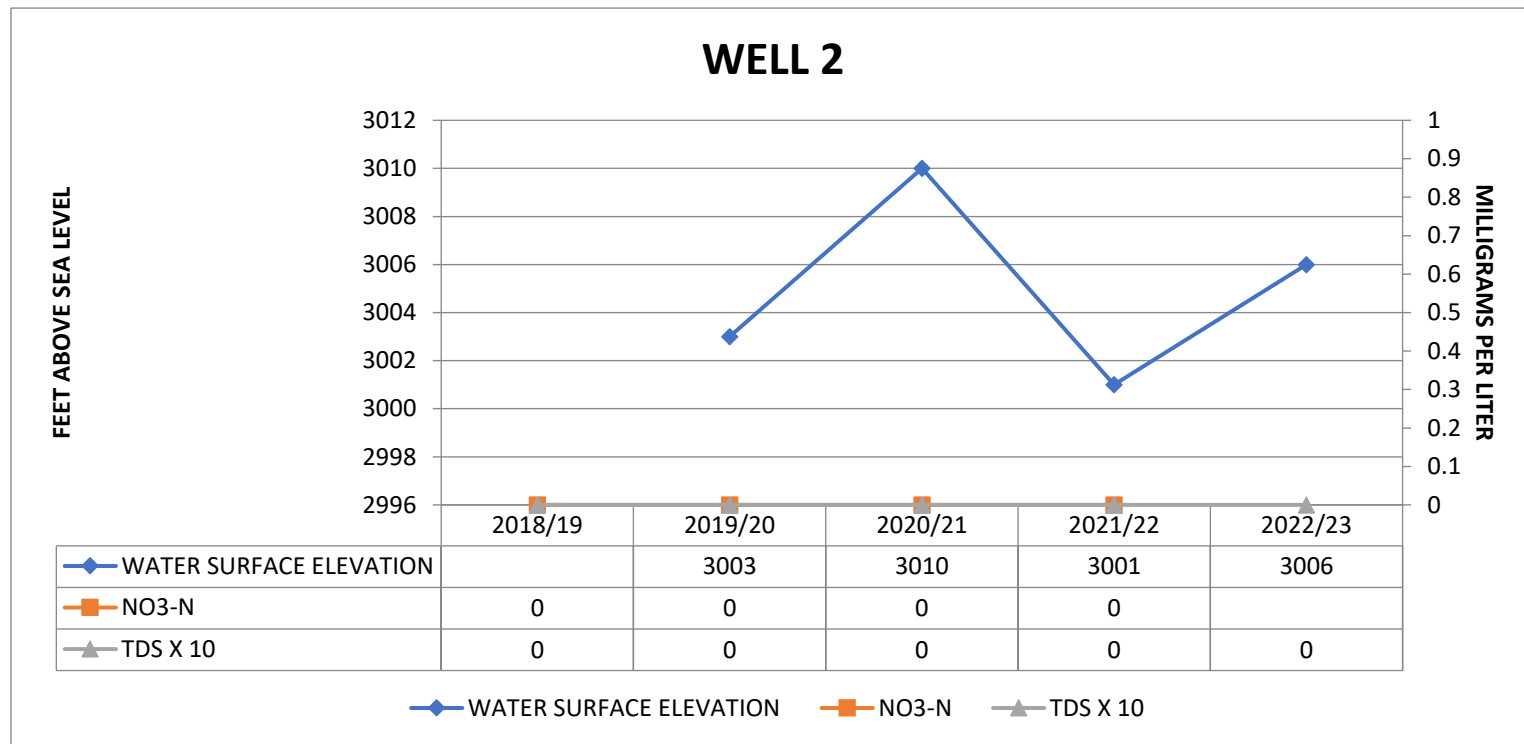
Year	Semester	Well ID	Nitrate (as NO ₃)	Date Sampled	T.D.S.	Date Sampled
2014	1	2w	17 mg/L	1/8/2014	260 mg/L	1/8/2014
	2		18 mg/L	7/3/2014	200 mg/L	7/3/2014
	1	6w	11 mg/L	1/8/2014	210 mg/L	1/8/2014
	2		12 mg/L	7/3/2014	210 mg/L	7/3/2014
	1	8w	9.6 mg/L	1/8/2014	180 mg/L	1/8/2014
	2		11 mg/L	7/3/2014	180 mg/L	7/3/2014
	1	9w	9.8 mg/L	1/8/2014	230 mg/L	1/8/2014
	2		9.8 mg/L	7/3/2014	180 mg/L	7/3/2014
	1	10w	** mg/L	**	** mg/L	**
	2		** mg/L	**	** mg/L	**
	1	11w	22 mg/L	1/8/2014	290 mg/L	1/8/2014
	2		22 mg/L	7/3/2014	240 mg/L	7/3/2014
	1	20w	** mg/L	**	** mg/L	**
	2		14 mg/L	6/9/2014	230 mg/L	6/9/2014
	1	9e	9.4 mg/L	1/9/2014	280 mg/L	1/9/2014
	2		11 mg/L	7/3/2014	260 mg/L	7/3/2014
	1	12e	19 mg/L	1/9/2014	290 mg/L	1/9/2014
	2		** mg/L	**	** mg/L	**
	1	14e	6 mg/L	1/9/2014	250 mg/L	1/9/2014
	2		8 mg/L	7/3/2014	230 mg/L	7/3/2014
	1	16e	20 mg/L	1/9/2014	240 mg/L	1/9/2014
	2		** mg/L	**	** mg/L	**
	1	17e	** mg/L	**	** mg/L	**
	2		** mg/L	**	** mg/L	**
	1	18e	** mg/L	**	** mg/L	**
	2		** mg/L	**	** mg/L	**
*denotes average reduction for graphing purposes due to a lack of data						

