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November 15, 2022

To: Mr. Patrick Chavez, PE  
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Albuquerque, NM 87107

From: Mr. David "Sonny" Cooper, PE  
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**Re: Third Quarter (July – September) 2022 In-Stream Water Quality Monitoring Memo**

## **1 Background**

The Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFCA) maintains a broad collection of field instrumentation within their jurisdictional watershed to monitor surface water quality. Surface water quality monitoring is performed to comply with the Middle Rio Grande Watershed Based Municipal Separate Storm Sewer System (MS4) permit (NMR 04A000) issued in December 2014. This data is collected, evaluated, and analyzed related to MS4 requirements, and presented as applicable in AMAFCA's MS4 Annual Report to the U.S. Environmental Protection Agency (EPA), Region 6. The following describes the duties and responsibilities fulfilled by Weston Solutions, Inc. (Weston) in support of instrument operation, maintenance, and data reporting tabulations for the third quarter of 2022.

AMAFCA maintains several water quality sondes within the Rio Grande. The locations of the four sondes were chosen to monitor the Rio Grande from US-550 to Isleta Pueblo. Surface water quality data is collected from four sites using Aqua Troll 600 sondes (manufactured by In-Situ) with remote transmission. Current locations along the Rio Grande include, from north (upstream) to south (downstream):

- US Highway 550 bridge in Bernalillo, NM
- Sandia Pueblo boundary just upstream of the North Diversion Channel outfall
- Central Avenue bridge spanning the Rio Grande
- Isleta Dam site at the northern Isleta Pueblo boundary.

These four sondes monitor and transmit several water quality parameter measurements near real-time. Data is transmitted to In-Situ's online dashboard at approximately 30-minute intervals. The data can be viewed and downloaded from the Hydro-Vu website operated by In-Situ. Access to data is shared with downstream stakeholders via the Hydro-Vu website (<https://www.hydrovu.com>).

The data is collected and reported by AMAFCA's current Stormwater Management Program (SWMP), dated December 1, 2018. Per SWMP Table ID #8, and to comply with the MS4 Permit Part I.C.1.c, AMAFCA monitors dissolved oxygen (DO) and temperature at these locations. The document providing guidance for surface water quality exceedances is New Mexico Administrative Code Title 20, Chapter 6,



Part 4 (20.6.4 NMAC) *Environmental Protection Water Quality Standards for Interstate and Intrastate Surface Waters*. Under 20.6.4 NMAC and the Pueblo of Isleta *Surface Water Quality Standards* for the reach of the Rio Grande under the jurisdiction of the MS4 permit, the Rio Grande has a designed use of “Marginal Warm water Aquatic Life”. 20.6.4.900 H (6) NMAC provides the following guidance for marginal warm water for aquatic life, for both non-stormwater and stormwater flow conditions:

*Dissolved oxygen 5mg/L or more. pH within the range of 6.6 to 9.0 and maximum temperature 32.2°C (90°F). Where a segment-specific temperature criterion is indicated in 20.6.4.101-899 NMAC, it is the maximum temperature.*

Per 20.6.4 NMAC, DO and temperature have established surface water quality standards while turbidity does not. In addition to 20.6.4 NMAC, the Pueblo of Isleta *Surface Water Quality Standards* also governs surface water quality standards under the MS4 Permit. The standards described in the *Surface Water Quality Standards* are the same as those described in 20.6.4 NMAC in regard to DO and temperature. Regarding turbidity, the Pueblo of Isleta *Surface Water Quality Standards* provides the following guidance under Section III, Paragraph G:

*Turbidity attributable to other than natural causes shall not reduce light transmission to a point where aquatic biota are inhibited or to a point that causes an unaesthetic and substantial visible contrast with the natural appearance of the water. Specifically, turbidity shall not exceed 5 NTU over background when background turbidity is 50 NTU or less, with no more than 10 percent increase when background turbidity is more than 50 NTU.*

This memorandum provides the collected data for all three surface water quality parameters at all four sonde locations.

## 2 Sonde Data Discussion

Data from Community Collaborative Rain, Hail, and Snow Network (CoCoRaHS) was used to determine if a storm event occurred within the Middle Rio Grande MS4 Permit watershed. During the Third Quarter (July – September) of 2022, 53 storm events occurred, however, 17 of these events only produced trace amounts of precipitation in the watershed. The storm event dates were used to determine if variations in data from the sondes were potentially related to runoff entering the Rio Grande or if data collected were erroneous due to equipment issues (such as a fouled sensor, data transmission failure, or random anomaly).

The tables below list the average, minimum, and maximum DO, temperature, and turbidity measurements for each sonde during 2022 Quarter 3. Data that appeared to be inaccurate were purged from the dataset. Graphs of each parameter recorded by the sondes are shown in Attachment 1.

### 2.1 Dissolved Oxygen

Parameter		US 550 Bridge	Sandia Boundary	Central Ave Bridge	Isleta Dam
DO (mg/L)	Average	6.56	-	6.17	6.43
	Minimum	1.24	-	2.56	5.09
	Maximum	7.90	-	8.53	7.66

## 2.2 Temperature

Parameter		US 550 Bridge	Sandia Boundary	Central Ave Bridge	Isleta Dam
Temperature (°C)	Average	23.59	-	24.83	24.43
	Minimum	17.74	-	15.73	17.08
	Maximum	30.88	-	36.94	32.32

## 2.3 Turbidity

Parameter		US 550 Bridge	Sandia Boundary	Central Ave Bridge	Isleta Dam
Turbidity (NTU)	Average	630.35	-	1060.19	465.36
	Minimum	33.16	-	139.75	5.92
	Maximum	9589.72	-	8707.76	6221.77

## 2.4 Data Review

The surface water quality standards discussed in Section 1, along with storm event dates and daily sonde record keeping, allowed Weston to determine if apparent exceedances were attributed to a natural phenomenon or were erroneous data points. If data appeared to be unrelated to a natural phenomenon, it was removed from the data set collected by the sonde. The following summaries are based upon review of the data, storm events, trends in the data collected, and sonde maintenance efforts:

Sonde	Parameter	Start Date	Start Time	End Date	End Time	Notes
US Highway 550 Bridge	Turbidity	07/13/2022	1600	07/14/2022	1900	Data appeared erroneous due to a fouling sensor. Removed from data set.
		07/16/2022	0500	07/16/2022	1730	Data appeared erroneous due to a fouling sensor. Removed from data set.
		07/17/2022	2330	07/18/2022	0730	Data appeared erroneous due to a fouling sensor. Removed from data set.



Sonde	Parameter	Start Date	Start Time	End Date	End Time	Notes
	DO, Temperature, and Turbidity	07/25/2022	1400	08/17/2022	1800	Sonde was not deployed due to low water level in the river.
<b>US Highway 550 Bridge</b>	Turbidity	08/18/2022	0500	08/18/2022	0800	Data appeared erroneous due to a fouling sensor. Removed from data set.
		08/25/2022	0300	08/25/2022	2031	Data appeared erroneous due to a fouling sensor. Removed from data set.
		09/01/2022	1200	09/02/2022	0300	Data appeared erroneous due to a fouling sensor. Removed from data set.
		09/11/2022	1030	09/12/2022	0600	Data appeared erroneous due to a fouling sensor. Removed from data set.
		09/14/2022	1500	09/20/2022	1800	Data appeared erroneous due to a fouling sensor. Removed from data set.
	DO	09/18/2022	0600	09/20/2022	1800	Data appeared erroneous due to a fouling sensor. Removed from data set.
	Turbidity	09/24/2022	0130	09/24/2022	1500	Data appeared erroneous due to a fouling sensor. Removed from data set.

