



EPL 283 2020 - 2021 Monitoring Report



Reporting Period: 24th November 2020 – 24th November 2021

Date Submitted: 3rd December 21

Version Number: 1

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Executive Summary

This report outlines the following in relation to Environmental Protection Licence 283 for the reporting period of November 24 2020 until November 24 2021:

- Monitoring objectives and plan
- Monitoring results
 - Presentation
 - Tabular representation
 - Graphical representation
 - Water discharge log
 - Quality assurance/Quality control evaluation
- Discussion and Interpretation of results
 - Exceedance report for Total Suspended Solids
 - Exceedance report for Total Phosphorous
- Conclusion and proposed actions

Monitoring Plan and Objectives

The monitoring conditions are specified in sections 23, 24, 25, 26, 27, 28 and 29 in the Environmental Protection Licence (EPL 283). The specific details of the surface water monitoring plan are as follows:

Site Code				Sample Locations ¹			
				TSF Discharge 1 (Discharge Pond - Monitoring point for assessment of discharge water quality)	TSF Ambient 1 ² (Compliance point – where discharge water enters the Blackmore River)	TSF Ambient 3 (Monitoring point for assessment of background ambient water quality in Darwin Harbour)	INLET (Monitoring point for water being pumped into the facility)
Longitude				130.912222	130.910639	130.901938	130.908591
Latitude				-12.568233	-12.575809	-12.591187	-12.565763
Parameter	Abbreviation	Units	Trigger Values ³				
In situ (field) Measurements							
pH	pH	pH units	6.0-8.5	W	M	M	W
Electrical Conductivity	EC	µS/cm	NA	W	M	M	W
Dissolved Oxygen	DO	% saturation	80-100%	W	M	M	W
Turbidity	NTU	NTU	<4 ⁴	W	M	M	W
Temperature	T	°C	NA	W	M	M	W
Parameters to be assessed at a NATA accredited laboratory							
Biological Oxygen Demand	BOD	mg/L	NA	M	M	M	M
Total Suspended Solids	TSS	mg/L	<10	M	M	M	M
Filterable Reactive Phosphorous	FRP	µg/L	<10	M	M	M	M
Total Phosphorous	TP	µg/L	<30	M	M	M	M
Ammonia	NH ₃	µg/L	<20	M	M	M	M
Total Nitrogen	TN	µg/L	<300	M	M	M	M
Total Oxidised Nitrogen	NO _x	µg N/L	<20	M	M	M	M
Nitrate	NO ₃	µg/L	NA	M	M	M	M
Nitrite	NO ₂	µg/L	NA	M	M	M	M
Chlorophyll-a	Chl-α	µg/L	<4	M	M	M	M

W = Weekly during operation, when actively discharging wastewater in accordance with Table 2.

M = Monthly during operation, when actively discharging wastewater in accordance with Table 2.

NA = Not Available

¹ Monitoring Locations are shown in Attachment 3.

² For monitoring at this location, the sample must be collected during an outgoing or turning tide (not an incoming tide).

³ Water Quality Objectives for the Darwin Harbour Region – Blackmore River Estuary, to be applied to the compliance point (TSF Ambient 1).

⁴ Only applies where the turbidity value at TSF Discharge 1 is greater than the INLET on same sampling occasion.



Monitoring Results - Presentation

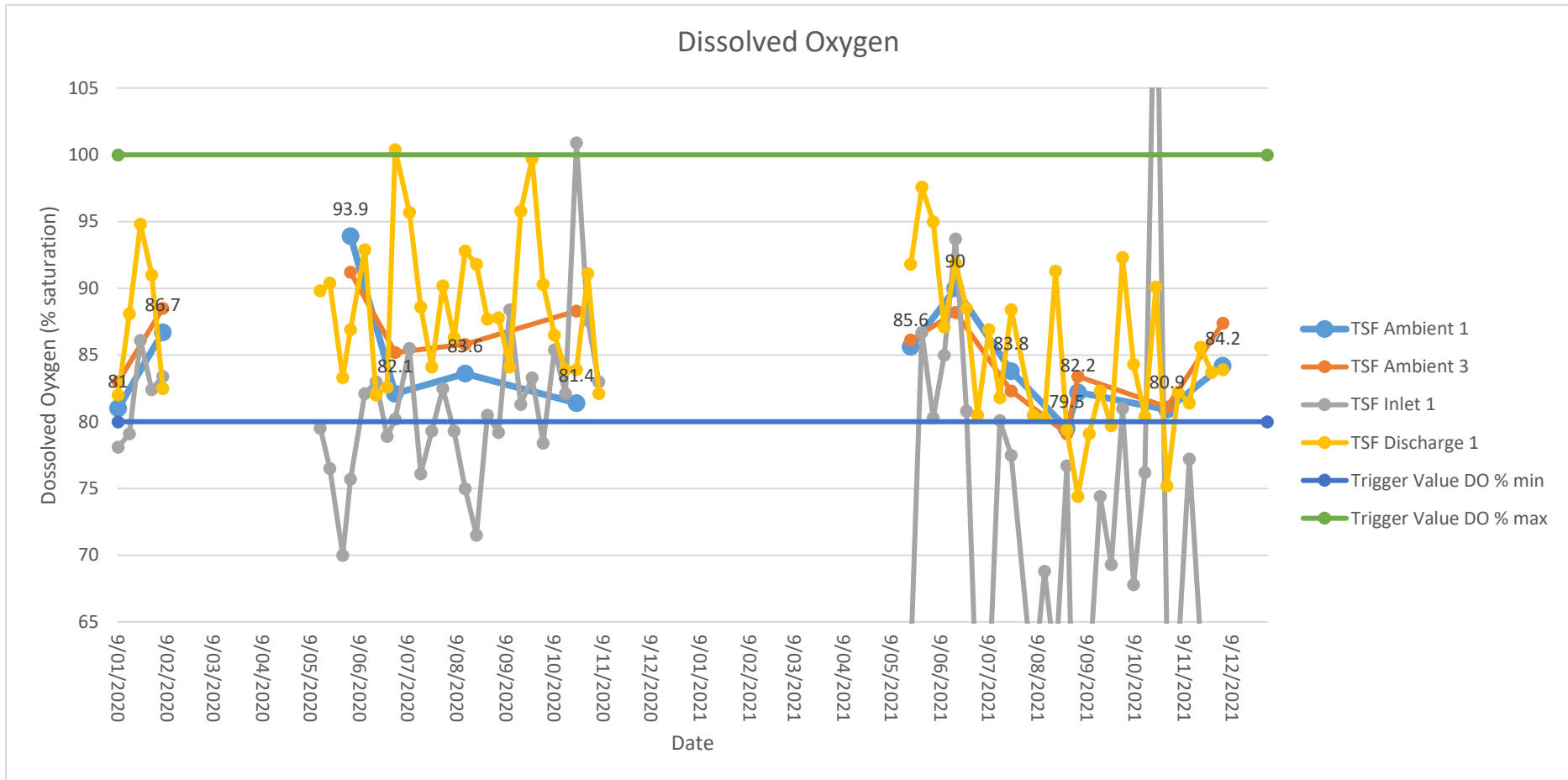
Tabulation of Results

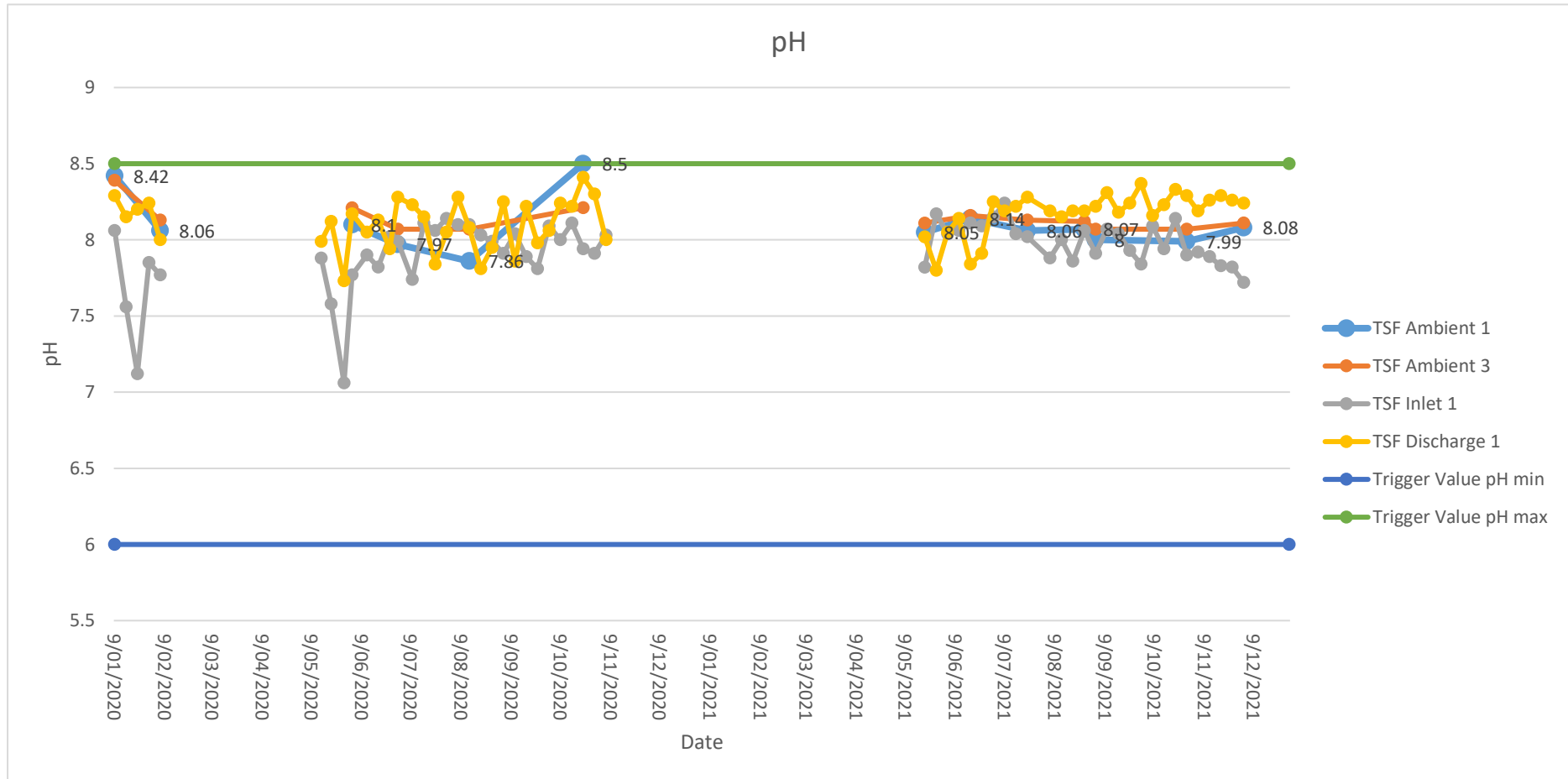
In situ (field) Measurements for the EPL 283 Surface Water Monitoring Plan November 2020 – November 2021