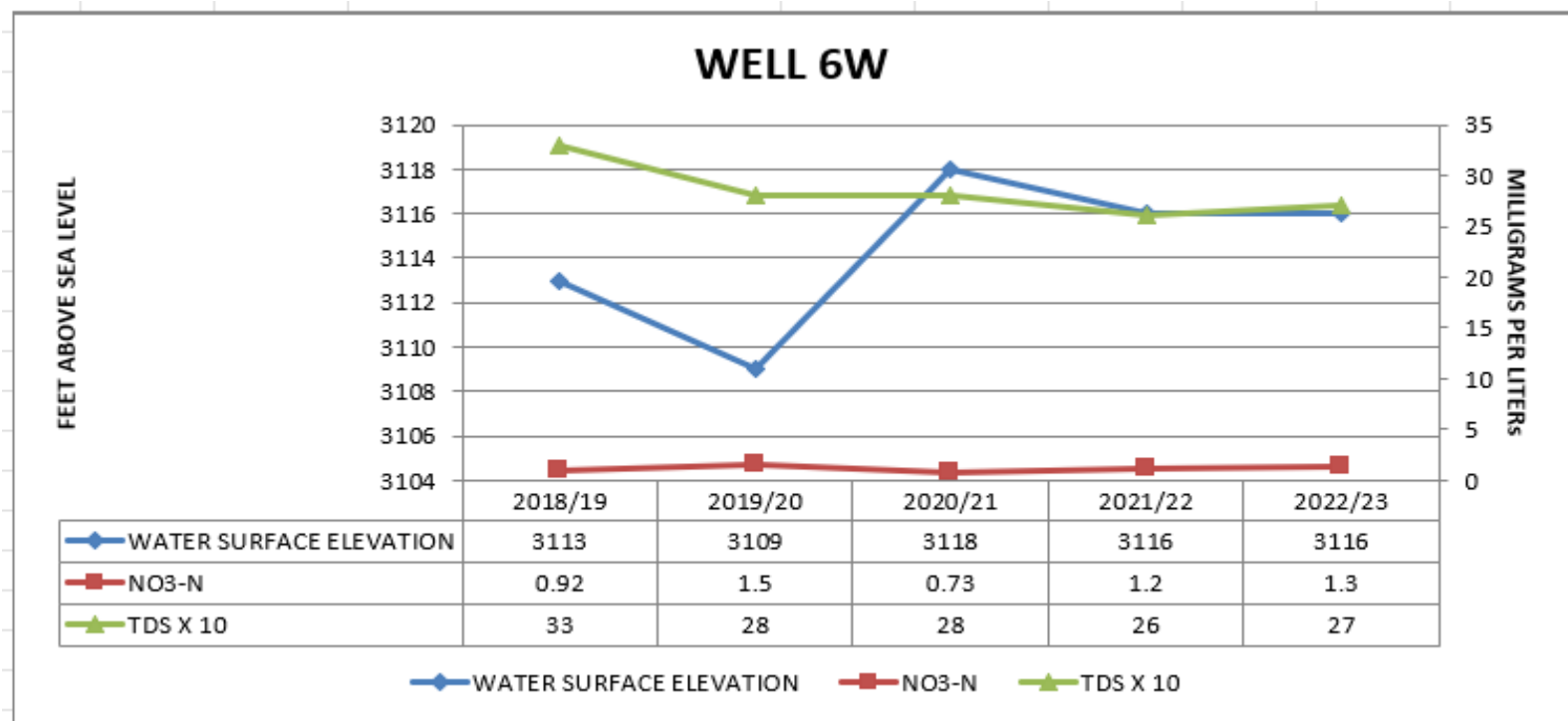
Year	Semester	Well ID	Nitrate (as NO ₃)	Date Sampled	T.D.S.	Date Sampled
2013	1	2w	24 mg/L			
	2		23 mg/L	7/2/2013	300 mg/L	7/2/2013
	1	6w	6.7 mg/L	1/8/2013	250 mg/L	1/8/2013
	2		11 mg/L	7/2/2013	210 mg/L	7/2/2013
	1	8w	11 mg/L	1/8/2013	170 mg/L	1/8/2013
	2		10 mg/L	7/2/2013	180 mg/L	7/2/2013
	1	9w	7.3 mg/L	1/8/2013	230 mg/L	1/8/2013
	2		11 mg/L	7/2/2013	200 mg/L	7/2/2013
	1	10w	** mg/L	**	** mg/L	**
	2		** mg/L	**	** mg/L	**
	1	11w	24 mg/L	1/8/2013	270 mg/L	1/8/2013
	2		22 mg/L	7/2/2013	290 mg/L	7/2/2013
	1	20w	** mg/L	**	** mg/L	**
	2		** mg/L	**	** mg/L	**
	1	9e	9.7 mg/L	1/8/2013	260 mg/L	1/8/2013
	2		9.7 mg/L	8/15/2013	260 mg/L	8/15/2013
	1	12e	15 mg/L	1/8/2013	300 mg/L	1/8/2013
	2		18 mg/L	7/2/2013	290 mg/L	7/2/2013
	1	14e	7.8 mg/L	1/8/2013	240 mg/L	1/8/2013
	2		8.3 mg/L	7/2/2013	240 mg/L	7/2/2013
	1	16e	20 mg/L	1/8/2013	250 mg/L	1/8/2013
	2		24 mg/L	7/2/2013	240 mg/L	7/2/2013
	1	17e	** mg/L	**	** mg/L	**
	2		** mg/L	**	** mg/L	**
	1	18e	** mg/L	**	** mg/L	**
	2		**	**	**	**
*denotes average reduction for graphing purposes due to a lack of data						

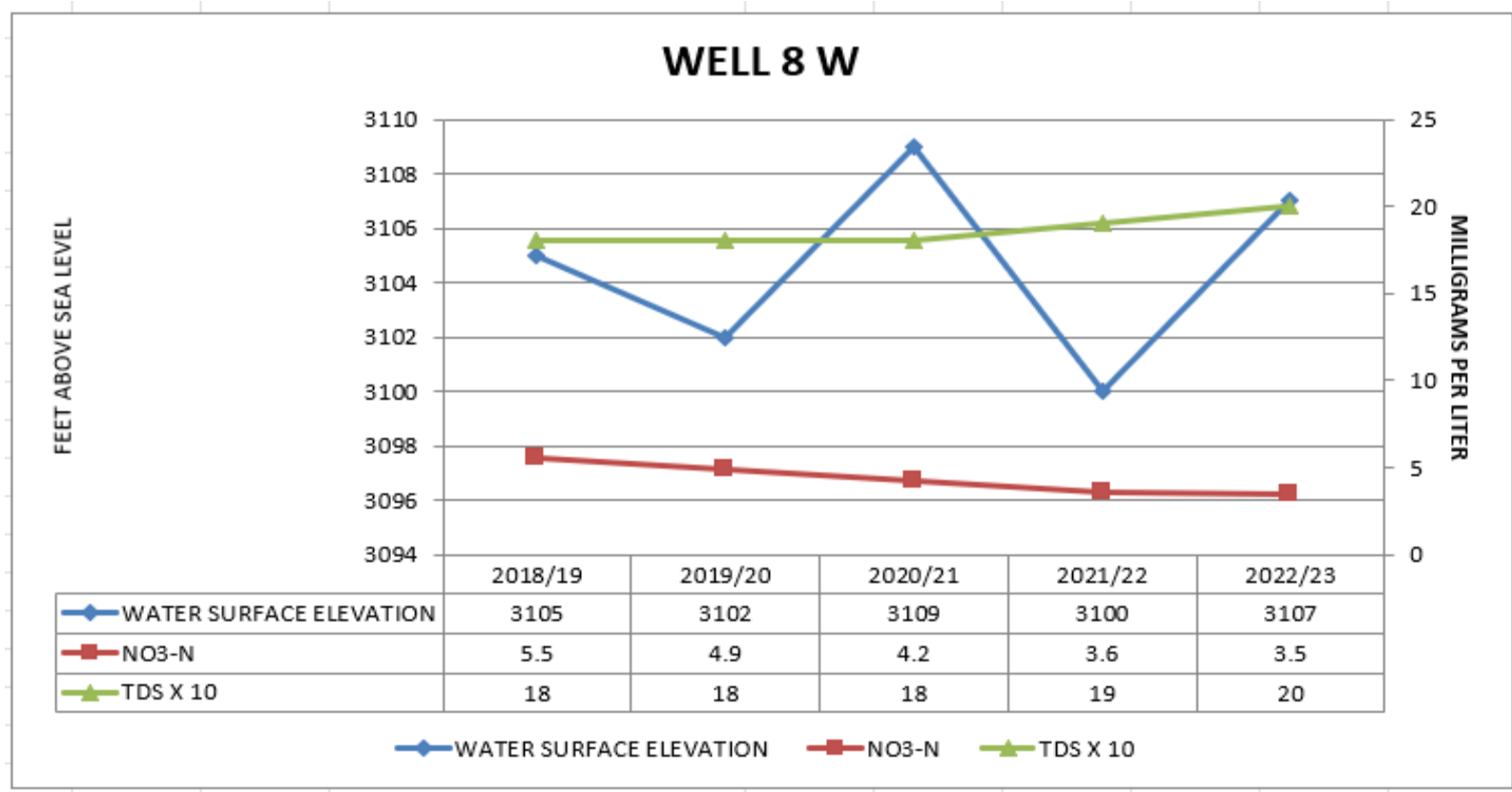
Year	Semester	Well ID	Nitrate (as NO ₃)	Date Sampled	T.D.S.	Date Sampled
2012	1	2w	15 mg/L	1/4/2012	210 mg/L	1/4/2012
	2		15 mg/L	7/3/2012	220 mg/L	7/3/2012
	1	6w	6.8 mg/L	1/4/2012	240 mg/L	1/4/2012
	2		7 mg/L	7/3/2012	240 mg/L	7/3/2012
	1	8w	10 mg/L	1/4/2012	180 mg/L	1/4/2012
	2		9 mg/L	7/3/2012	190 mg/L	7/3/2012
	1	9w	12 mg/L	1/4/2012	210 mg/L	1/4/2012
	2		3.7 mg/L	7/3/2012	210 mg/L	7/3/2012
	1	10w	** mg/L	**	** mg/L	**
	2		** mg/L	**	** mg/L	**
	1	11w	22 mg/L	1/4/2012	270 mg/L	1/4/2012
	2		19 mg/L	7/3/2012	280 mg/L	7/3/2012
	1	20w	** mg/L	**	** mg/L	**
	2		** mg/L	**	** mg/L	**
	1	9e	9.4 mg/L	1/19/2012	*265 mg/L	1/19/2012
	2		8.5 mg/L	7/5/2012	250 mg/L	7/5/2012
	1	12e	16 mg/L	1/4/2012	300 mg/L	1/4/2012
	2		16 mg/L	7/26/2012	250 mg/L	7/26/2012
	1	14e	8.3 mg/L	1/19/2012	*255 mg/L	1/19/2012
	2		6 mg/L	7/5/2012	270 mg/L	7/5/2012
	1	16e	22 mg/L	1/4/2012	250 mg/L	1/4/2012
	2		21 mg/L	7/5/2012	250 mg/L	7/5/2012
	1	17e	15 mg/L	1/4/2012	300 mg/L	1/4/2012
	2		14 mg/L	7/5/2012	280 mg/L	7/5/2012
	1	18e	** mg/L	**	** mg/L	**
	2		** mg/L	**	** mg/L	**
*denotes average reduction for graphing purposes due to a lack of data						