Sonde	Parameter	Start Date	Start Time	End Date	End Time	Notes
<b>Sandia Boundary</b>	DO, Temperature and Turbidity	07/01/2022	0000	09/30/2022	2330	The sonde was not deployed in the river for the duration of quarter 3 due to low water level in the river. Removed from the data set.
<b>Central Ave Bridge</b>	DO and Temperature	07/12/2022	2100	07/13/2022	0300	Data appeared erroneous due to a fouling sensor. Removed from the data set.
	Turbidity	07/18/2022	2030	07/20/2022	0600	Data appeared erroneous due to a fouling sensor. Removed from the data set.
		07/20/2022	1100	07/20/2022	1730	Data appeared erroneous due to a fouling sensor. Removed from the data set.
	DO, Temperature, and Turbidity	07/25/2022	0530	09/20/2022	2000	Sonde was not deployed due to low water.
	Turbidity	09/24/2022	2100	09/27/2022	1345	Data appeared erroneous due to a fouling sensor. Removed from the data set.
		09/29/2022	0030	09/29/2022	0745	Data appeared erroneous due to a fouling sensor. Removed from the data set.
<b>Isleta Dam</b>	Turbidity	07/15/2022	0900	07/17/2022	0400	Data appeared erroneous due to a fouling sensor. Removed from the data set.

Sonde	Parameter	Start Date	Start Time	End Date	End Time	Notes
	DO, Temperature, and Turbidity	07/25/2022	1900	08/15/2022	1900	Sonde was not deployed due to low water.
	Turbidity	09/18/2022	1630	09/19/2022	1930	Data appeared erroneous due to a fouling sensor. Removed from the data set.

### 3 Sonde Maintenance

Maintenance of the sonde generally consists of cleaning the sonde to ensure reliable data was being collected.

Sonde	Maintenance Dates	Maintenance Performed	Performed By	Equipment / Inventory Used
<b>US 550 Bridge</b>	07/06/2022	The sonde was cleaned.	AMAFCA	None
	07/14/2022	The sonde was cleaned.	AMAFCA	None
	07/20/2022	The sonde was cleaned.	AMAFCA	None
	07/25/2022	The sonde was removed.	AMAFCA	None
	08/17/2022	The sonde was deployed and calibrated.	AMAFCA	None
	08/25/2022	The sonde was cleaned.	AMAFCA	None
	09/06/2022	The sonde was cleaned.	AMAFCA	None
	09/20/2022	The sonde was cleaned.	AMAFCA	None
	09/27/2022	The sonde was cleaned.	AMAFCA	None
<b>Sandia Boundary</b>	-	-	-	-
<b>Central Ave Bridge</b>	07/07/2022	The sonde was cleaned.	AMAFCA	None
	07/14/2022	The sonde was cleaned.	AMAFCA	None
	07/20/2022	The sonde was cleaned and calibrated.	AMAFCA	None
	07/25/2022	The sonde was removed.	AMAFCA	None
	08/15/2022	The Vulink batteries were replaced.	AMAFCA	Yes, batteries.
	09/20/2022	The sonde was deployed, new turbidity sensor installed, batteries replaced, and calibrated.	AMAFCA	Yes, turbidity sensor and batteries.
	09/26/2022	The sonde was cleaned.	AMAFCA	None

Sonde	Maintenance Dates	Maintenance Performed	Performed By	Equipment / Inventory Used
Central Ave Bridge	09/28/2022	The Vulink antenna was replaced	AMAFCA	None
Isleta Dam	07/05/2022	The sonde was cleaned.	AMAFCA	None
	07/14/2022	The sonde was cleaned.	AMAFCA	None
	07/25/2022	The sonde was removed.	AMAFCA	None
	08/15/2022	The sonde was deployed and calibrated.	AMAFCA	None
	08/25/2022	The sonde was cleaned.	AMAFCA	None
	09/06/2022	The sonde was cleaned.	AMAFCA	None
	09/19/2022	The sonde was cleaned.	AMAFCA	None

## 4 Exceedances

### 4.1 Dissolved Oxygen

Sonde	Date of Occurrence	Time of Occurrence	Minimum DO Recorded	Precipitation in Watershed?
US 550 Bridge	07/03/2022 to 07/04/2022	2300 to 1300	1.25	Trace
	08/19/2022 to 0/20/2022	2200 to 0800	4.03	Yes
Central Ave Bridge	07/01/2022	0600 to 1030	4.21	Trace
	07/11/2022 to 07/12/2022	2100 to 0000	4.66	Yes
	07/14/2022 to 07/15/2022	2330 to 0130	4.90	Yes
	07/18/2022 to 07/19/2022	2200 to 0130	4.83	No
	07/24/2022	0230 to 1100	2.56	Yes
	07/25/2022	0230 to 0500	3.00	Yes

### 4.2 Temperature

Sonde	Date of Occurrence	Time of Occurrence	Max Temperature Recorded (°C)	Precipitation in Watershed?
	07/09/2022	2230	32.5	Yes
Central Ave Bridge	07/10/2022 to 07/11/2022	2230 to 0000	32.5	Trace
	07/11/2022	2100 to 0000	33.9	Trace

Sonde	Date of Occurrence	Time of Occurrence	Max Temperature Recorded (°C)	Precipitation in Watershed?
	07/13/2022 to 07/14/2022	2100 to 0000	33.7	Yes
	07/14/2022 to 07/15/2022	2100 to 0130	33.3	Yes
	07/15/2022 to 07/16/2022	2000 to 0130	34.5	No
	07/16/2022 to 07/17/2022	2000 to 0230	35.6	No
	07/17/2022 to 07/18/2022	2000 to 0100	34.9	No
	07/18/2022 to 07/19/2022	2000 to 0130	35.0	No
	07/19/2022 to 07/20/2022	1930 to 0130	34.6	Yes
	07/20/2022 to 07/21/2022	2030 to 0030	34.1	Yes
	07/21/2022 to 07/22/2022	1900 to 0130	36.7	Trace
	07/22/2022	1900 to 2330	36.9	Yes
	07/23/2022 to 07/24/2022	1900 to 0200	36.8	Yes
	07/24/2022 to 07/25/2022	1930 to 0130	36.5	Yes
<b>Isleta Dam</b>	07/12/2022	0.00	32.3	Yes