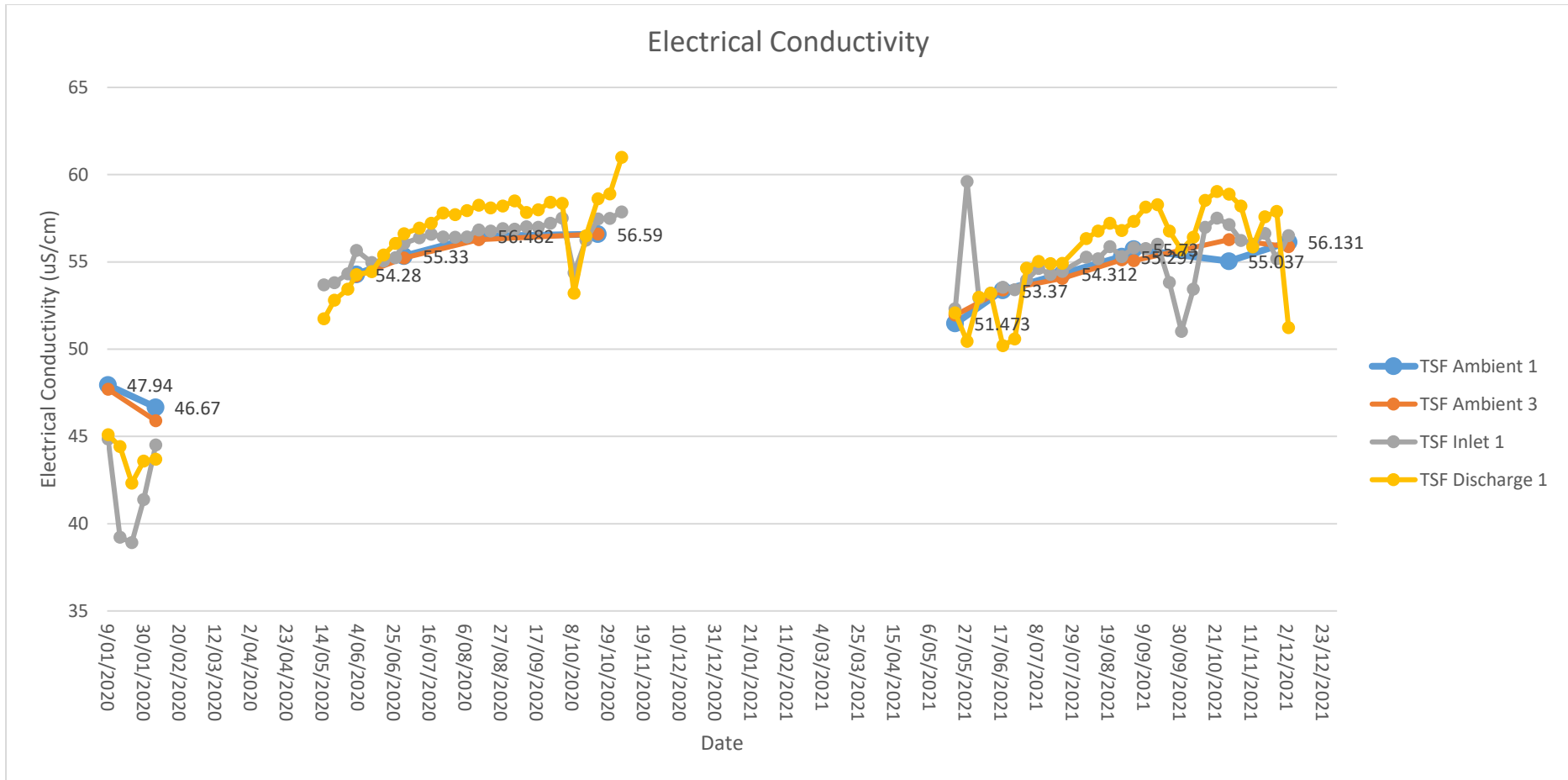
Date	TSF Ambient 1							TSF Ambient 3							TSF Inlet 1							TSF Discharge 1						
	DO mg/L	DO %	pH	EC	Temperature	Turbidity	Salinity	DO mg/L	DO %	pH	EC	Temperature	Turbidity	Salinity	DO mg/L	DO %	pH	EC	Temperature	Turbidity	Salinity	DO mg/L	DO %	pH	EC	Temperature	Turbidity	Salinity
27/11/2020	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
4/12/2020	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
11/12/2020	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
18/12/2020	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
25/12/2020	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
1/01/2021	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
8/01/2021	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
15/01/2021	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
22/01/2021	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
29/01/2021	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
5/02/2021	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
12/02/2021	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
19/02/2021	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
26/02/2021	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
5/03/2021	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
12/03/2021	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
19/03/2021	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
26/03/2021	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
2/04/2021	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
9/04/2021	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
16/04/2021	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
23/04/2021	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
30/04/2021	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
7/05/2021	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
14/05/2021	Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.							Ponds empty. No discharge.						
21/05/2021	5.65	85.6	8.05	51.47	26.9	0	33.77	5.64	86.1	8.11	51.9	27.3	0	34.11	4.22	62.5	7.82	52.31	25.4	23.5	34.43	6.09	91.8	8.02	52.07	26.4	3.89	34.22
28/05/2021															5.62	86.7	8.17	59.61	27.7	106.5	34.59	6.45	97.6	7.8	50.44	27.1	5.26	33
4/06/2021								5.18	80.3	8.04	52.91	27.3	34.85	5.83	95	8.05	52.97	28	27.3	34.85	5.83	95	8.05	52.97	31.2	12.81	34.43	
11/06/2021								5.61	85	8.06	53.21	26.5	44.3	35.06	5.74	87.1	8.14	53.21	26.5	44.3	35.06	5.74	87.1	8.14	53.21	26.5	3.47	35.06
18/06/2021	6.02	90	8.14	53.37	25.7	6.77	35.21	6	88.2	8.16	53.4	26.4	0.32	35.2	6.04	93.7	8.11	53.55	24.8	36.4	35.36	6.08	91.9	7.84	50.2	23.9	3.29	35.2
25/06/2021								5.4	80.8	8.09	53.41	26.5	17.2	35.22	5.89	88.5	7.91	50.58	26.1	17.2	35.22	5.89	88.5	7.91	50.58	26.1	7.41	35.82
2/07/2021								3.92	57.1	8.15	53.96	23.9	17.3	35.69	5.55	80.5	8.25	54.64	23.6	17.3	35.69	5.55	80.5	8.25	54.64	23.6	8.6	36.2
9/07/2021								3.81	60	8.24	54.63	28.5	42.7	36.06	5.51	86.9	8.19	55.03	28.6	42.7	36.06	5.51	86.9	8.19	55.03	28.6	3.1	36.35
16/07/2021								5.31	80.1	8.04	54.28	26	22.9	35.88	5.34	81.8	8.22	54.9	26.7	22.9	35.88	5.34	81.8	8.22	54.9	26.7	0	36.31
23/07/2021	5.57	83.8	8.06	54.31	25.8	10.38	35.9	5.43	82.3	8.13	54.1	26.3	12.4	35.7	5.21	77.5	8.02	54.45	25.1	43.6	36.02	5.87	88.4	8.28	54.92	25.7	0	36.36
30/07/2021	Covid 19 Lockdown. No Sample														Covid 19 Lockdown. No Sample.													
6/08/2021								4.08	60.2	7.88	55.27	24.4	16.29	36.02	5.5	80.5	8.19	56.33	23.7	16.29	36.02	5.5	80.5	8.19	56.33	23.7	1.05	37.46
13/08/2021								4.48	68.8	8	55.19	26.8	13.91	36.65	5.17	80.3	8.15	56.77	27.1	13.91	36.65	5.17	80.3	8.15	56.77	27.1	2.92	37.7
20/08/2021								3.99	61.6	7.86	55.87	27	41.5	36.53	5.78	91.3	8.19	57.21	28	41.5	36.53	5.78	91.3	8.19	57.21	28	4.48	38.01
27/08/2021	5.13	79.5	8.07	55.3	27.4		36.59	5.09	79.1	8.12	55.1	27.5		36.46	5.01	76.7	8.06	55.31	26.6	28.4	37.03	5.19	79.4	8.19	56.79	26.2	7.54	37.75
3/09/2021	5.2	82.2	8	55.73	28.7	2.51	36.88	5.28	83.4	8.07	55.1	28.6	0	36.39	2.48	39.2	7.91	55.81	28.6	70.1	36.62	4.6	74.4	8.22	57.33	29.5	0	38.05
10/09/2021								3.94	61.1	8.07	55.77	27.2	18.94	36.94	5.12	79.1	8.31	58.14	26.5	18.94	36.94	5.12	79.1	8.31	58.14	26.5	10.8	38.76
17/09/2021								5.09	74.4	8.04	56.01	29.7	22.4	37.21	5.21	82.3	8.18	58.28	30.4	22.4	37.21	5.21	82.3	8.18	58.28	30.4	7.41	38.88
24/09/2021								4.5	69.3	7.93	53.82	31.1	85.5	35.81	5.1	79.7	8.24	56.77	32.3	85.5	35.81	5.1	79.7	8.24	56.77	32.3	2.05	37.75
1/10/2021								4.72	81	7.84	51.01	35.1	128.9	33.15	5.34	92.3	8.37	55.68	34.3	128.9	33.15	5.34	92.3	8.37	55.68	34.3	12.67	36.63
8/10/2021								4.21	67.8	8.09	53.44	30.5	19.22	35.21	5.09	84.3	8.16	56.41	30.9	19.22	35.21	5.09	84.3	8.16	56.41	30.9	1.31	37.4
15/10/2021								5.19	76.2	7.94	56.98	35.2	47.84	37.74	4.89	80.4	8.23	58.52	34.2	47.84	37.74	4.89	80.4	8.23	58.52	34.2	3.65	38.92
22/10/2021								6.79	120	8.14	57.51	35.4	93.7	37.94	5.12	90.1	8.33	59.03	34.6	93.7	37.94	5.12	90.1	8.33	59.03	34.6	7.13	39.12
29/10/2021	4.87	80.9	7.99	55.04	31.8	0	36.25	4.86	81.1	8.07	56.3	31.8	0	37.17	3.83	63.2	7.9	57.14	30.8	10.43	37.86	4.48	75.2	8.29	58.89	31.5	0	39.14
5/11/2021								4.12	62.8	7.92	56.23	34.1	51.1	37.11	4.59	82.2	8.19	58.21	33.3	51.1	37.11	4.59	82.2	8.19	58.21	33.3	5.86	38.86
12/11/2021								4.6	77.2	7.89	56.01	32.2	20.9	36.96	4.64	81.4	8.26	55.86	35.2	20.9	36.96	4.64	81.4	8.26	55.86	35.2	10.2	36.72
19/11/2021								3.67	63.5	7.83	56.63	34	81.1	37.35	4.91	85.6	8.29	57.58	34.3	81.1	37.35	4.91	85.6	8.29	57.58	34.3	13.68	38.04
26/11/2021								3.64	59.6	7.82	55.17	30.8	20.8	36.39	4.9	83.7	8.26	57.89	32.9	20.8	36.39	4.9	83.7	8.26	57.89	32.9	6.95	38.34
3/12/2021	4.97	84.2	8.08	56.13	32.7	0.13	37.03	5.22	87.4	8.11	55.9	32.2	0	36.86	3.31	55.4	7.72	56.51	31.9	34.8	37.35	5.05	83.9	8.24	51.23	32.8	8.83	33.39