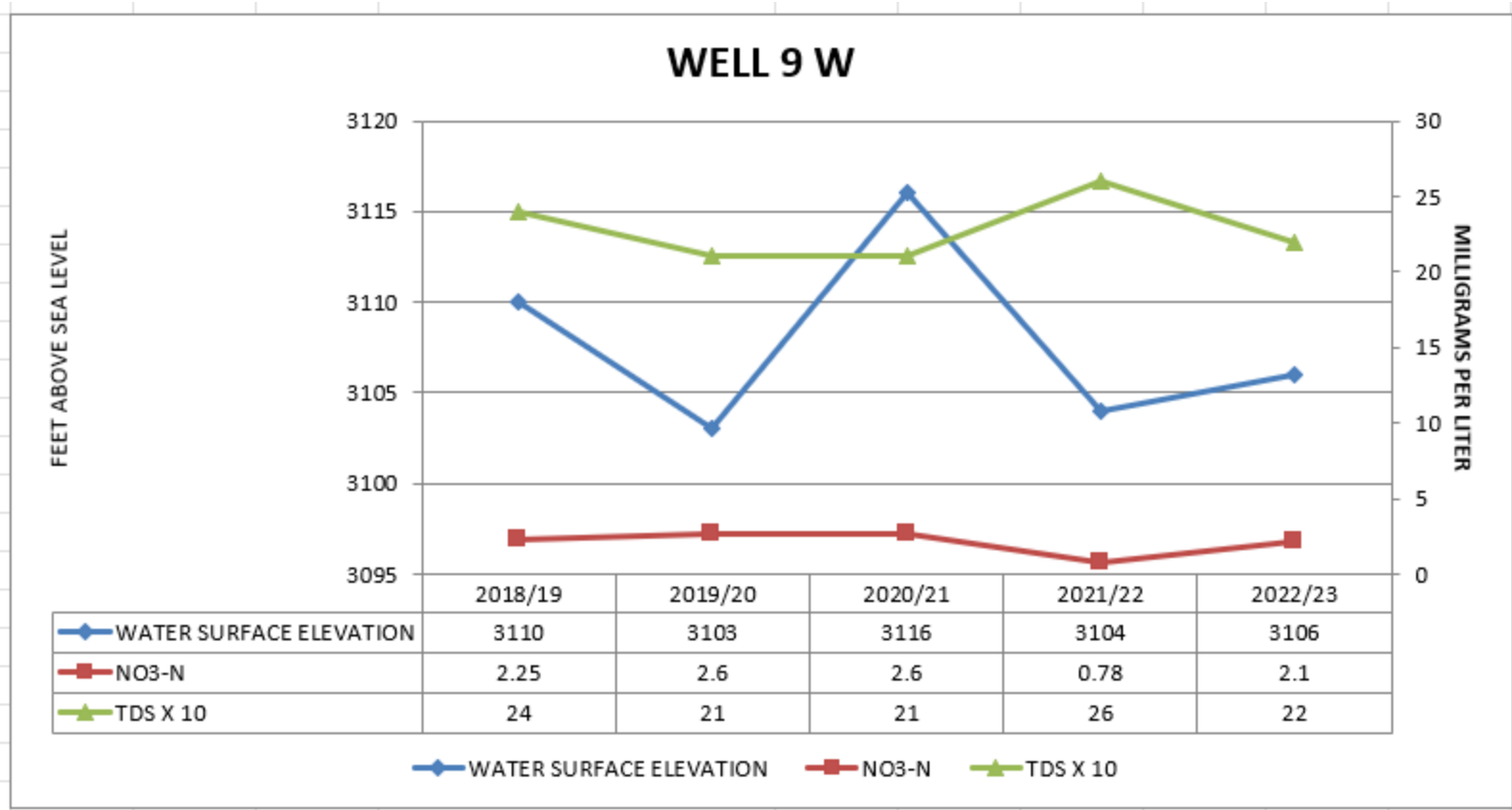
Year	Semester	Well ID	Nitrate (as NO ₃)	Date Sampled	T.D.S.	Date Sampled
2011	1	2w	9.7 mg/L	1/4/2011	220 mg/L	1/4/2011
	2		15 mg/L	7/7/2011	240 mg/L	7/6/2011
	1	6w	5.9 mg/L	3/14/2011	270 mg/L	3/14/2011
	2		4.5 mg/L	7/7/2011	270 mg/L	7/6/2011
	1	8w	12 mg/L	1/4/2011	150 mg/L	1/4/2011
	2		13 mg/L	7/7/2011	160 mg/L	7/6/2011
	1	9w	10 mg/L	1/4/2011	190 mg/L	1/4/2011
	2		12 mg/L	7/7/2011	180 mg/L	7/6/2011
	1	10w	** mg/L	**	** mg/L	**
	2		** mg/L	**	** mg/L	**
	1	11w	14 mg/L	1/4/2011	260 mg/L	1/4/2011
	2		16 mg/L	7/7/2011	260 mg/L	7/6/2011
	1	20w	** mg/L	**	** mg/L	**
	2		** mg/L	**	** mg/L	**
	1	9e	10 mg/L	1/3/2011	280 mg/L	1/3/2011
	2		11 mg/L	7/7/2011	280 mg/L	7/7/2011
	1	12e	20 mg/L	1/3/2011	300 mg/L	1/3/2011
	2		21 mg/L	7/7/2011	300 mg/L	7/7/2011
	1	14e	9 mg/L	1/3/2011	240 mg/L	1/3/2011
	2		10 mg/L	7/7/2011	240 mg/L	7/7/2011
	1	16e	23 mg/L	1/3/2011	230 mg/L	1/3/2011
	2		23 mg/L	7/7/2011	240 mg/L	7/7/2011
	1	17e	18 mg/L	1/3/2011	260 mg/L	1/3/2011
	2		18 mg/L	7/7/2011	300 mg/L	7/7/2011
	1	18e	** mg/L	**	** mg/L	**
	2		** mg/L	**	** mg/L	**