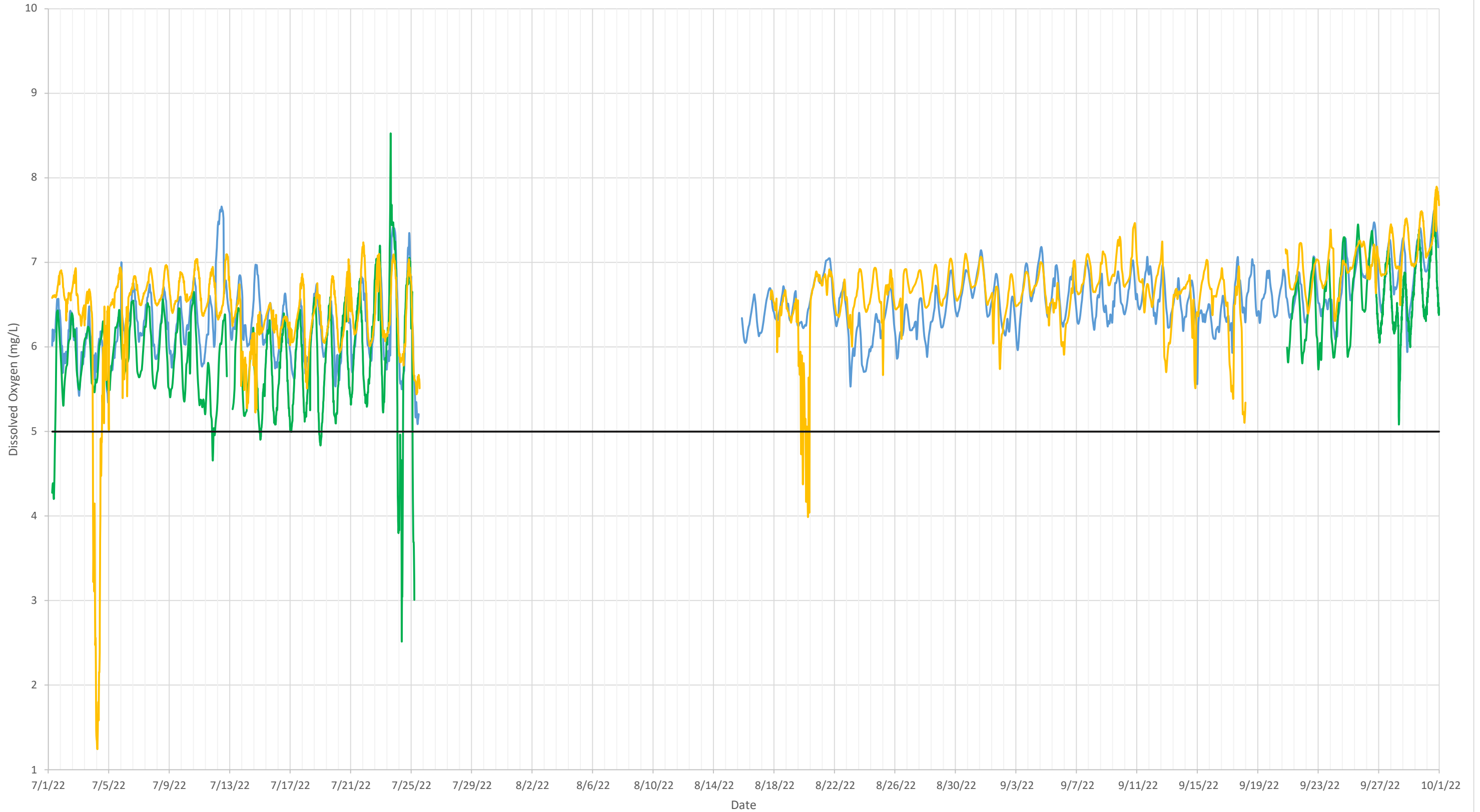
## 5 Attachments

Attachment 1: Third Quarter Data Graphs for Dissolved Oxygen, Temperature, and Turbidity.



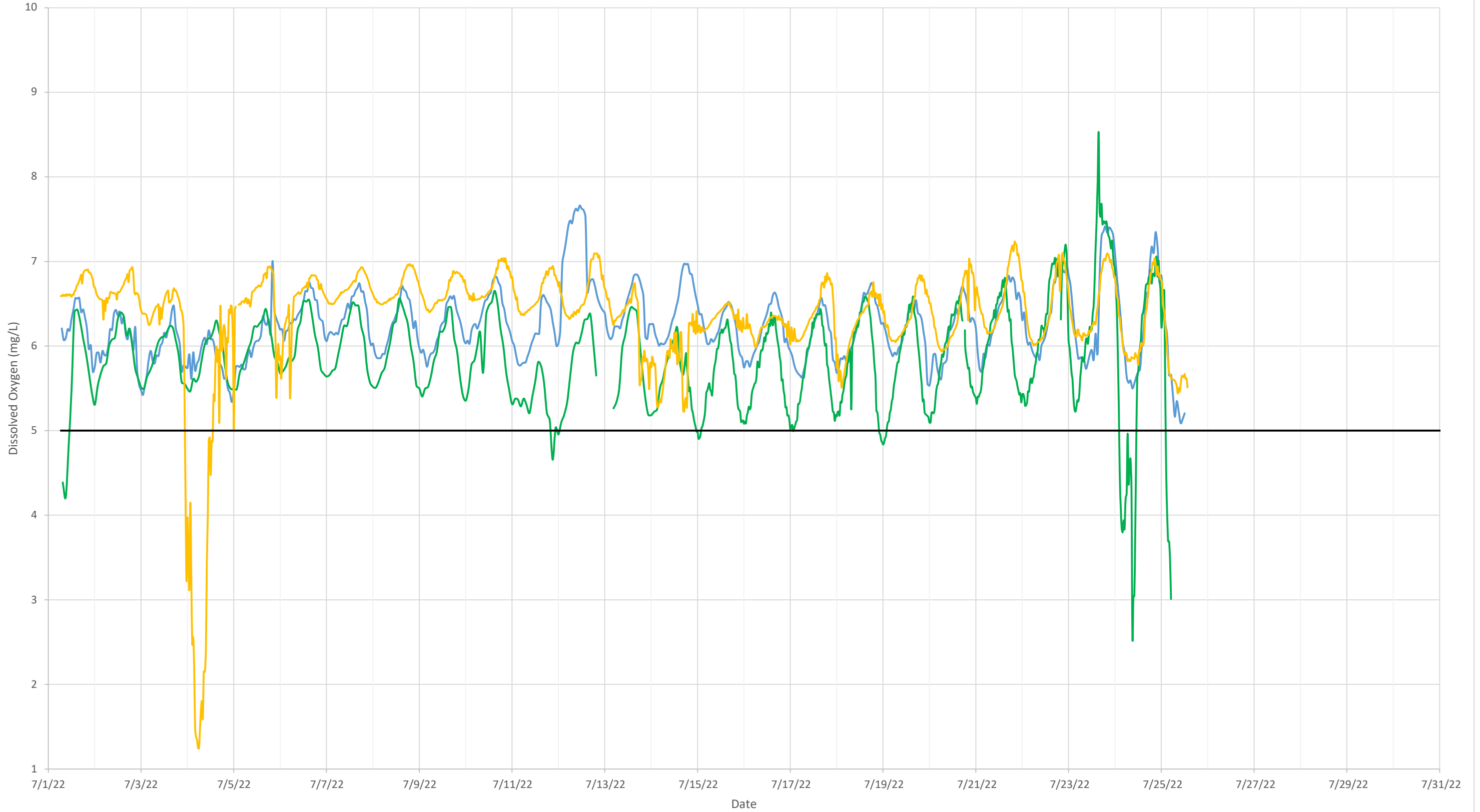
### Dissolved Oxygen - All Sondes - Quarter 3, 2022

