Santos

Darwin LNG

Annual Environmental Monitoring Report

1 January 2022 – 31 December 2022

EPL217-03

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28/02/22	0	Final submission to NT EPA	JD/DC	JB	WJ

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Table of Contents:

Attachments:

1.0 Executive Summary

Santos NA Darwin Pipeline Pty Ltd (Santos) is the operator of the Darwin Liquefied Natural Gas facility (DLNG) at Wickham Point, near Darwin, in the Northern Territory (NT) of Australia. DLNG receives dry natural gas from the Bayu-Undan field located in Timor-Leste offshore waters via a pipeline. The dry gas is liquefied, stored, and exported from the DLNG facility.

As a facility producing over 500,000 tonnes of Liquefied natural gas (LNG) annually, DLNG is required by Schedule 2 of the *NT Waste Management and Pollution Control Act 1998* to have an environmental licence (the Licence). The Licence requires Santos to provide an Annual Monitoring Report (this report). This report includes the environmental monitoring results in relation to the Licence for the period between 1 January 2022 and 31 December 2022. This report has been developed in line with Condition 84 of the Licence and the NT Environmental Protection Authority (EPA) Guideline for Reporting on Environmental Monitoring.

The Licence requires that Santos undertake a range of environmental monitoring programs in relation to the DLNG facility, including;

- Discharges to water
- Discharges to air, and
- Discharges to land and surrounding environment.

Monitoring results for each of these environmental monitoring programs are provided in this report.

1.1 Discharges to water

Total volume of irrigation water discharged was below the Licence limit and significantly less than previous years with a declining trend since 2016. Water quality sampling of the irrigation discharge showed the licence trigger values were exceeded for BOD, NH_3-N, NO_3-N, NO_2-N and PO_4-P, including an instance of four values over triple the trigger values. This is an ongoing non-compliance that the NT EPA is aware of. The new STP is expected to rectify the cause of these exceedances that resulted in these non-conformances.

The total volume of Jetty outfall water discharged was below the Licence limit and significantly less than previous years with a declining trend since 2016. Water quality parameters in the jetty outfall discharge during 2022 were generally within the Licence trigger values and consistent with or below the long term average. The exceptions were zinc and ammonium nitrogen (NH_3-N). These exceedances did not result in an exceedance in the jetty outfall mixing zone or trigger a reportable non-conformance to the NT EPA. Several other exceedances were observed in the mixing zone; however, all were considered to be compliant with the Licence.

Field measurements for the discharge of all sediment ponds during 2022 were generally consistent with the long term average and were within the Licence trigger values with the following exceptions: Turbidity, and copper. Neither of these events triggered a reportable non-conformance to the NT EPA with all other parameters being below the Licence limits.

Mangrove survey results for 2022 indicated that mangroves remain in good condition, with canopy cover characteristic of healthy mangrove assemblages. Examination of long-term trends in canopy data demonstrate that mangrove health has remained stable or slightly improved during

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the 20 years since program commencement. Overall, defoliation index or tree condition recorded at each surveillance site showed minimal changes from the previous survey and that all changes recorded survey were naturally occurring. This confirms that the mangrove forests surrounding the DLNG site remain in a stable and healthy condition. The 2022 mangrove groundwater salinity results demonstrated consistency with previous monitoring since the baseline.

The extent of sediment deposition or accretion recorded long term has not been detrimental to mangrove health with small net differences at most sites reported in 2022. The sediment chemical results indicate sediments are predominantly un-influenced chemically by DLNG operations. Several sediment samples analysed in 2022 reported Total Recoverable Hydrocarbons (TRH) above the laboratory limit of reporting and at levels greater than the historical range. The cause behind these readings is unknown however it is highly unlikely to be a result of DLNG due to levels being similar across all sites including control sites.

Metal concentrations observed in the 2022 mudwhelk samples were below the recommended guidelines for all metals except lead. Although this is an unusual spike in the data set there is no evidence to suggest this is associated with site activities at this point in time. There was no evidence of any hydrocarbon contamination within mudwhelks sampled.