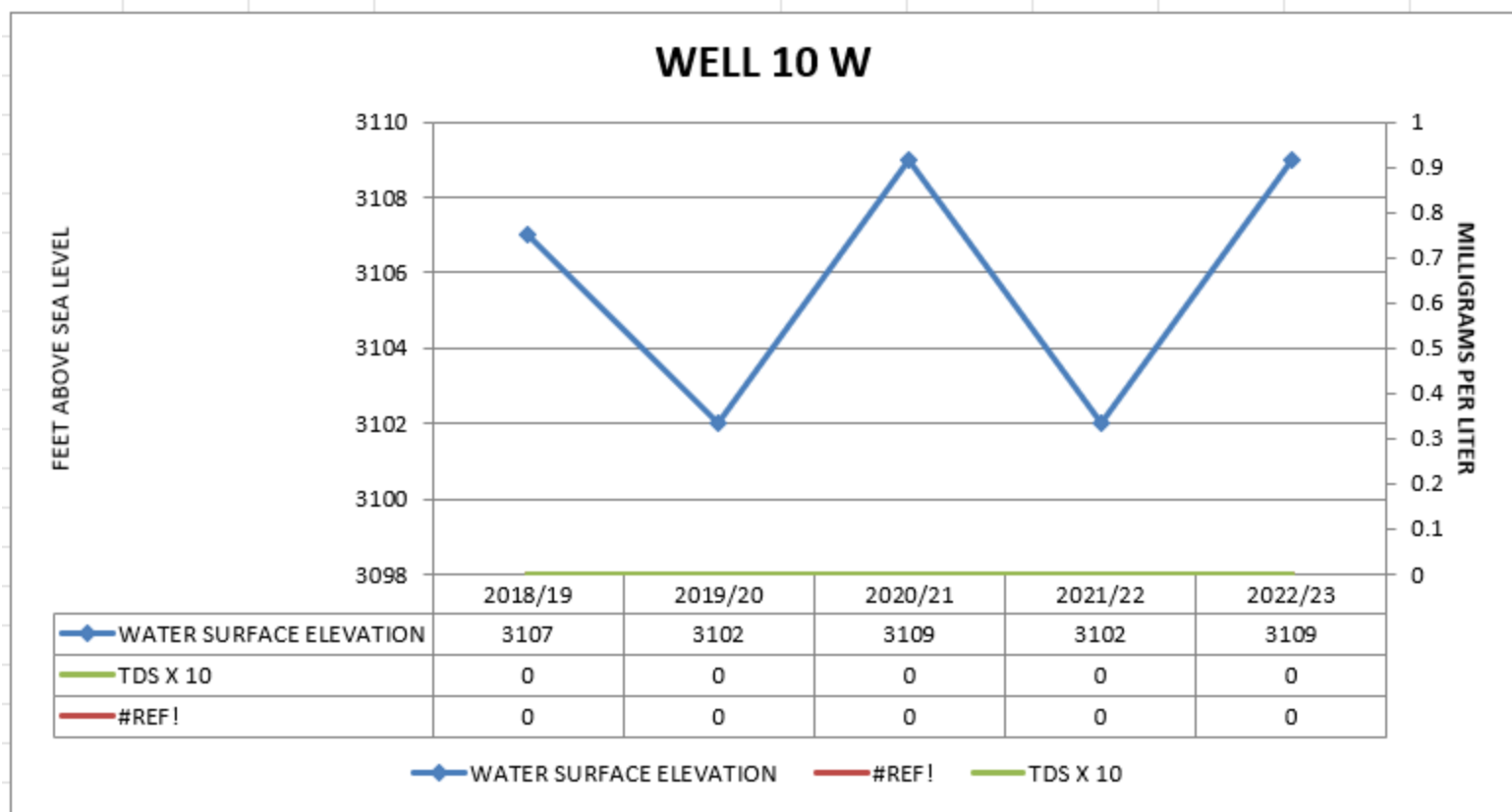
Appendix G

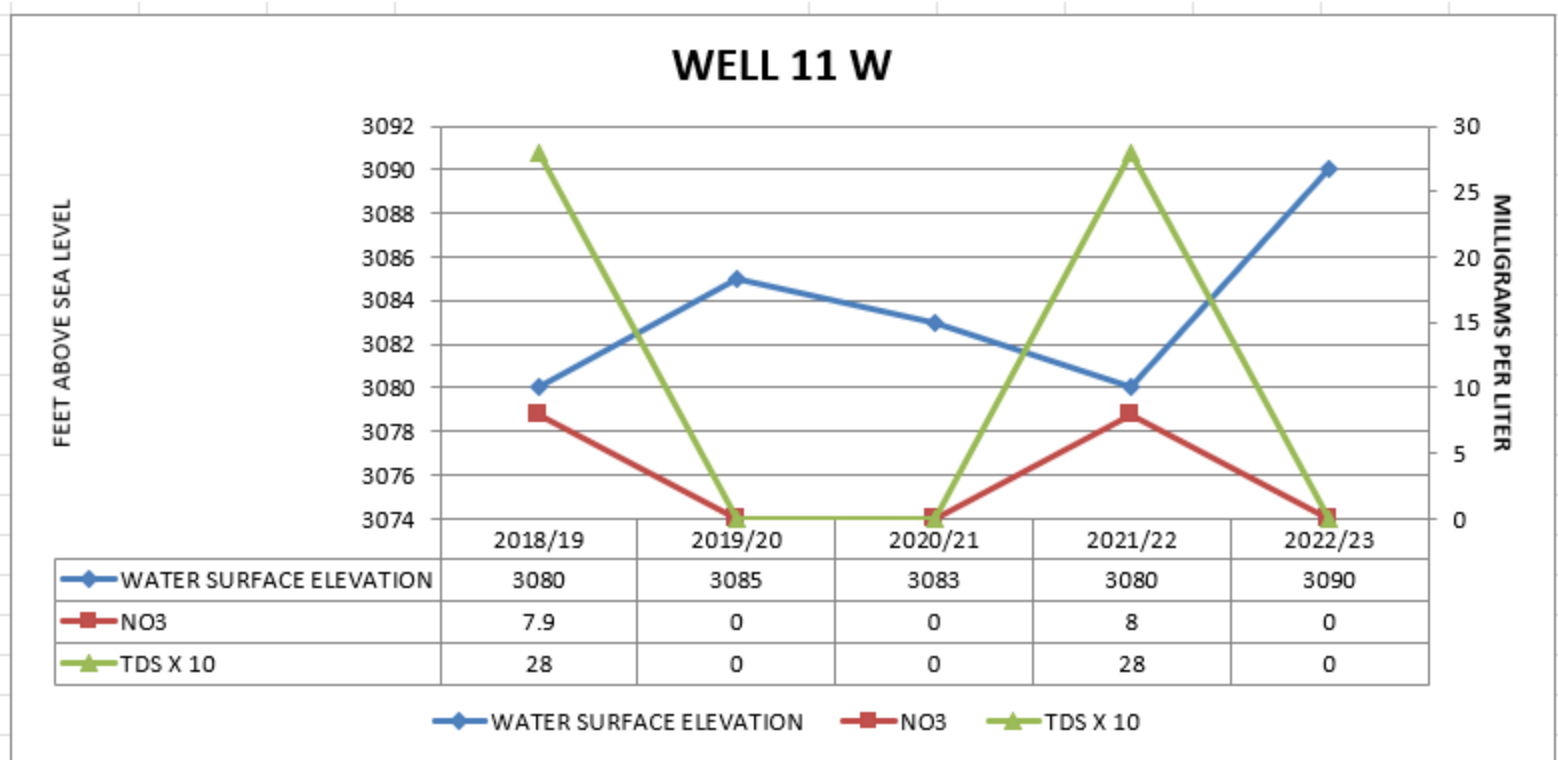




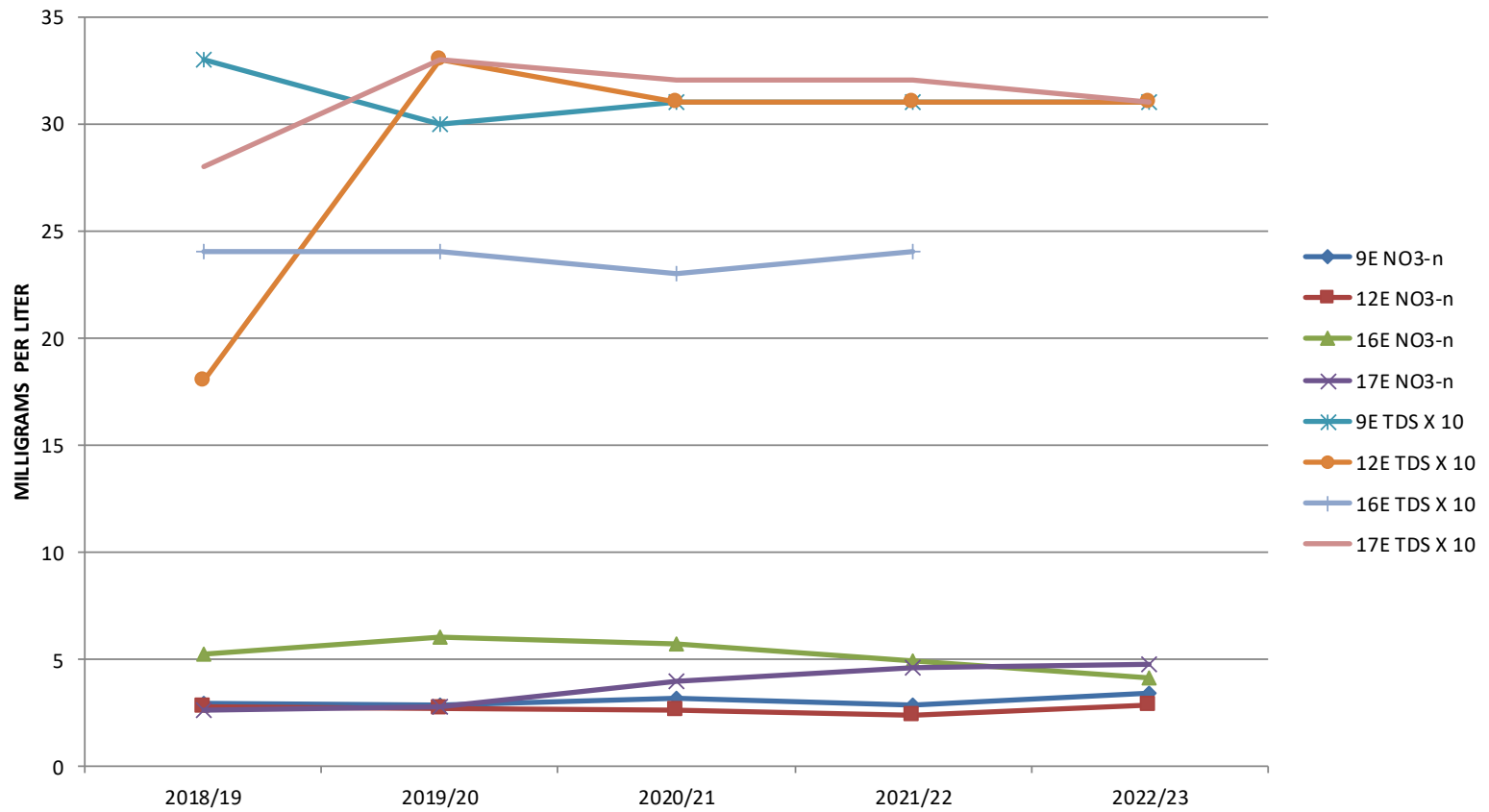




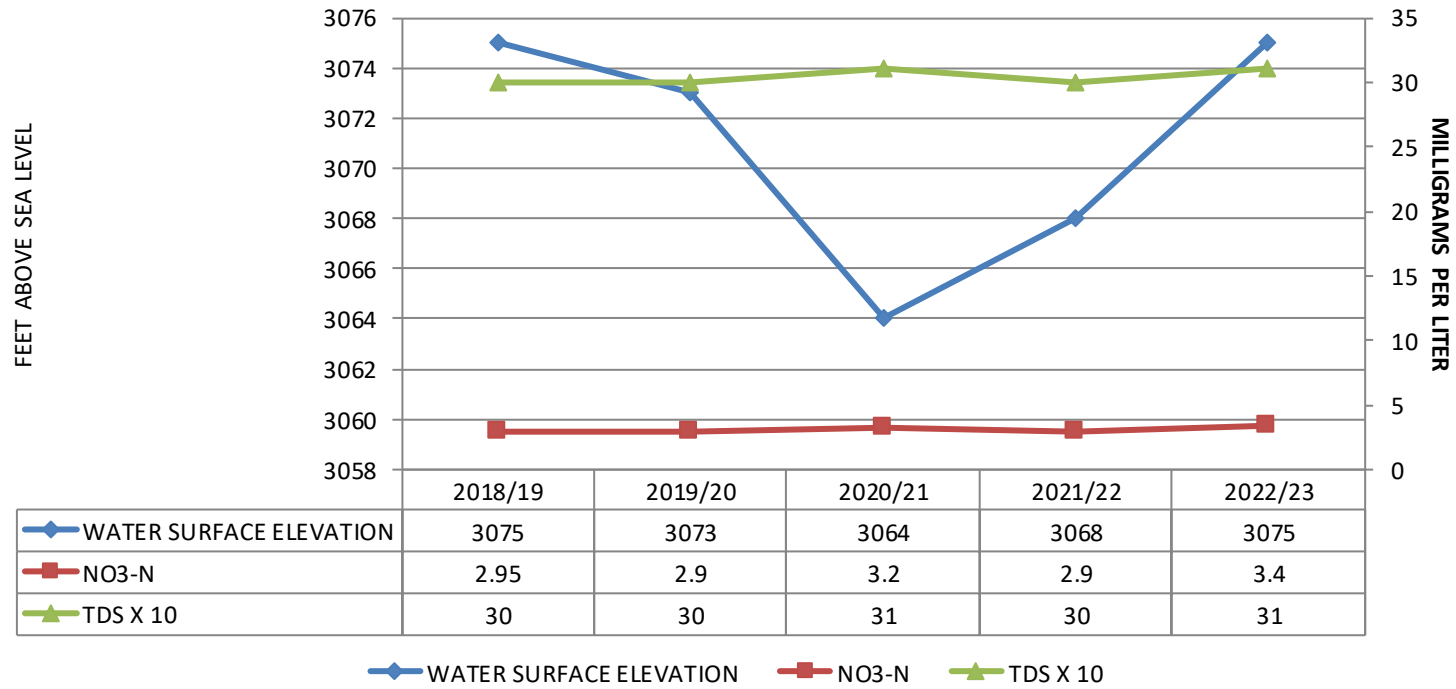




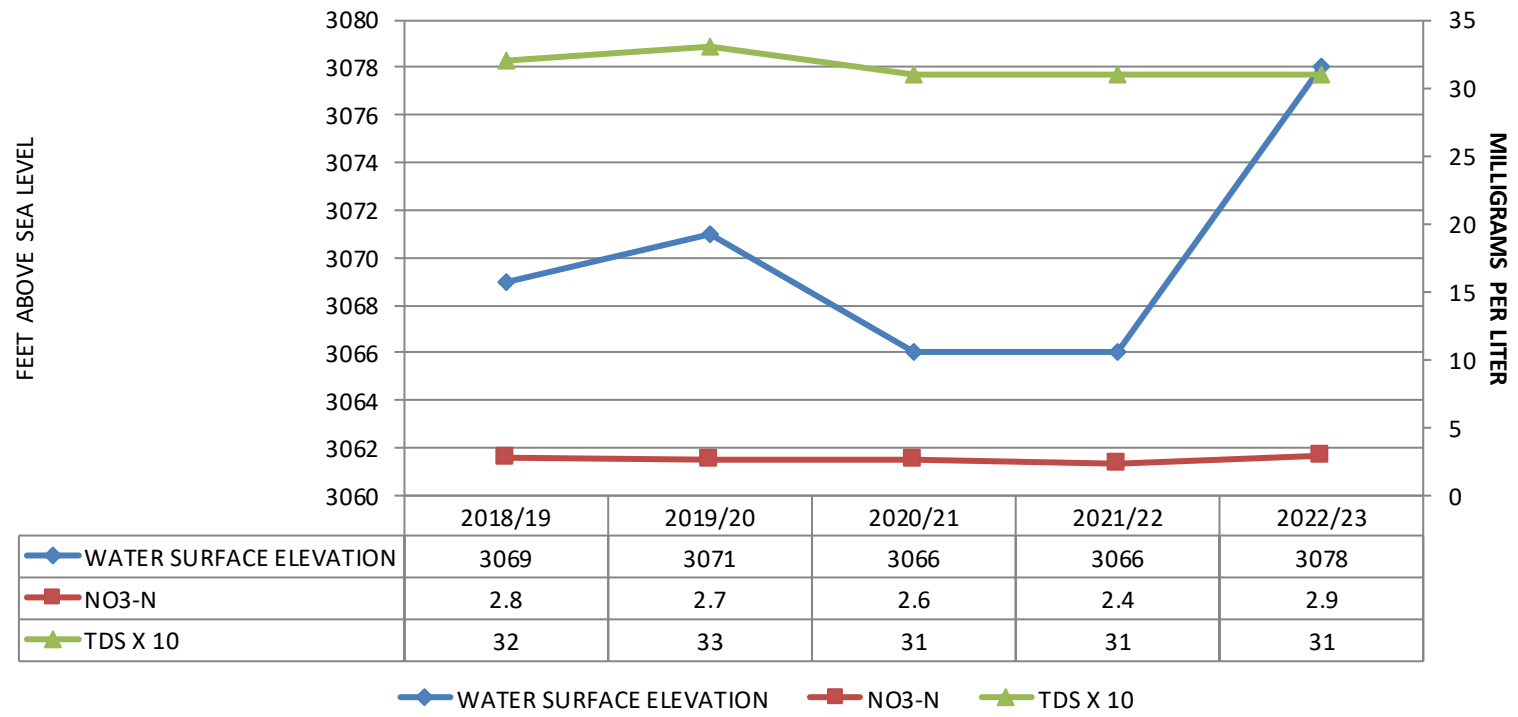
MID-WEST HYDROGEOLOGIC SUB-UNIT, NO3 AND TDS COMPARISON



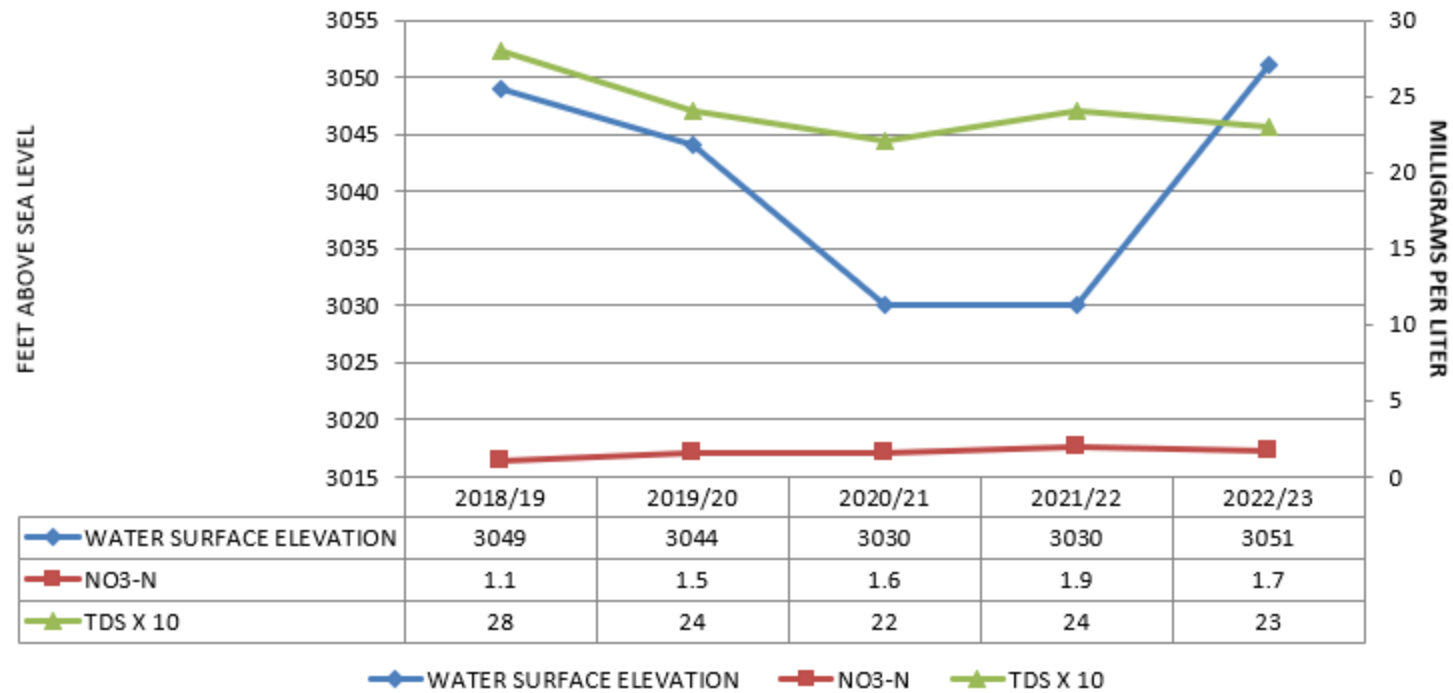
WELL 9E



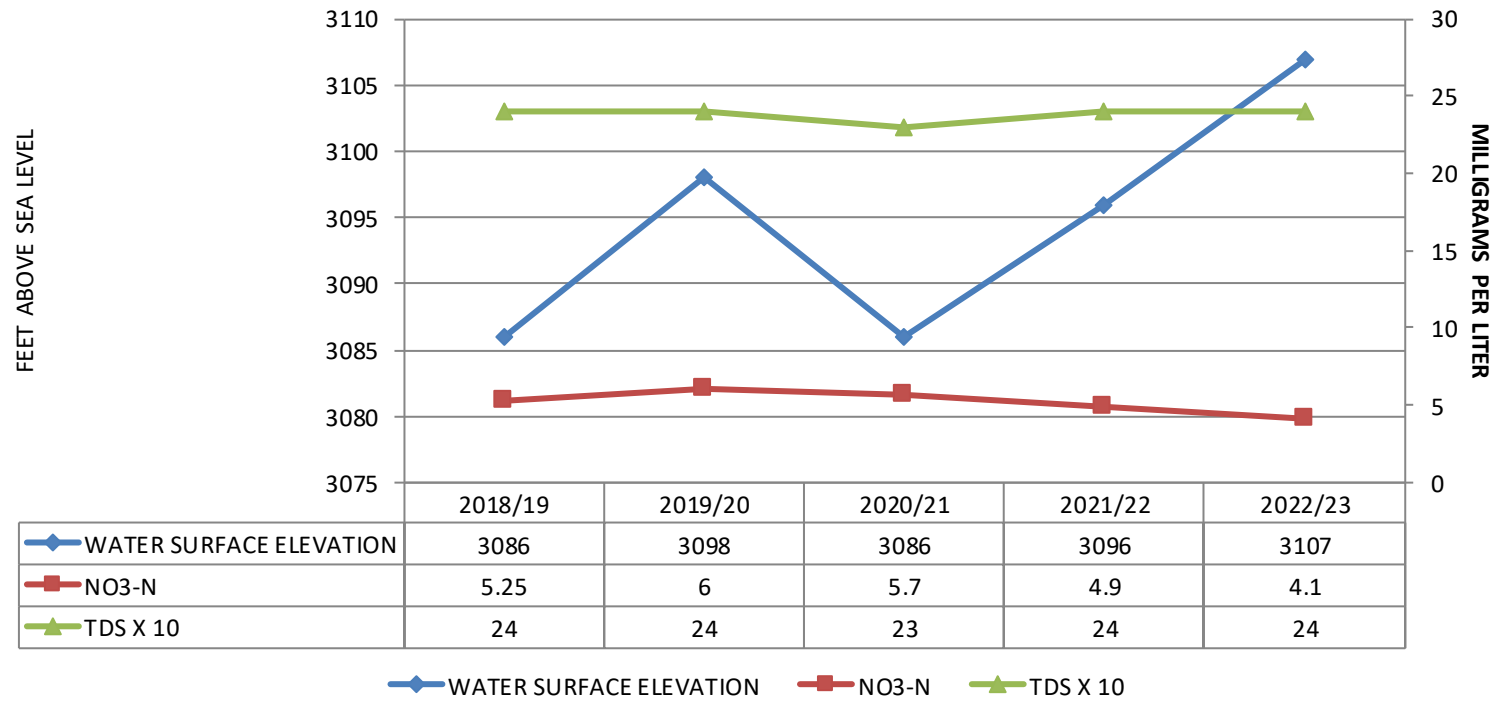
WELL 12E

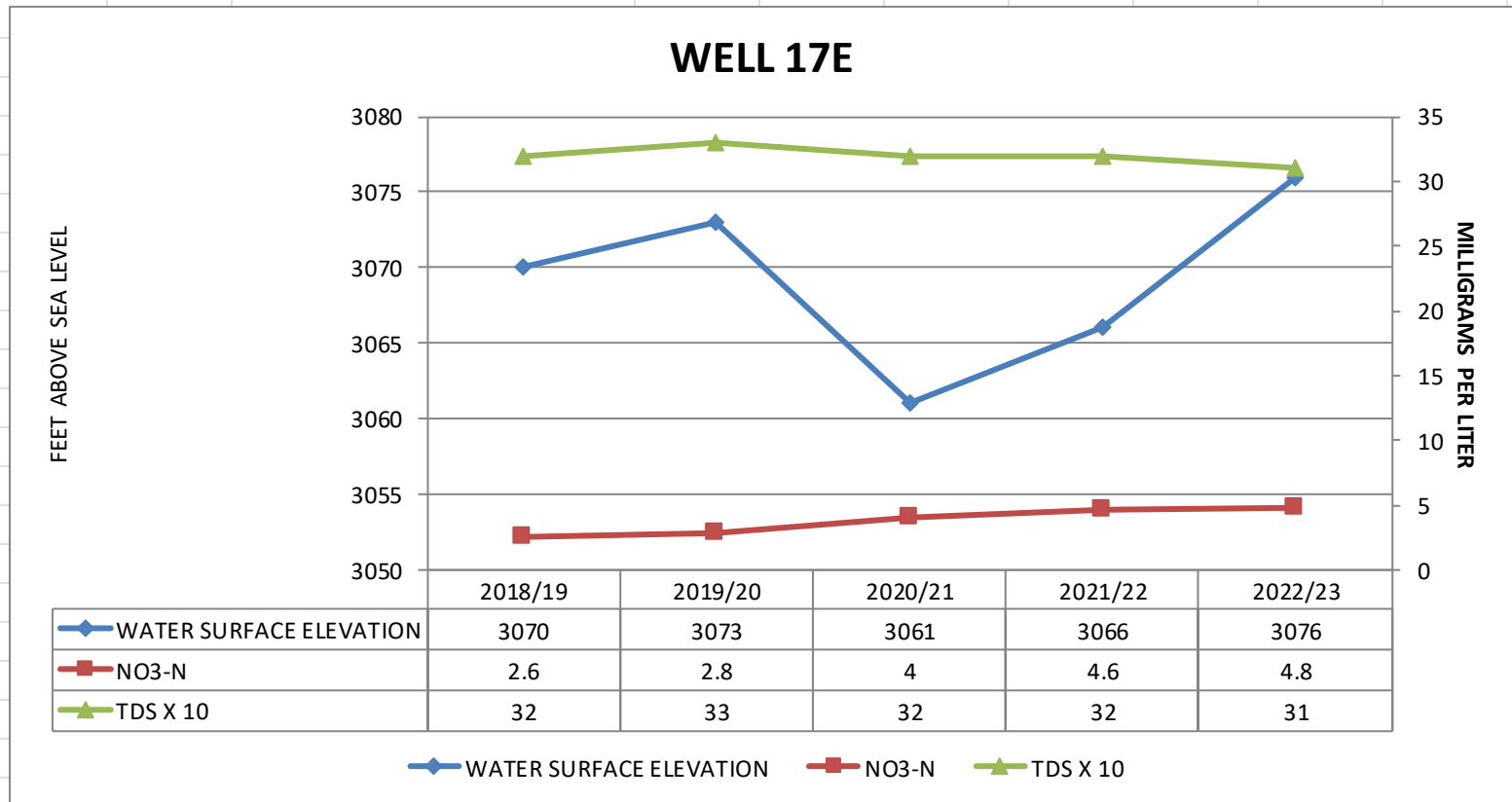


WELL 14E

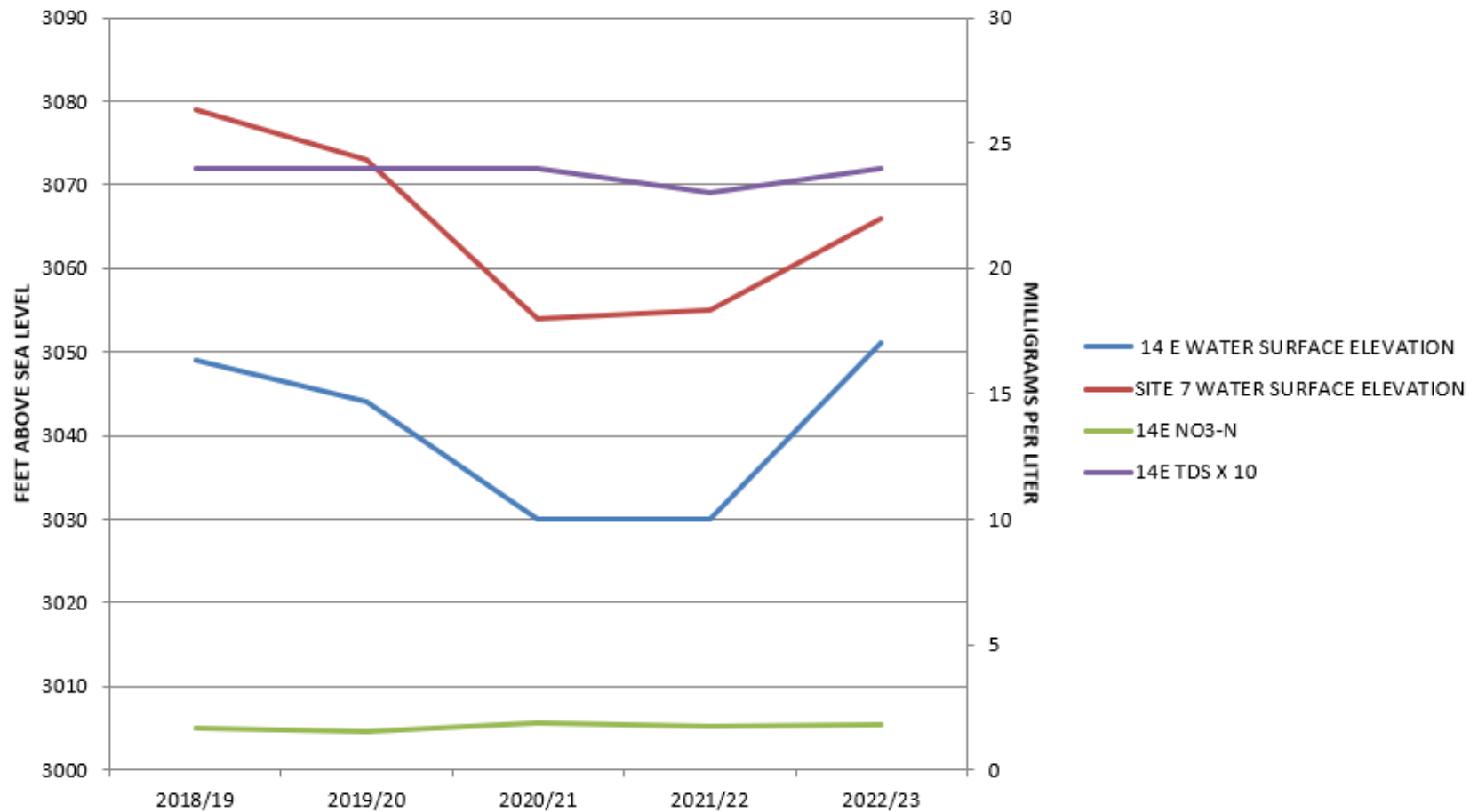


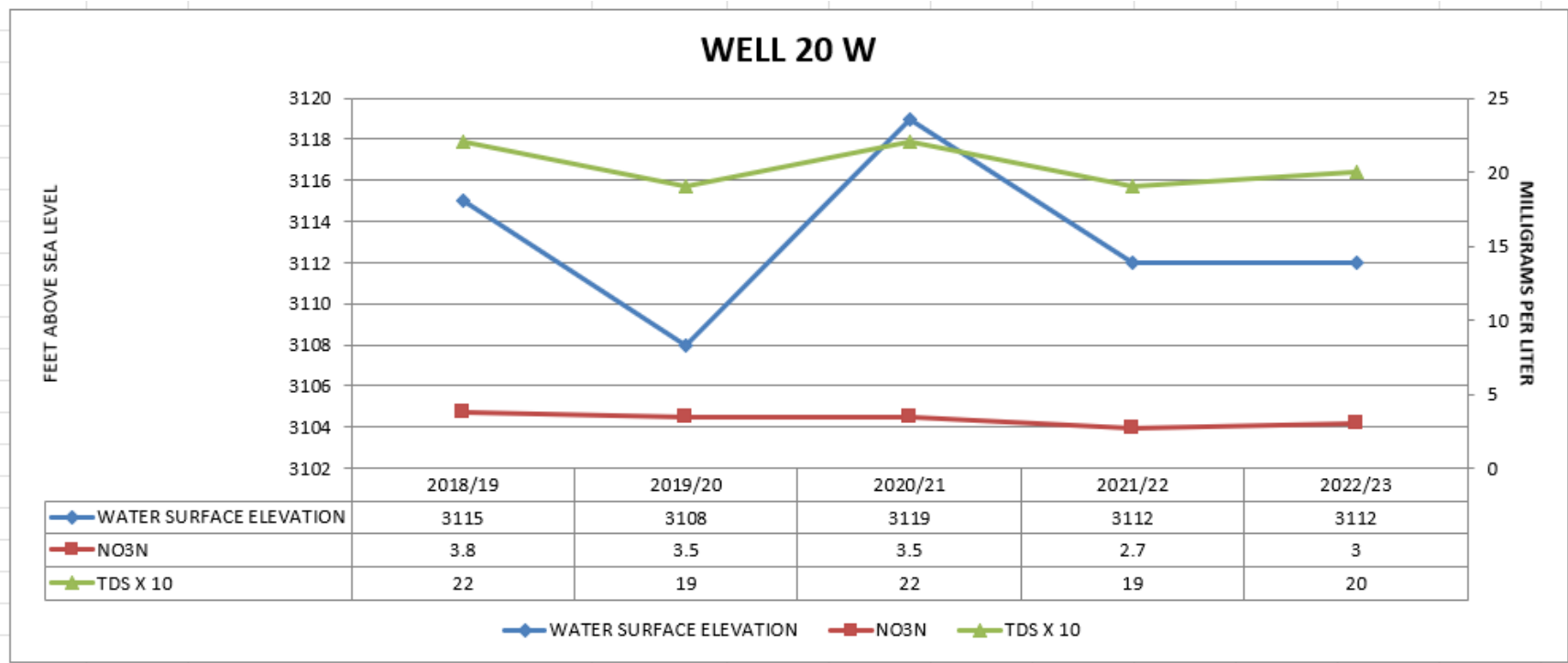
WELL 16E





MID-WEST HYDROGEOLOGIC SUB-UNIT, NO3 AND TDS COMPARISON





APPENDIX H - WARREN BASIN WATER STORAGE AND BALANCE													11/30/2023		
Water Year	State Water	USGS	Wastewater	USGS	Warren Basin	HDWD	HLBS Golf	USGS	Warren Basin	Warren Basin	Warren Basin	Cummulative	Years	Cummulative	