Isleta Central Sandia 550 DO Exceedance (5 mg/L)



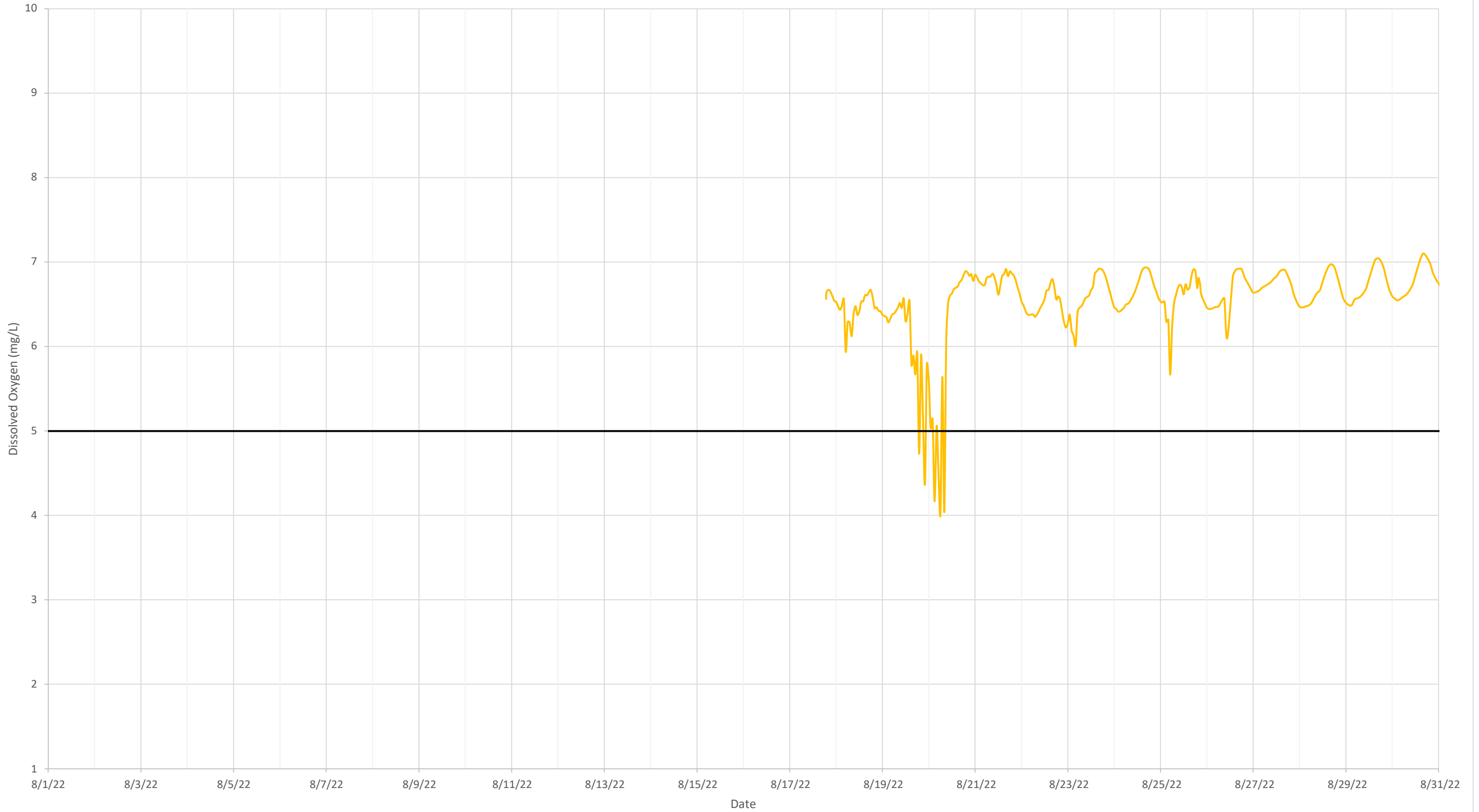
Dissolved Oxygen - All Sondes - July 2022

Isleta Central Sandia 550 DO Exceedance (5 mg/L)



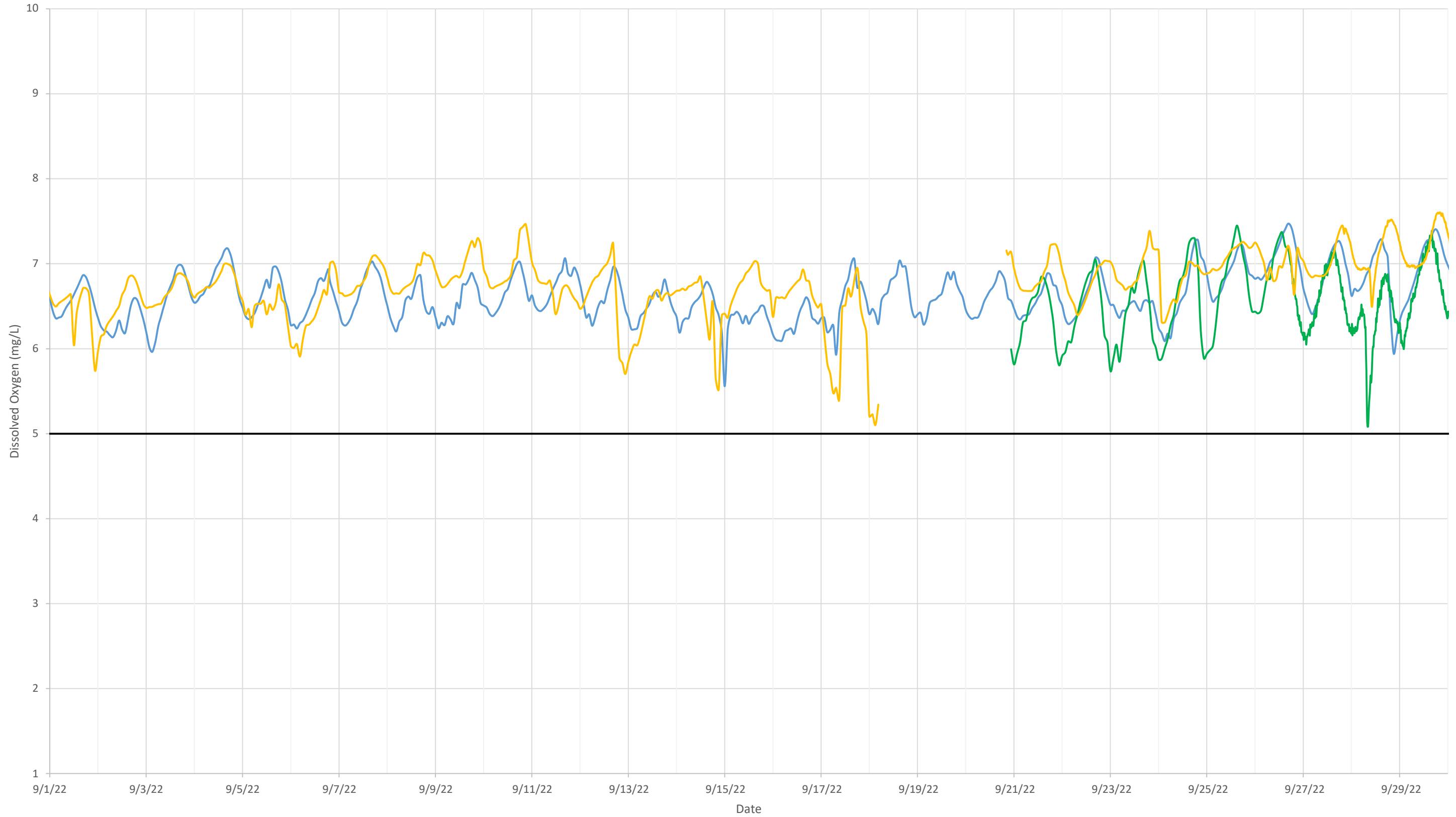
### Dissolved Oxygen - All Sondes - August 2022