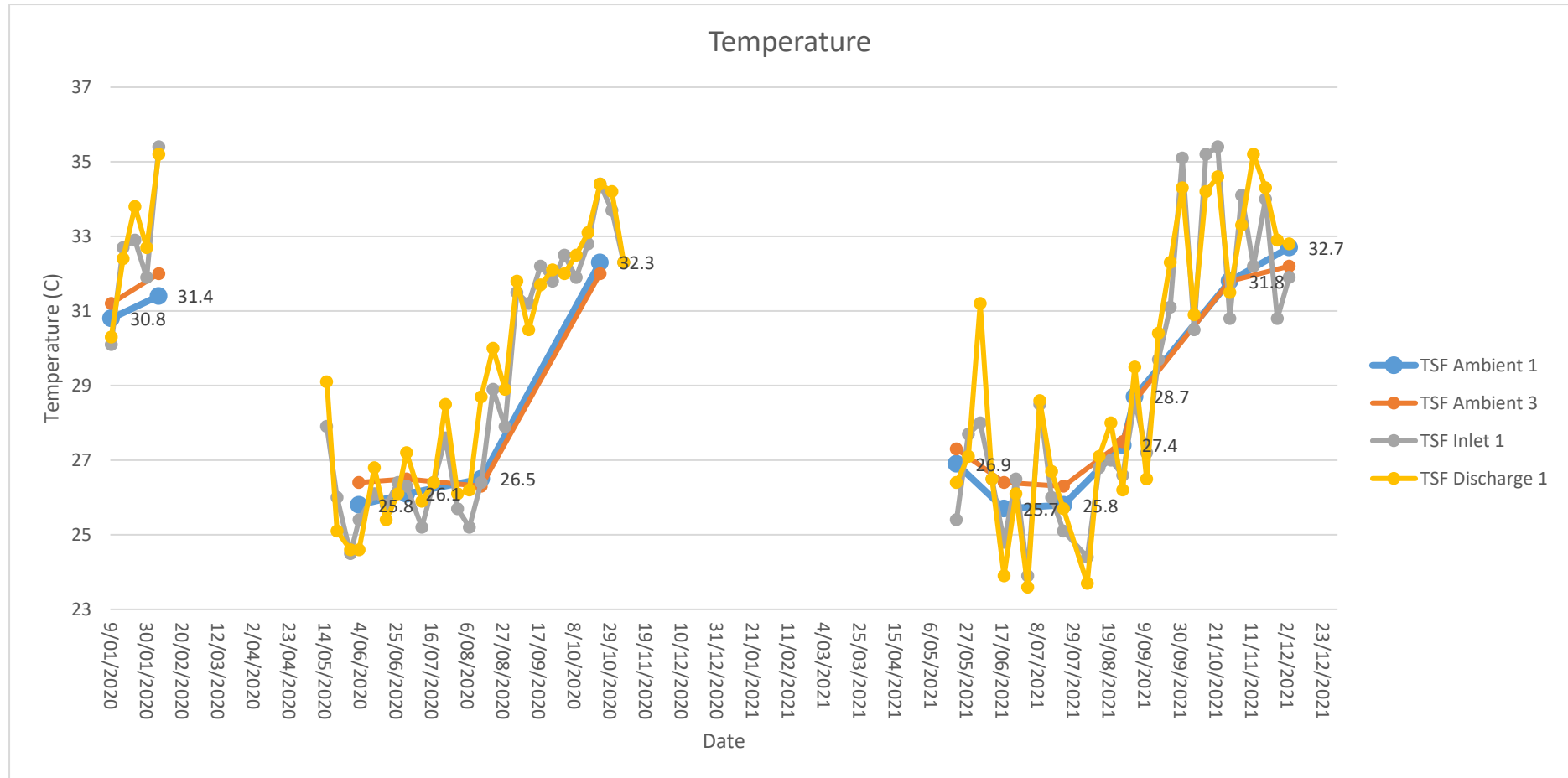


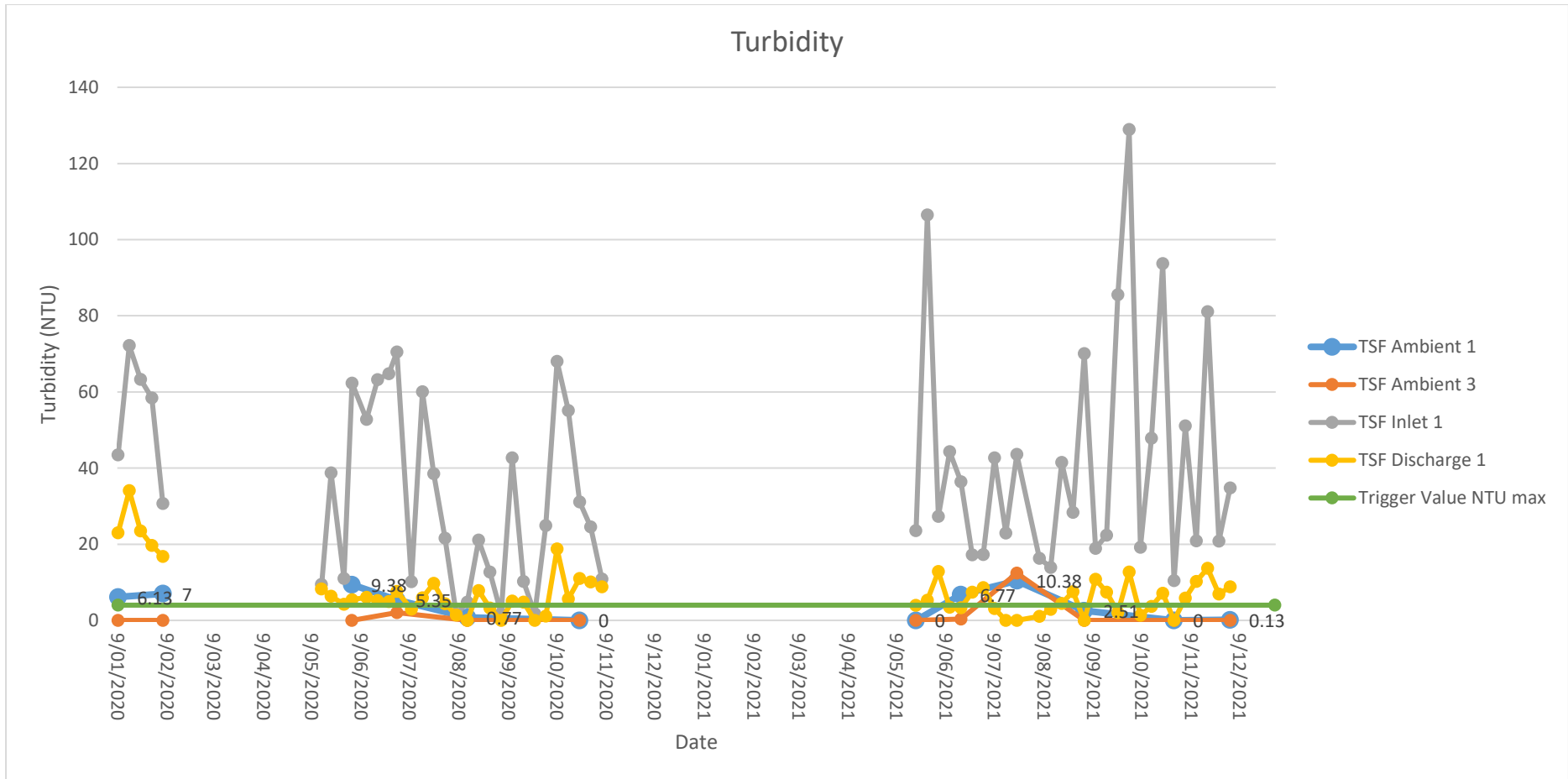
Graphs of Results

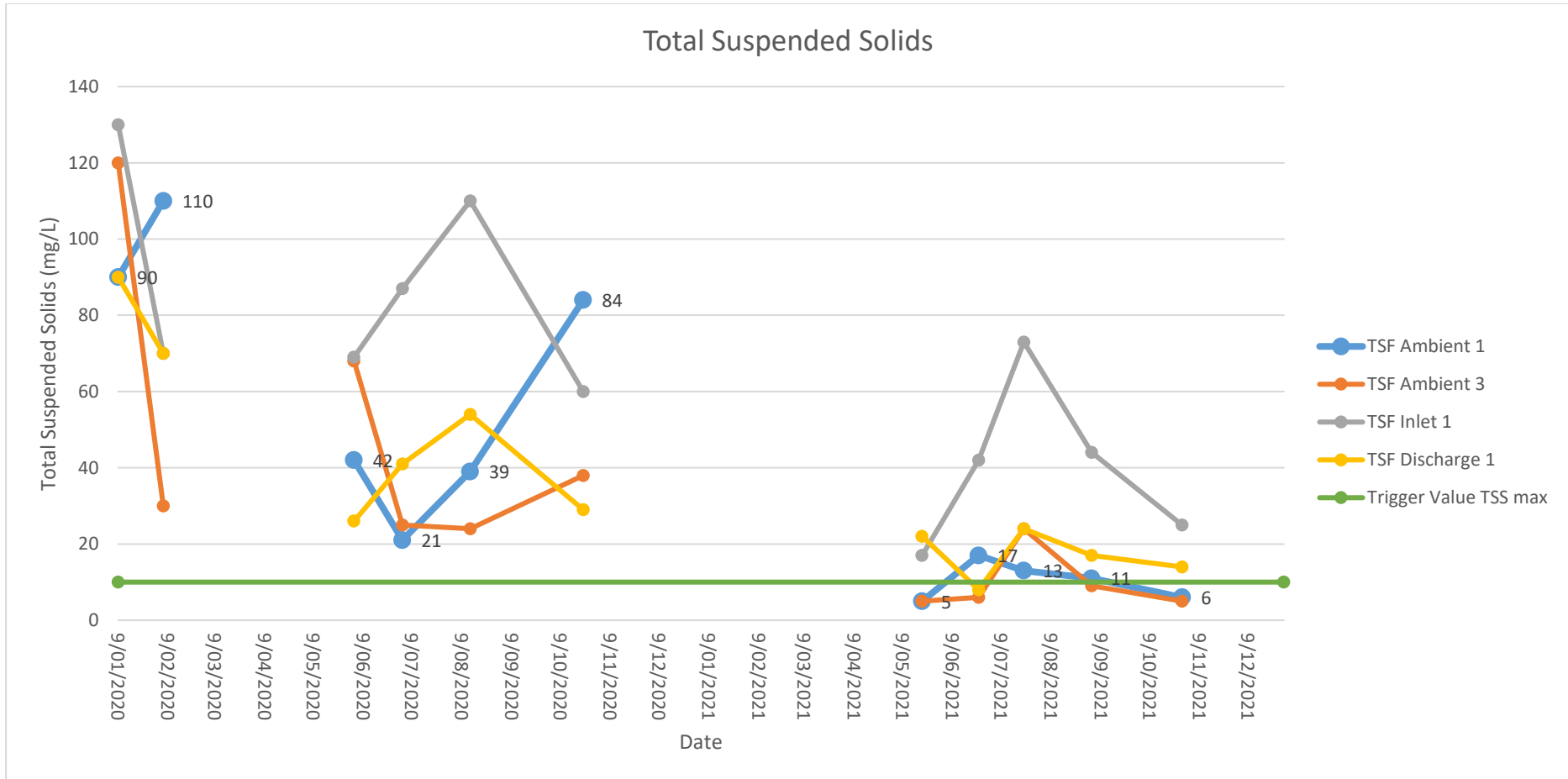


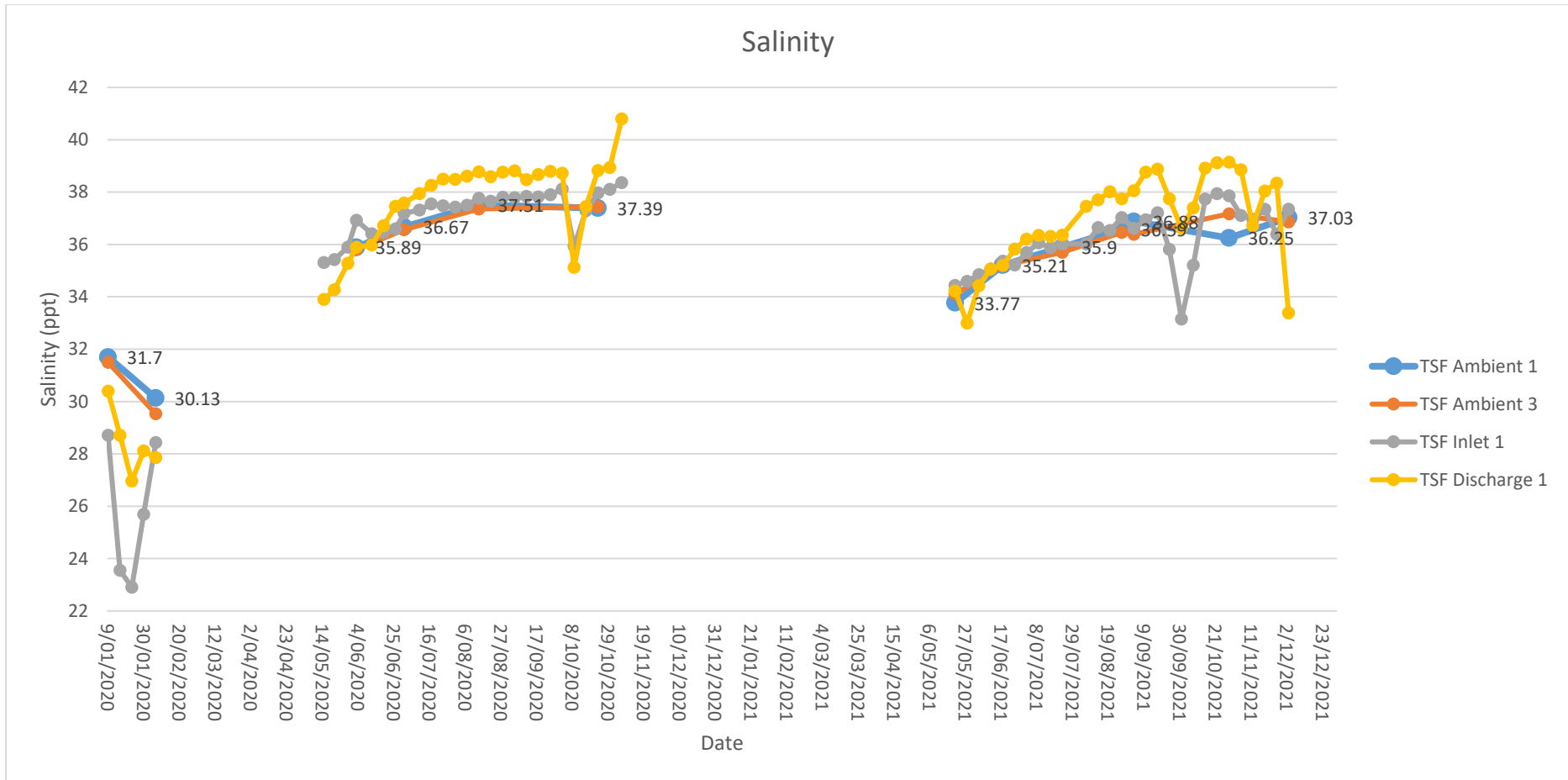


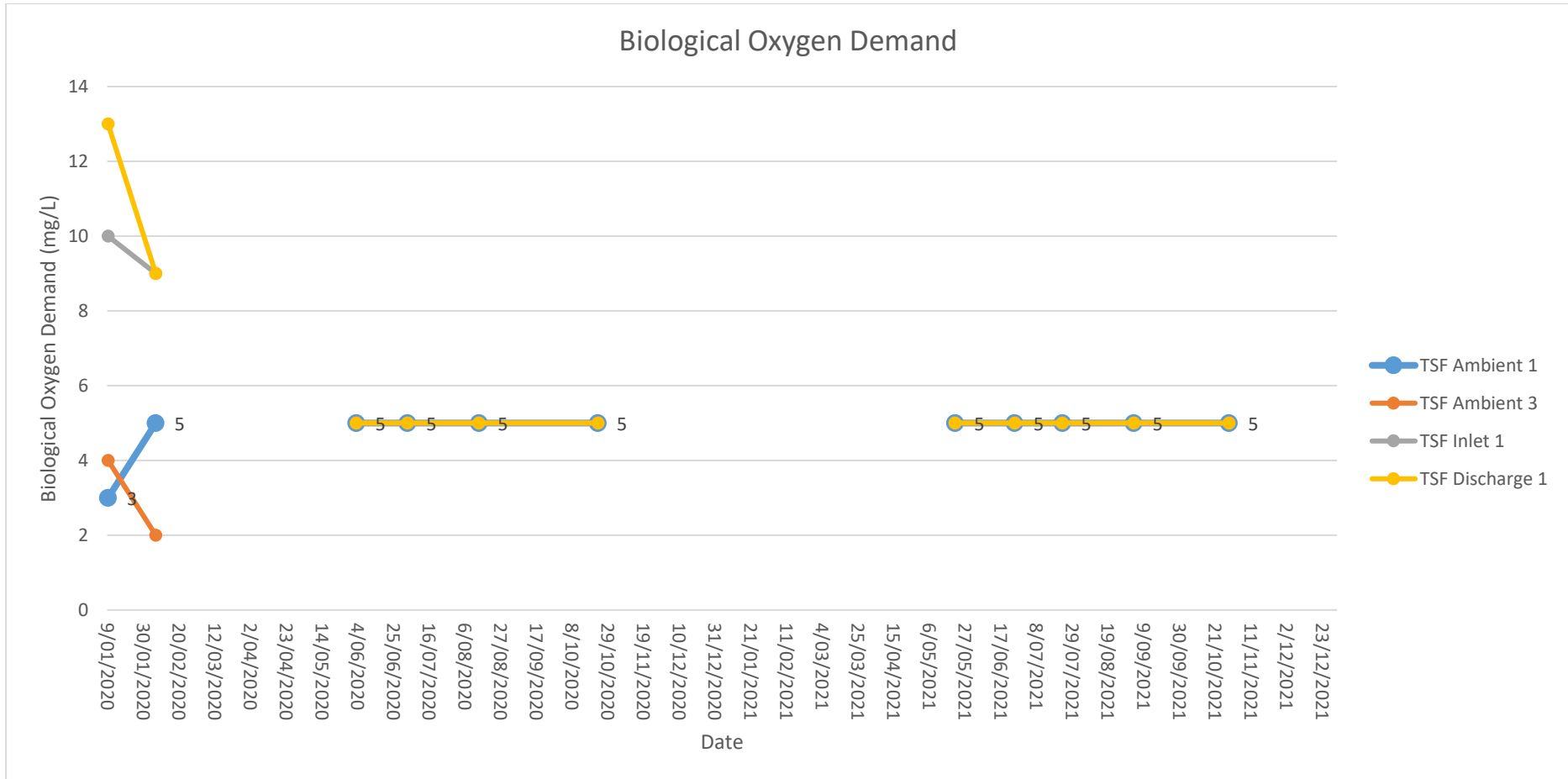


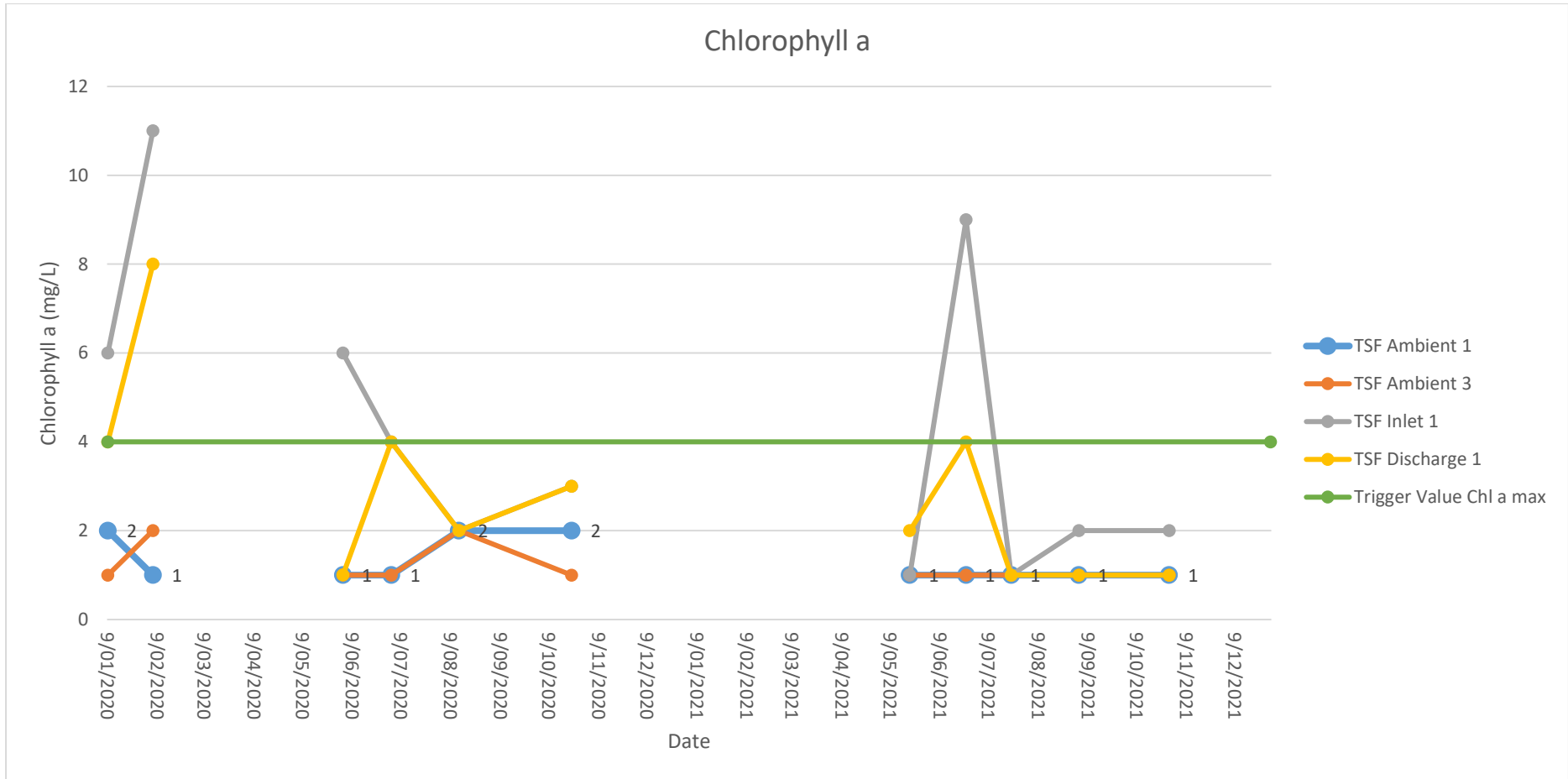


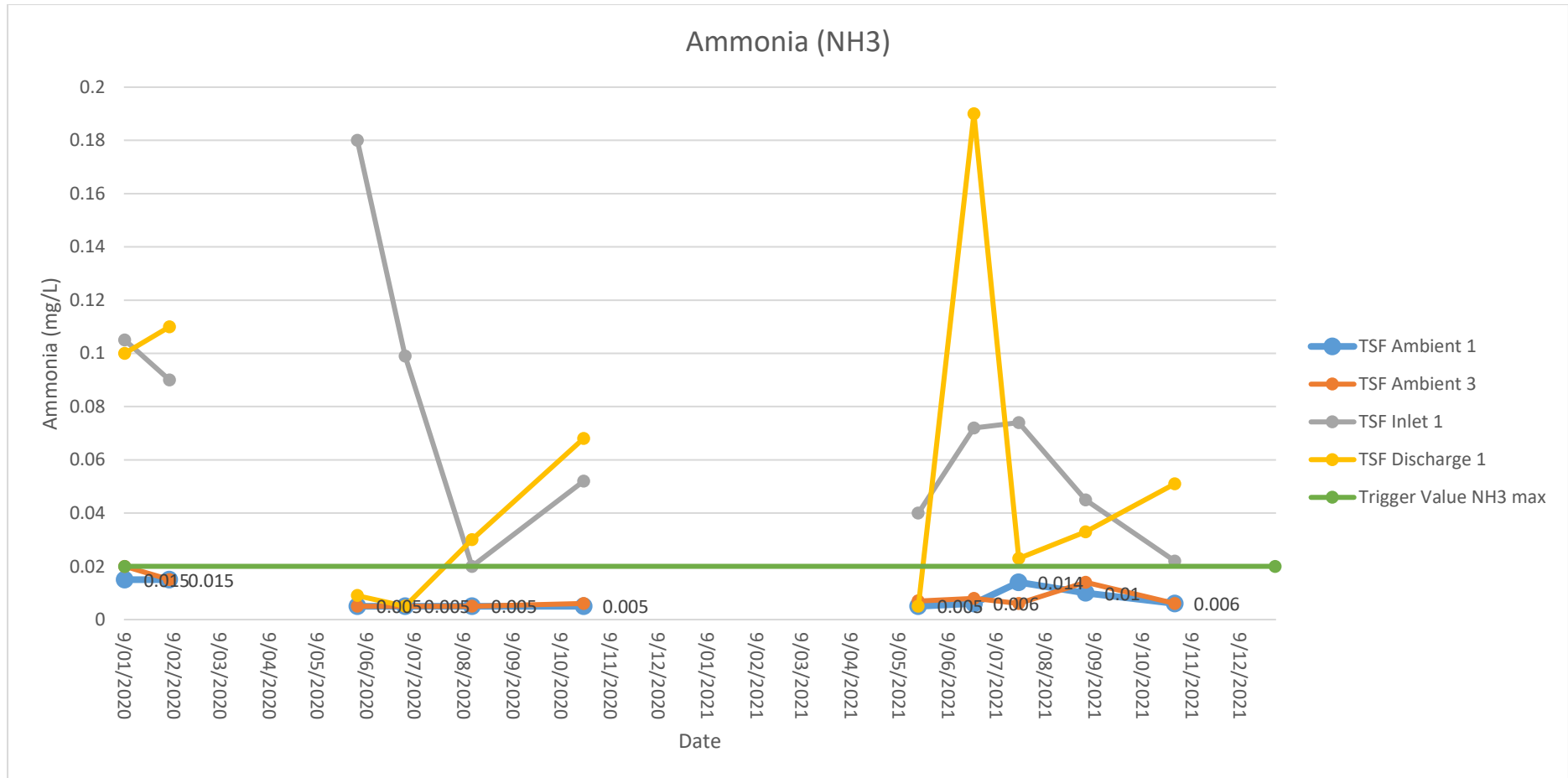


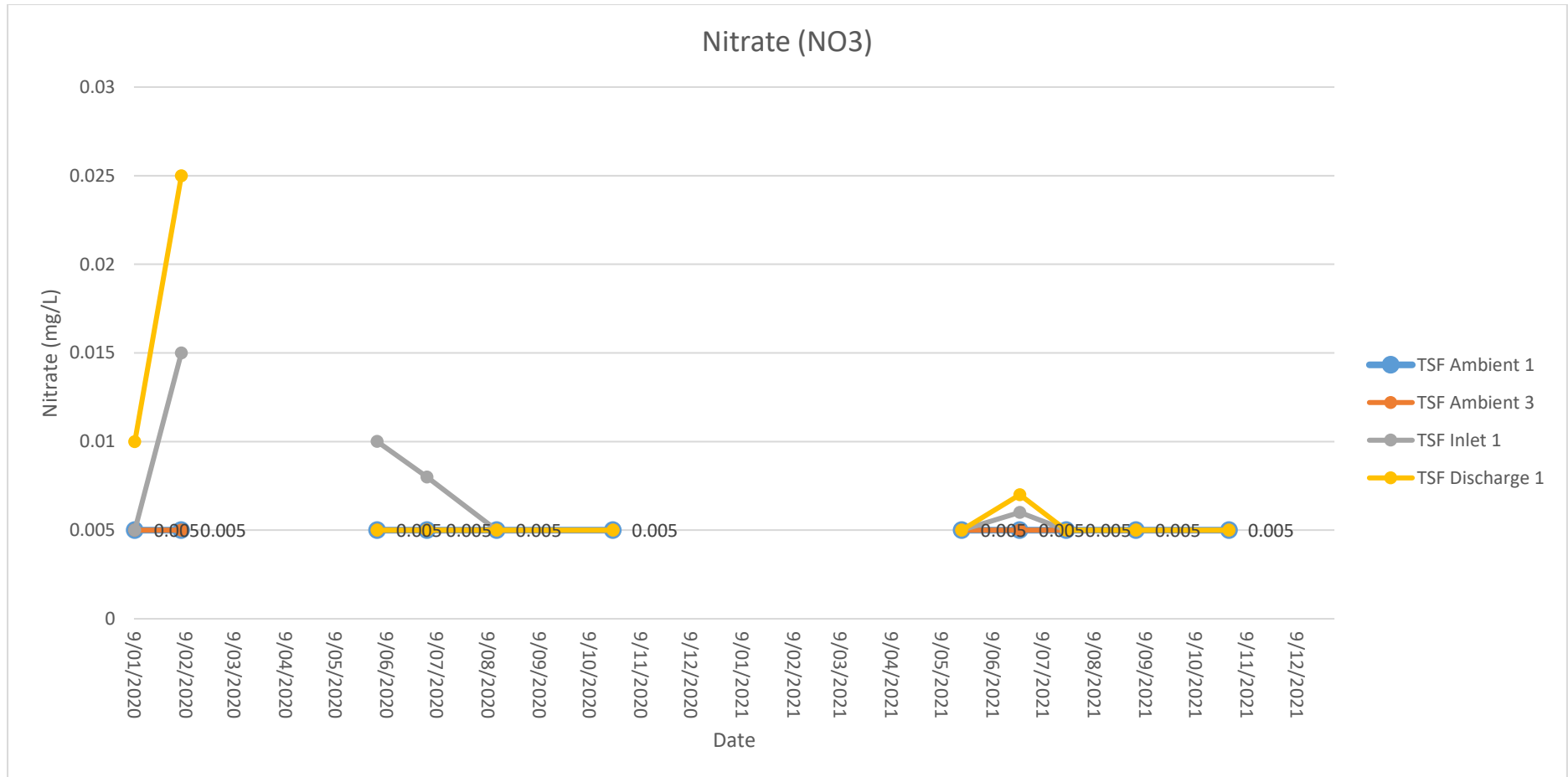


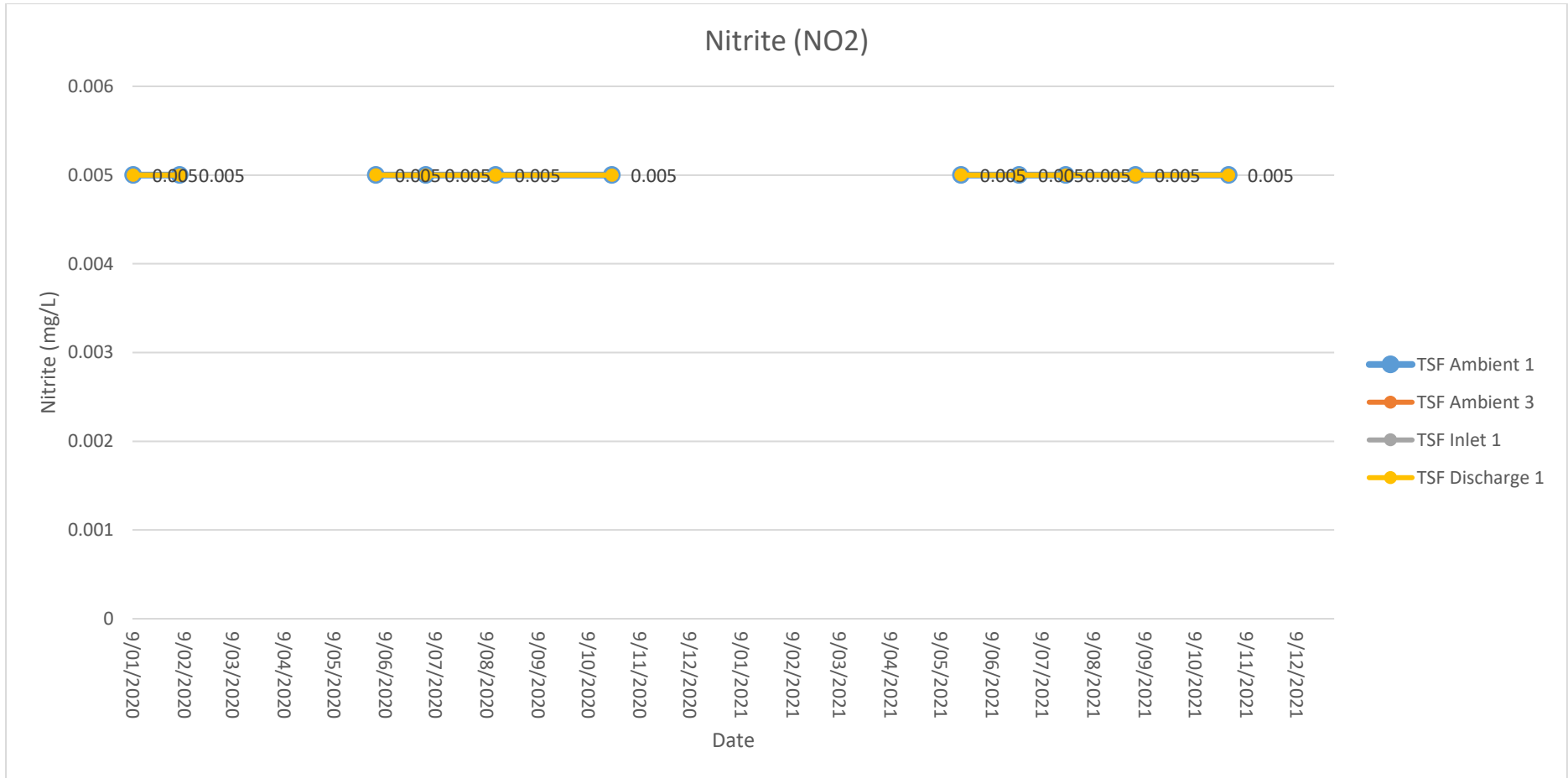


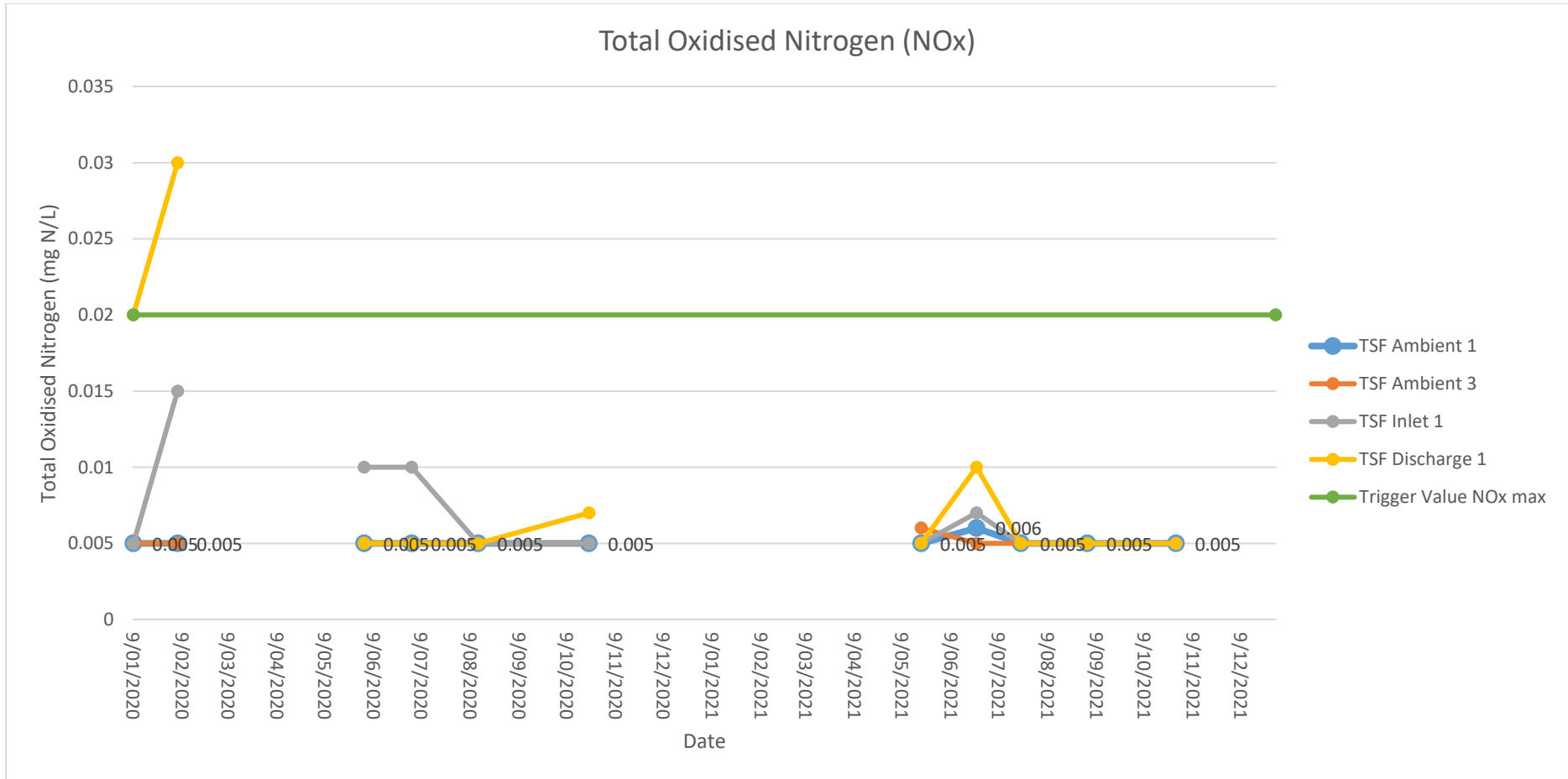


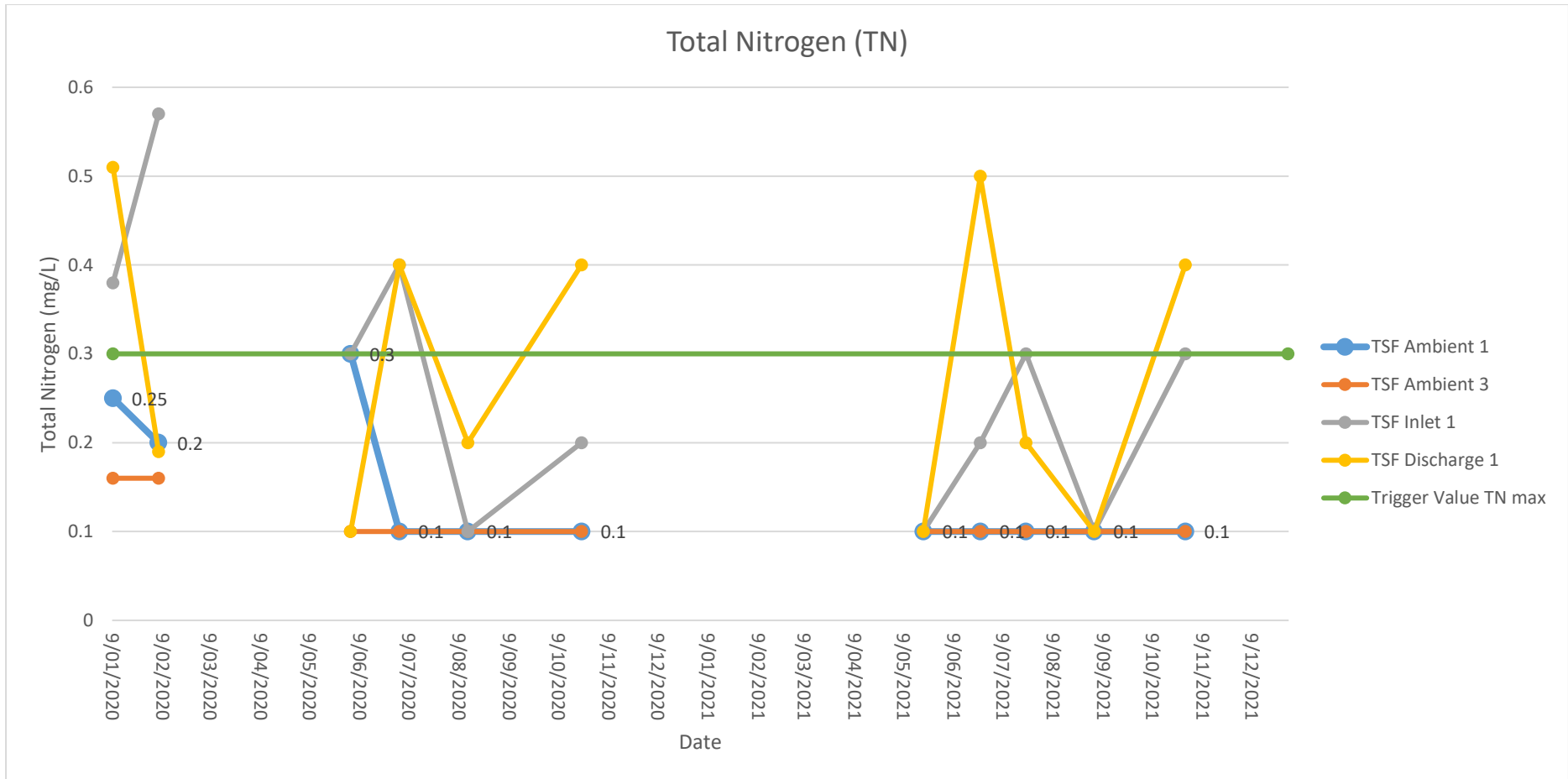


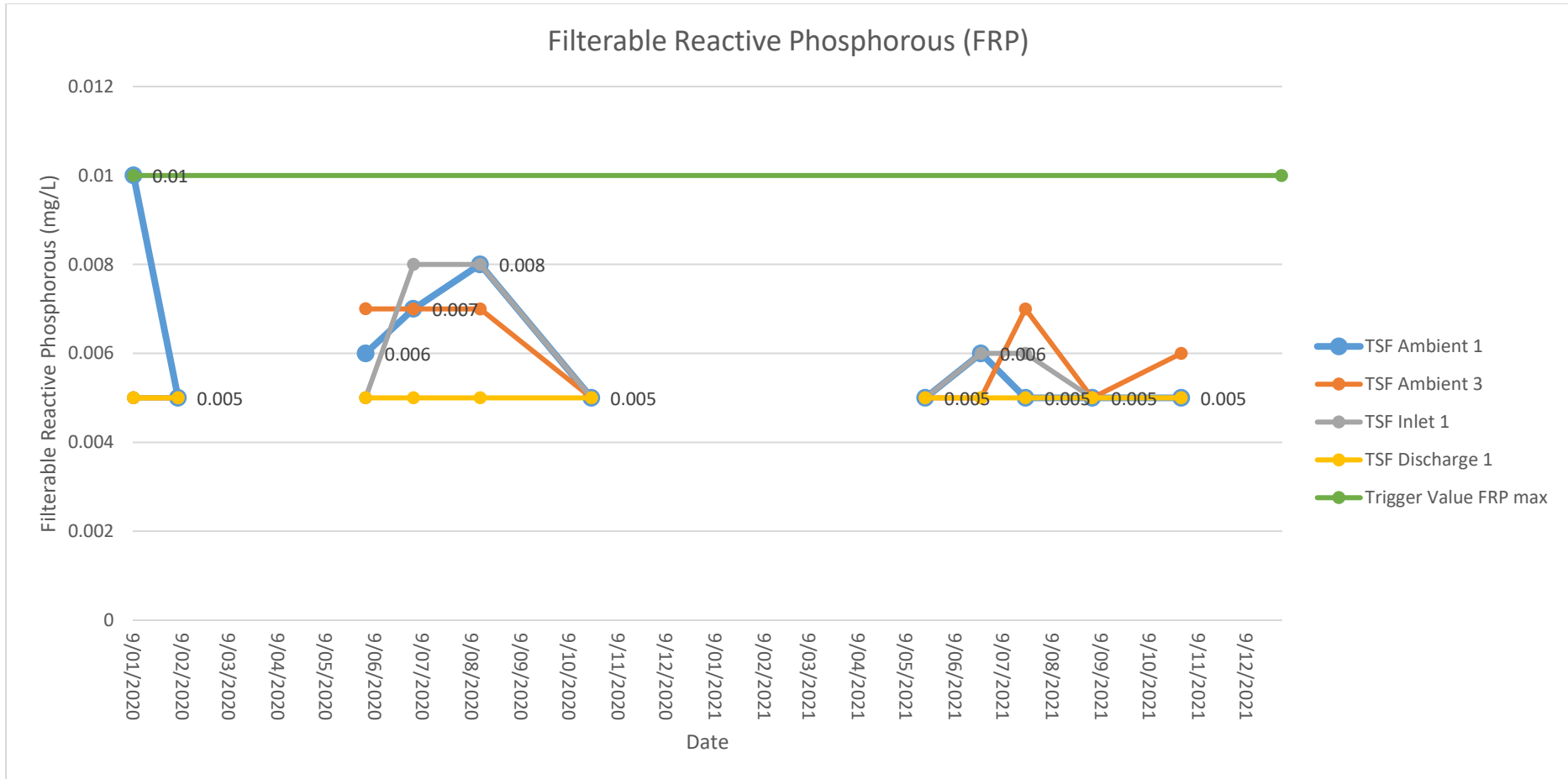


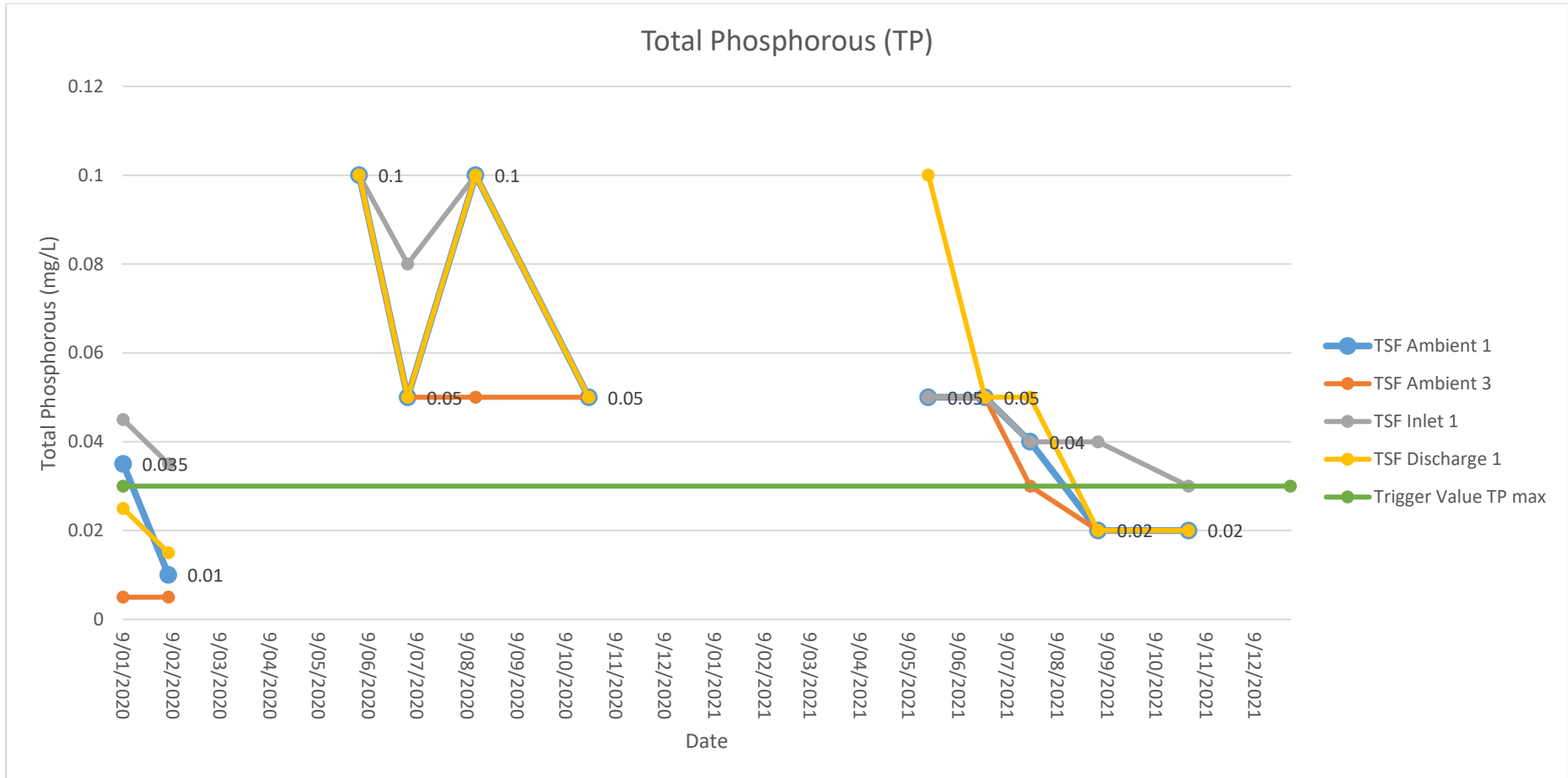














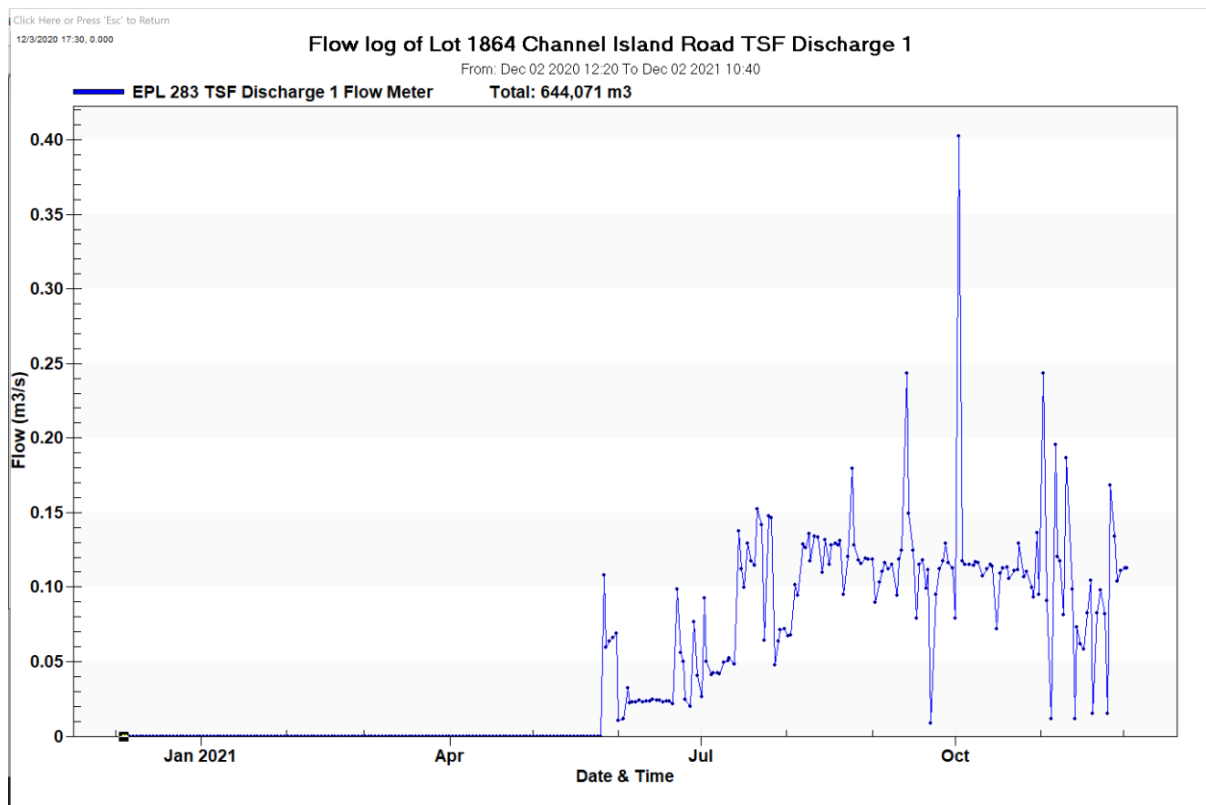
Water Discharge Log

The graph below details the water discharged from the site TSF Discharge 1 as recorded by the water flow meter.

The graph shows a few high peaks during September, October, and November. These are from rainfall events.

A period of no discharge is observed from the start of this monitoring period until discharge at the site begins again in late May. The rest of the year shows