Oct. - Sept.	Recharge	Nat	Recharge	Septic &	Total	Pumpage	Course	Groundwater	Outflow	Inflow -	Cumulative	Storage	of	Storage	Years of
		Recharge		Golf Course	Recharge	Total	Pumpage	Underflow	Total	Outflow	added storage	Upper Aquifer	Reserve	Upper and Middle Aquifer	Reserve
BASIN RESERVE BALANCE															
1994/95	1,909	49		2,131	4,089	1,644	319	41	2,004	2,085	2,870	23,120	9	59,560	23
1995/96	2,800	49		2,131	4,980	1,356	300	41	1,697	3,283	6,153	29,273	11	64,928	24
1996/97	5,072	49		2,131	7,252	2,140	394	52	2,586	4,666	10,819	33,939	13	69,594	27
1997/98	3,153	49		2,131	5,333	1,669	323	59	2,051	3,282	14,101	37,221	14	72,876	28
1998/99	1,900	49		944	2,893	1,884	312	29	2,225	668	14,769	37,889	15	73,544	29
1999/00	3,916	49		942	4,907	2,323	228	27	2,578	2,329	17,098	40,218	16	75,873	29
2000/01	3,459	49		925	4,433	2,179	300	34	2,513	1,920	19,018	42,138	16	77,793	30
2001/02	2,491	49		940	3,480	2,336	473	39	2,848	632	19,650	42,770	17	78,425	30