Isleta Central Sandia 550 DO Exceedance (5 mg/L)



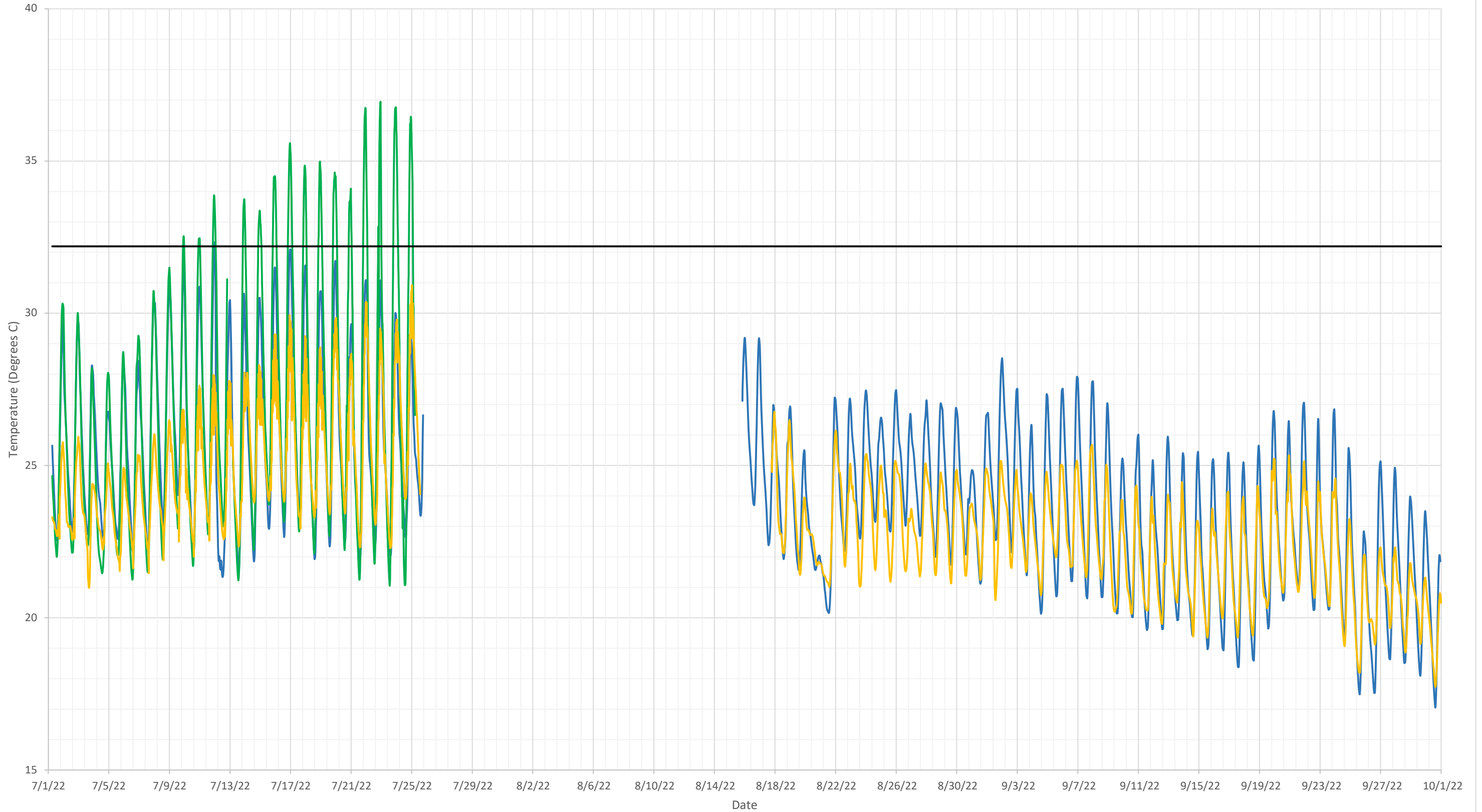
Dissolved Oxygen - All Sondes - September 2022

Isleta Central Sandia 550 DO Exceedance (5 mg/L)



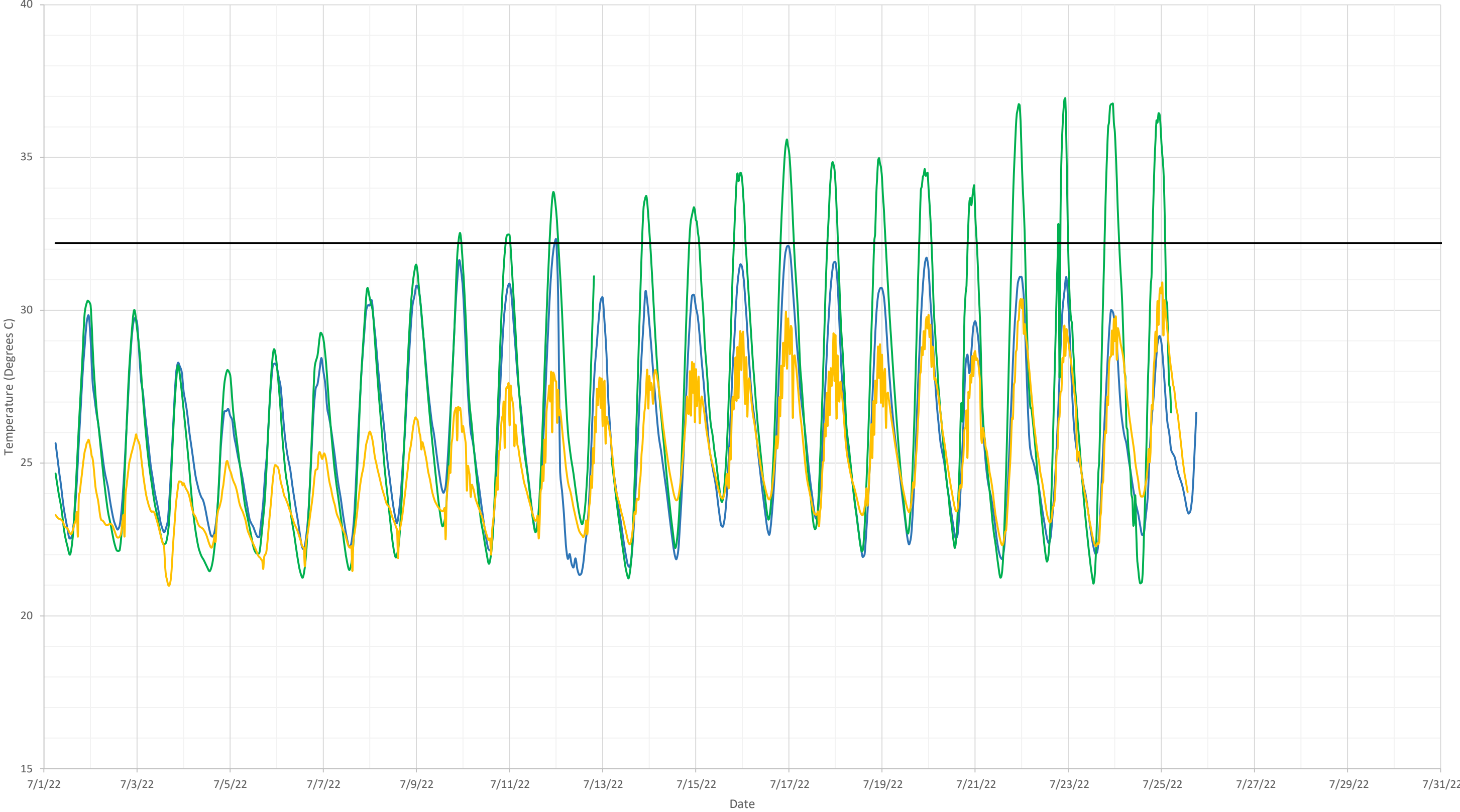
### Temperature - All Sondes - Quarter 3, 2022