Overall, the results of mangrove monitoring indicate that surface water discharged from the DLNG facility has not had a significant impact on mangrove sediment and biota surrounding the facility since post-commissioning monitoring began in 2006. In addition, the sediment ponds do not generally appear to be affected by algal blooms, odour issues, mortality or any other sources of contamination and spikes in water quality are of short duration. For these reasons, the discharge water quality from the sediment ponds is of low environmental risk or impact.

1.2 Discharges to air

During the reporting period, the total flaring volume from routine and non-routine sources was less than the previous year but within the range for the previous five years. The elevated value for 2022 is due to overall plant downturn and loading line repairs during the reporting period.

Nitrogen Rejection Unit venting was significantly greater than the historical range during 2022 due to plant downturn impacts and planned maintenance.

During the 2022 reporting period, the total acid gas venting volume for planned and unplanned downtime was less than previous years and the historical range. The total number of days for hot venting did not exceed the Licence limits. Stack testing showed that all emissions measured were complaint for 2022 though increased Benzene concentrations above licence trigger limits in January, February, April, August, and October 2022 were noted for the acid gas vent. Benzene mass emission rates meet or are below the Licence limits. This trend is attributed to the plant downturn and decrease of gas flowrate into the facility. These elevated Benzene concentrations are not considered a non-compliance with Licence conditions, as during this stack testing event the waste gas stream was being treated by the acid gas incinerator and not being discharged via the acid gas vent.

Analysis of the NT EPA ambient air quality monitoring data from Palmerston, Stokes Hill and Winnellie shows that for the parameters analysed only PM_{10} and $PM_{2.5}$ exceeded the air NEPM standard. These exceedances are not attributed to DLNG operations.

The overall consistency with long-term data indicates the processes generating stack emissions are relatively stable and well understood. When considered in conjunction with the results of the ambient air monitoring program, the stack emissions are considered to present negligible environmental impact or risk.

1.3 Discharges to land and surrounding environment

Groundwater monitoring data shows that groundwater level elevations are mostly lower in 2022 than those measured for 2021. This is likely due to the significantly drier wet season experienced for 2021/22

Statistical assessment comparing the groundwater and irrigation water parameters using the Mann Kendal analysis identified no correlation between the groundwater and irrigation water quality, therefore overall, the data collected from the 2022 groundwater monitoring events demonstrate that current irrigation practices present a low environmental risk.