2002/03	2,635	49		974	3,658	2,577	226	43	2,846	813	20,462	43,582	17	79,237	31
2003/04	3,647	49		925	4,621	2,465	301	45	2,811	1,810	22,273	45,393	18	81,048	32
2004/05	2,932	49		901	3,882	2,507	106	48	2,661	1,221	23,494	46,614	18	82,269	32
2005/06	4,682	49		901	5,632	3,004	104	47	3,155	2,477	25,970	49,090	19	84,745	33
2006/07	4,743	49		901	5,693	2,959	106	49	3,114	2,579	28,549	51,669	20	87,324	34
2007/08	4,070	49		901	5,020	2,636	2	51	2,689	2,331	30,879	53,999	21	89,654	35
2008/09	2,091	49		880	3,020	2,672	0	50	2,722	297	31,177	54,297	21	89,952	35
2009/10	3,446	49		880	4,375	2,598	0	50	2,648	1,739	32,916	56,036	22	91,691	36
2010/11	2,816	49		880	3,745	2659	0	50	2,709	1,036	33,952	57,072	22	92,727	36
2011/12	2,468	49		880	3,397	2431	0	50	2,481	916	34,868	57,988	23	93,643	36
2012/13	2,982	49		880	3,911	2342	0	50	2,392	1,519	36,387	59,507	23	95,162	37