steady increase in discharge as more ponds are used in production. The flow rate from August until October November is believed to be near maximum for the site as all ponds and tanks were being used at this time.

The total discharge for this time is 664071m³.





Monitoring Results – Quality Assurance / Quality Control Evaluation

In situ (field) measurements for the surface water monitoring plan for this reporting period were conducted weekly when discharging for the TSF Inlet 1 and TSF Discharge 1 sites, and monthly for the TSF Ambient 1 and TSF Ambient 3 sites. Sampling was missed on the 30-7-21 due to local Covid lockdown restrictions.

Parameters to be assessed at a NATA accredited laboratory were sampled monthly for all 4 sites. The August sample was repeated in the first week of September as Covid delays on freight to the NATA laboratory meant that the samples did not arrive in time to be properly assessed.

The site was not in operation from the 13-11-20 until the 17-05-21. Sampling did not occur during these periods when not discharging.

Discussion and Interpretation of Results

In situ (field) Measurements

The readings at the compliance point for the in situ (field) measurements all fell below the trigger values for pH and dissolved oxygen. The measurements for turbidity however exceeded the trigger values on two occasions. On each exceedance occasion the reading at the compliance point was lower than the Inlet. The note to turbidity on the Surface Water Monitoring Plan states that the exceedance “only applies where the turbidity value at TSF Discharge 1 is greater than the inlet on the same sampling occasion” making the exceedance non applicable.

Parameters to be assessed at a NATA accredited laboratory

The measurements at the compliance point for the NATA assessed parameters were below the trigger values for; filterable reactive phosphorous, ammonia, total nitrogen, total oxidised nitrogen, and chlorophyll a. There were exceedances in Total Suspended Solids (TSS) and Total Phosphorus (TP).