Isleta Central Sandia 550 Temperature Exceedance (32F)



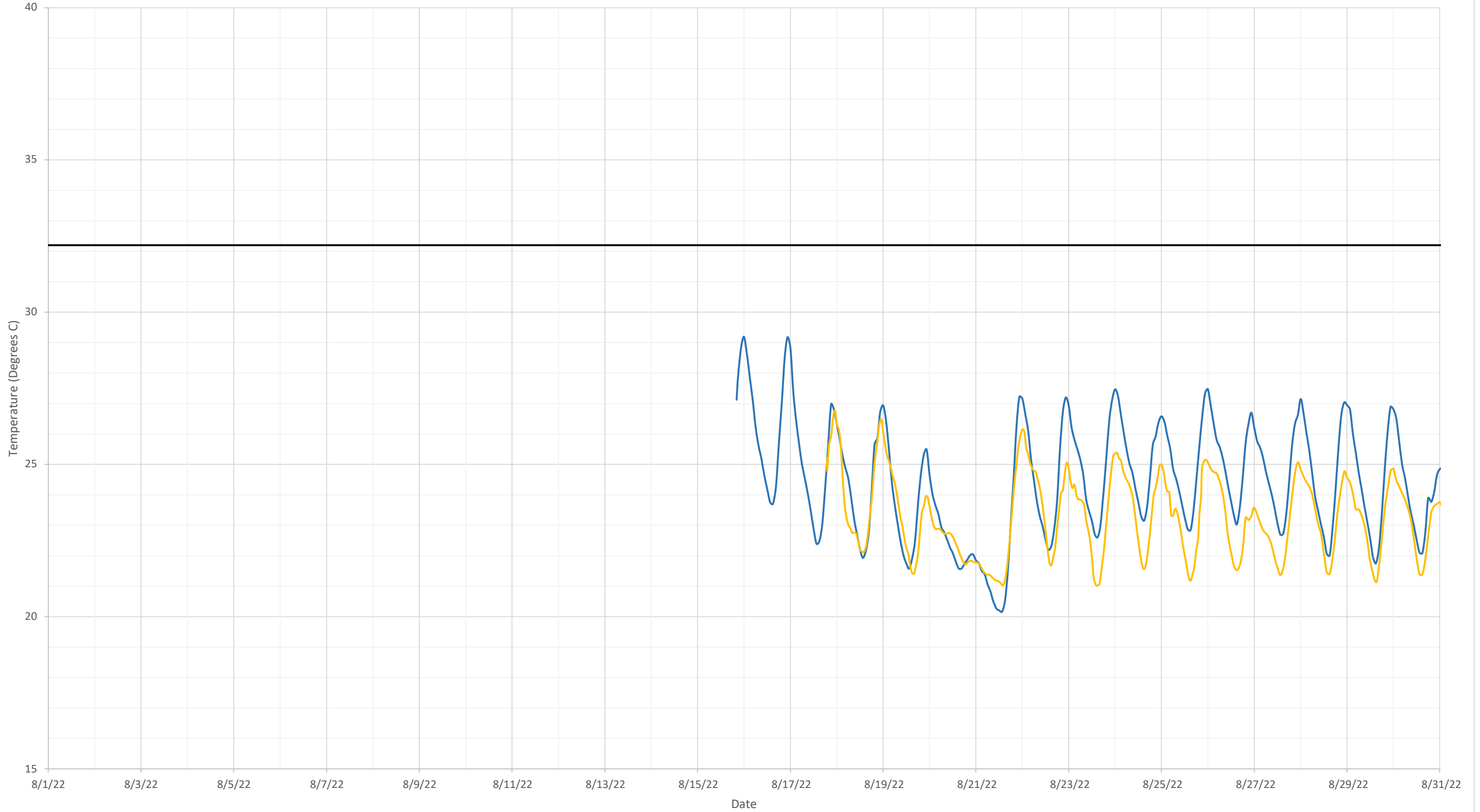
Temperature - All Sondes - July 2022

Isleta Central Sandia 550 Temperature Exceedance (32F)