2013/14	889	49		880	1,818	2270	311	50	2,631	-813	35,574	58,694	23	94,349	37
2014/15	2,673	49		880	3,602	2161	227	50	2,438	1,164	36,738	59,858	23	95,513	37
2015/16	2,508	49		880	3,437	2196	274	50	2,520	917	37,655	60,775	24	96,430	37
2016/17	4,274	49		880	5,203	2153	341	50	2,544	2,659	40,314	63,434	25	99,089	39
2017/18	4,739	49		880	5,668	2214	341	50	2,605	3,063	43,377	66,497	26	102,152	40
2018/19	2,125	49		880	3,054	2535	274	50	2,859	195	43,572	66,692	26	102,347	40
2019/20	1,479	49		880	2,408	2187	294	50	2,531	-123	43,449	66,569	26	102,224	40
2020/21	2,745	49	421	573	3,788	2200	339	50	2,589	1,199	44,648	67,768	26	103,423	40
2021/22	2,156	49	633	499	3,337	2045	322	50	2,417	920	45,568	68,688	27	104,343	41
2022/23	1,971	49	666	436	3,122	1906	266	50	2,222	900	46,468	69,588	27	105,243	41
Total 1994-2023	86,771	1,420	1,720	29,847	119,758	66,248	6,483	1,356	74,087	45,683	46,468	69,588	27	105,243	41
Storage prior to start of Recharge															
Notes:															
1) All Water volumes are Acre-Feet												Total storage (yrs) recharge - production only			
2) Recharge water reflects agreed upon adjustment of 2% loss due to evaporation															
3) JTRC production not included - extractions not part of recharged basins															
4) Well 2W is included in column HDWD Pumpage Totals															
5) Years of reserves = reserves within upper and middle aquifer divided by a running average of pumpage															
5.46															

Appendix I Sounding Chart / Recharge since 1991

YEAR	WELL 9E	WELL 12E	WELL 14E	WELL 16E	WELL 8W	WELL 6W	WELL 9W	WELL 11W		
1991	2797.00	2805.00	2842.00	2757.00	2951.00	2930.00	2948.00	2941.00		
2007	3024.83	3023.16	3010.00	3037.00	3015.28	3069.09	2944.66	2944.83		
2023	3083.52	3067.48	3039.98	3098.72	3101.38	3116.40	3187.90	3081.87		