Exceedance – Total Suspended Solids

Sampling Date	Total Suspended Solids (mg/L)				Key
	TSF Ambient 1 (compliance point)	TSF Ambient 3	TSF Inlet 1	TSF Discharge 1	
21/05/2021	5	5	17	22	less than trigger value
25/06/2021	17	6	42	8	exceedance of trigger value (x1 – x3)
23/07/2021	13	24	73	24	non-compliance of trigger value (>x3)
3/09/2021	11	9	44	17	
29/10/2021	6	5	25	14	Trigger value 10

Actual and potential causes and the contributing factors to the exceedance

The results show exceedances of the trigger values for Total Suspended Solids (TSS) at all the monitoring sites, most noticeably the TSF Inlet 1. This was also reported in the EPL 283 2019 – 2020 Monitoring Report and frequently in reports for the previous waste discharge licence (WDL 173-05). It appears that the high TSS measurements are not a result of the ponds operation and are more likely a result of the natural environment of Darwin Harbour.

Risk of environmental harm arising from the exceedance

Nil.

Action(s) that have or will be taken to address the exceedance

Perhaps we could review Total Suspended Solids as a trigger for an exceedance and non-compliance.

If no action was taken, why was no action taken



Exceedance and Non-Compliance Report – Total Phosphorus

Sampling Date	Phosphorus - Total (mg/L)				Key
	TSF Ambient 1 (compliance point)	TSF Ambient 3	TSF Inlet 1	TSF Discharge 1	
21/05/2021	<0.05	<0.05	<0.05	0.1	less than trigger value
25/06/2021	<0.05	<0.05	<0.05	<0.05	exceedance of trigger value (x1 – x3)
23/07/2021	0.04	0.03	0.04	<0.05	non-compliance of trigger value (>x3)
3/09/2021	0.02	0.02	0.04	0.02	
29/10/2021	0.02	0.02	0.03	0.02	Trigger value 0.03

Actual and potential causes and the contributing factors to the exceedance and non-compliances

Across all of the monitoring sites, exceedances for Total Phosphorus are common. Each exceedance at the TSF Ambient 1 compliance point was equal to, or lower than Inlet for the same sampling period. This was also observed in the EPL 286 2019 – 2021 Monitoring Report. Its therefore unlikely that the operation of the ponds is the cause of the exceedances against the trigger values and is more likely to be the result of a local condition of the environment.

Risk of environmental harm arising from the exceedance and non-compliances

Nil

Action(s) that have or will be taken to address the exceedance and non-compliance

Perhaps we could review Total Phosphorous as a trigger for an exceedance and non-compliance.

If no action was taken, why was no action taken



Conclusion and Proposed Actions

There have been exceedances against the trigger values for Total Suspended Solids and Total Phosphorus at the TSF Ambient 1 compliance point. Reasonable explanations for these are outlined above. It is of my opinion that none of these are caused by the operation of the ponds facility or would have caused any environmental harm.

A thought to review the trigger values for the Total Suspended Solids and Total Phosphorous parameters should be considered as the water quality objectives are often exceeded in all monitoring locations.