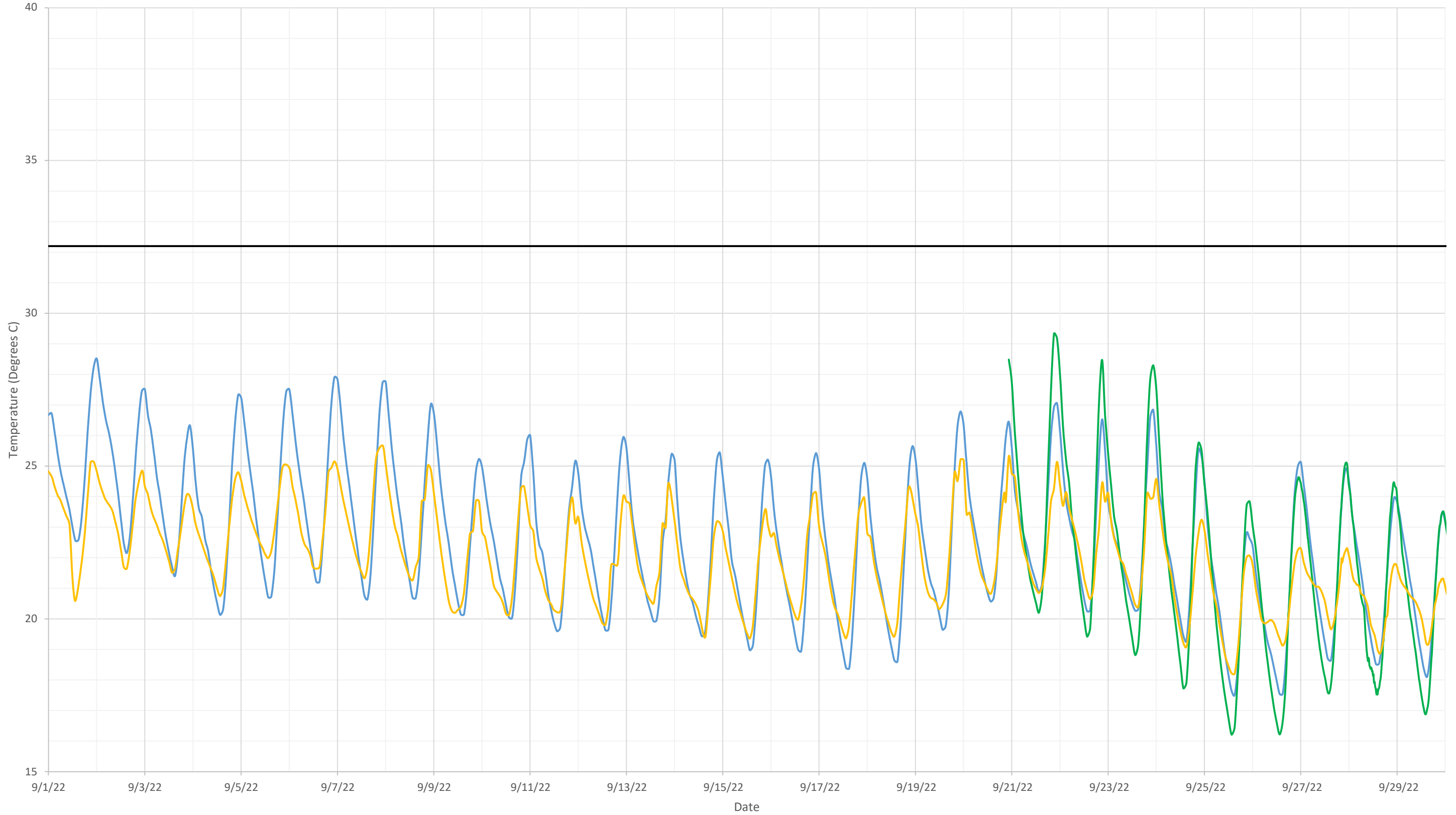
### Temperature - All Sondes - August 2022

Isleta Central Sandia 550 Temperature Exceedance (32F)



Temperature - All Sondes - September 2022

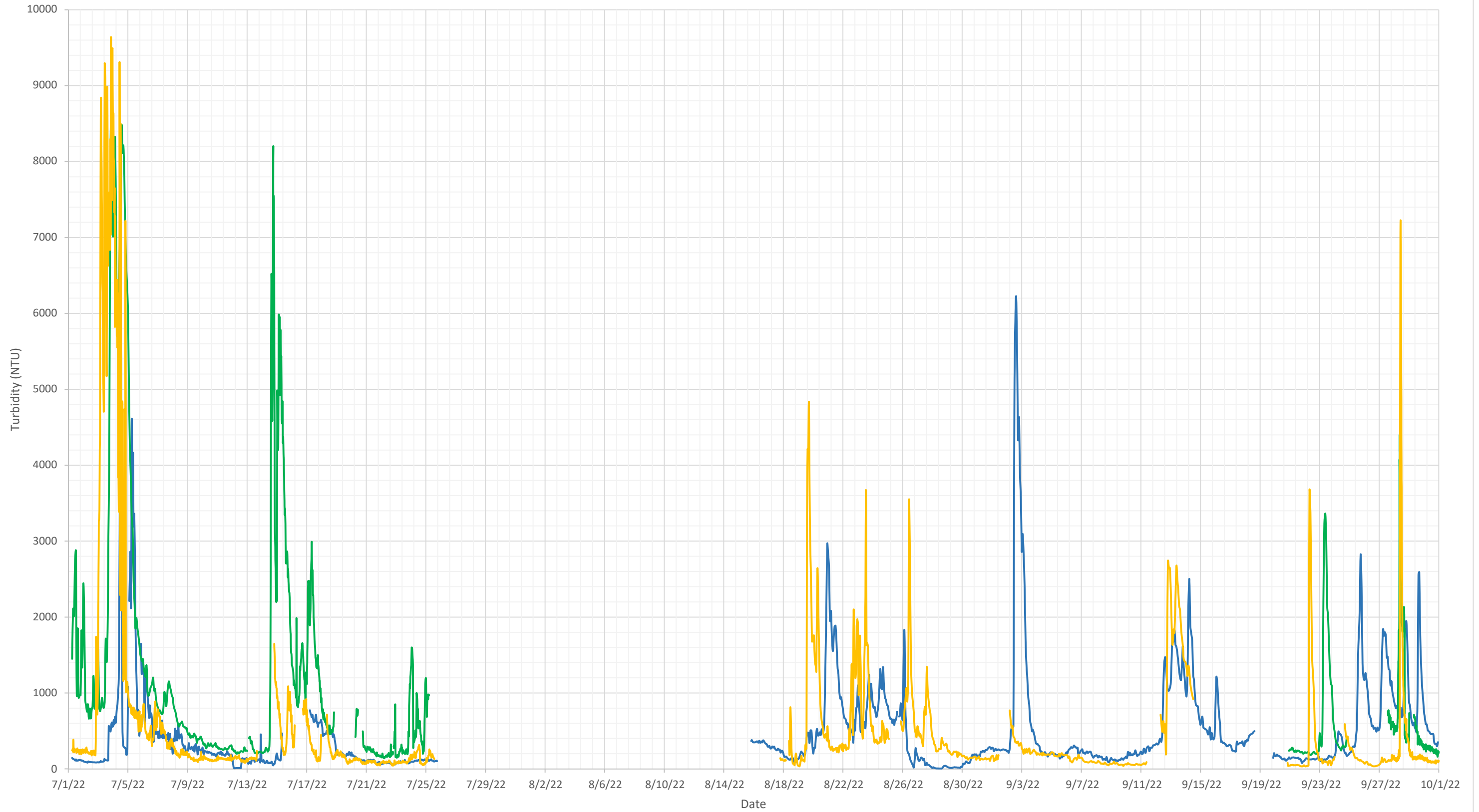
Isleta Central Sandia 550 Temperature Exceedance (32F)





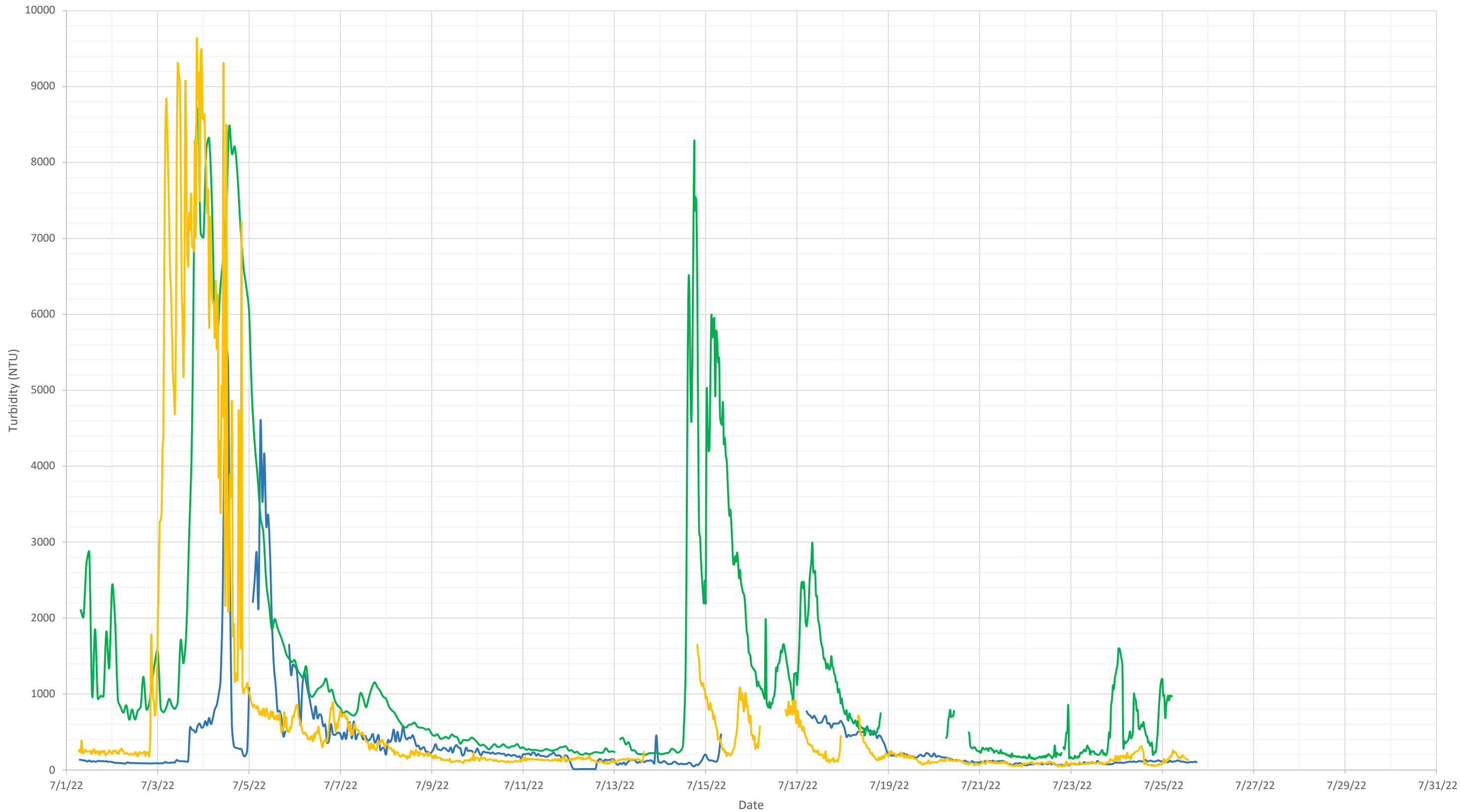
Turbidity - All Sondes - Quarter 3, 2022

Isleta Central Sandia 550



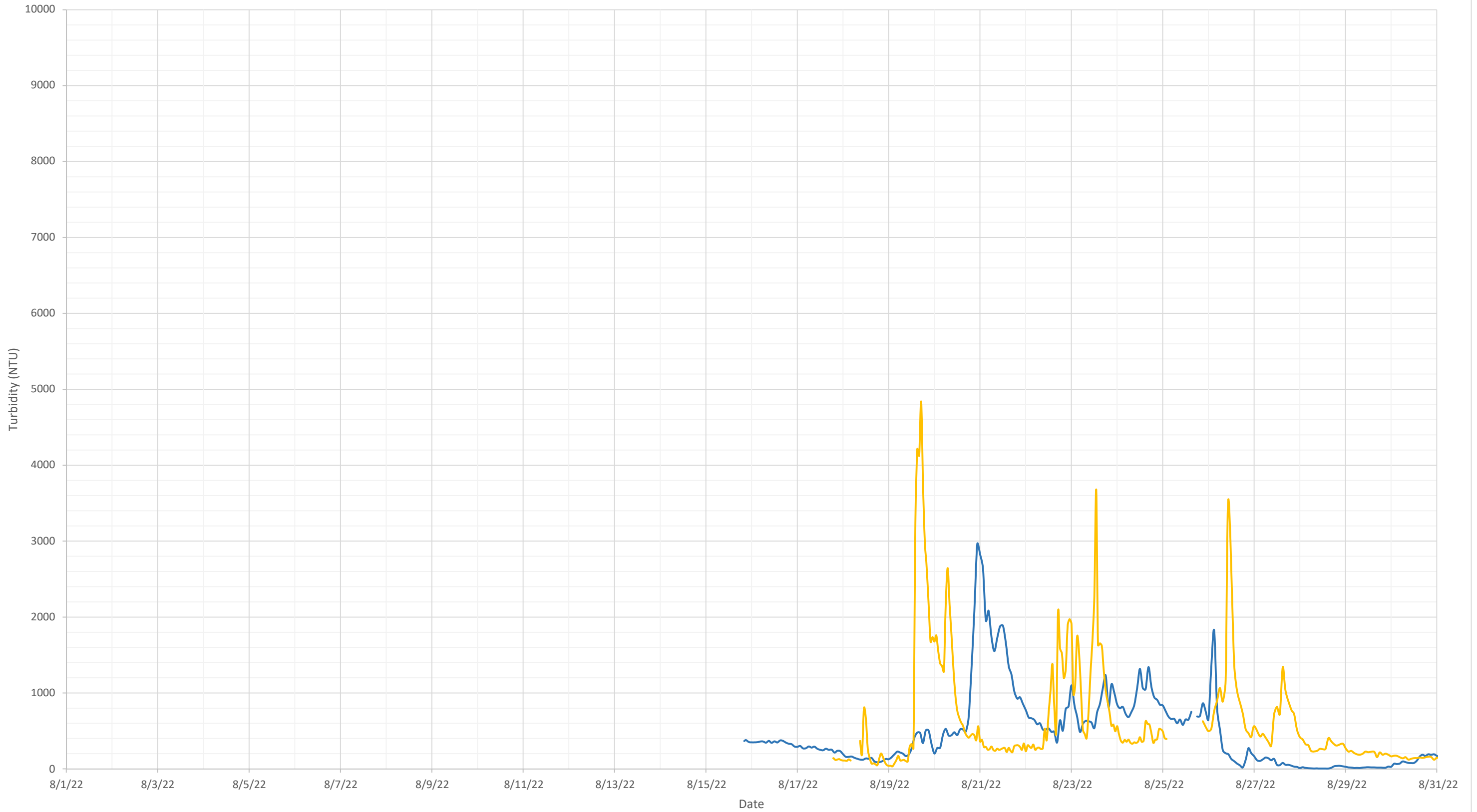
Turbidity - All Sondes - July 2022

Isleta Central Sandia 550



Turbidity - All Sondes - August 2022

Isleta Central Sandia 550



Turbidity - All Sondes -September 2022

Isleta Central Sandia 550