2.0 Introduction

2.1 Overview

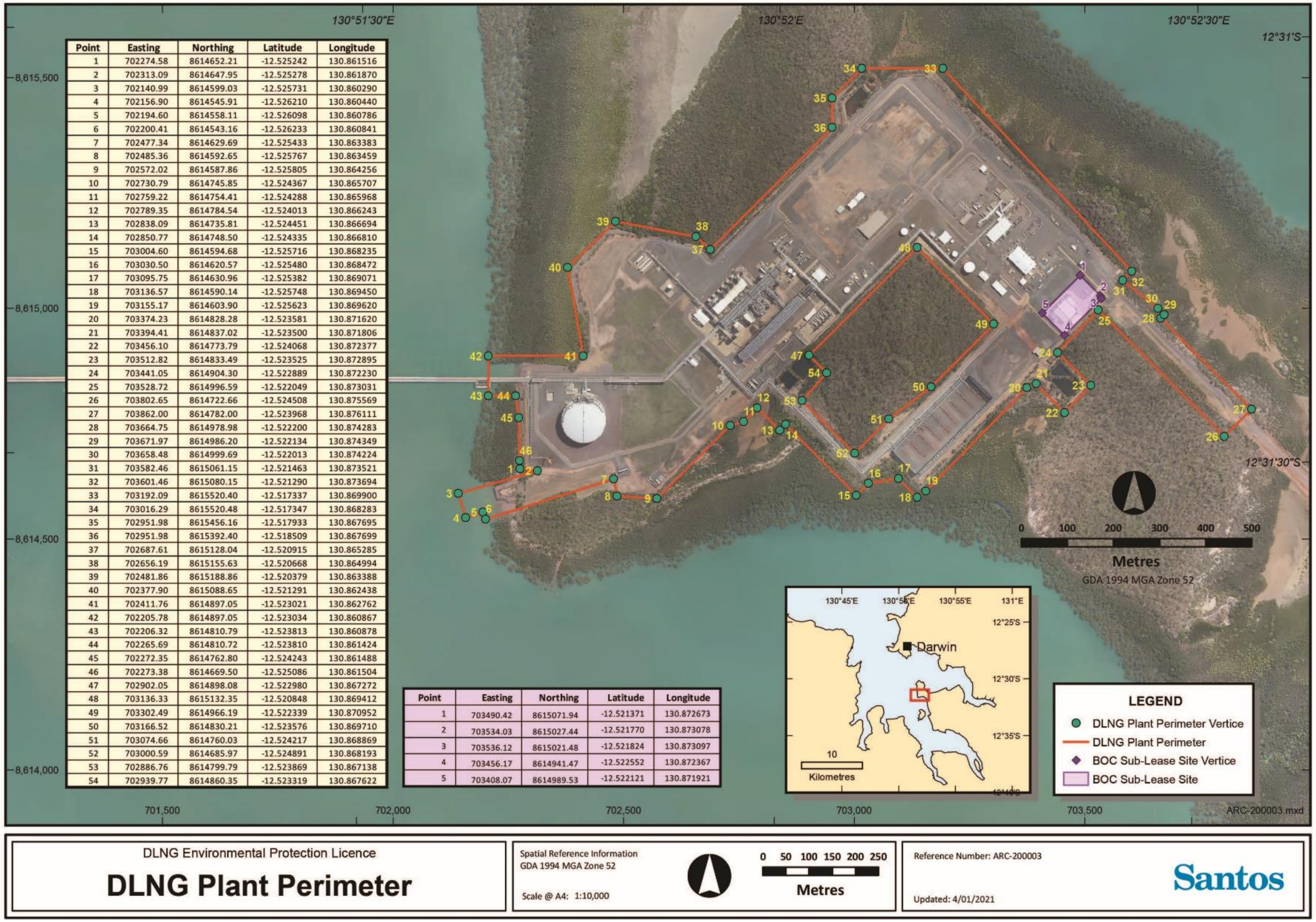
Santos NA Darwin Pipeline Pty Ltd (Santos) is the operator of the Darwin Liquefied Natural Gas facility (DLNG) at Wickham Point, near Darwin, in the Northern Territory (NT) of Australia. DLNG receives dry natural gas from the Bayu-Undan field located in Timor-Leste offshore waters via the 502 km long pipeline. The dry gas is liquefied, stored, and exported from the DLNG facility. The upstream geographical limit of DLNG facility is defined as the beach valve of the Bayu-Darwin gas pipeline, located on Wickham Point. The downstream limit is the LNG loading arms at the jetty. The layout of the DLNG facility is shown in Figure 2-1

As a facility producing over 500,000 tonnes of LNG annually, DLNG is required by Schedule 2 of the *NT Waste Management and Pollution Control Act* 1998 (WMPC Act) to have an environmental licence. Santos holds licence number EPL217-03 (the Licence) in accordance with this requirement. The Licence was issued by the NT Environment Protection Authority (EPA). Further information on the Licence is provided in Section 2.2.

Condition 84 of the Licence requires Santos to provide an annual monitoring report. The annual monitoring report must be provided to the NT EPA by 1 March annually and relate to the previous period of 1 January to 31 December. This report includes the environmental monitoring results in relation to the Licence for the period between 1 January 2022 and 31 December 2022 (herein referred to as the reporting period).

As per the requirements of Condition 85 of the Licence, this report:

- Has been prepared in accordance with the requirements of the 'Guidelines for Reporting on Environmental Monitoring' (NT EPA 2016)
- Includes a tabulation of all monitoring data (refer to Attachments)
- Includes long-term trend analysis (at least three years) where suitable monitoring data are available
- Includes an assessment of the environmental impact of the activity and
- Includes analysis on the impacts of the operation of DLNG on ambient air quality.



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3	702140.99	8614599.03	-12.525731	130.860290
4	702156.90	8614545.91	-12.526210	130.860440
5	702194.60	8614558.11	-12.526098	130.860786
6	702200.41	8614543.16	-12.526233	130.860841
7	702477.34	8614629.69	-12.525433	130.863383
8	702485.36	8614592.65	-12.525767	130.863459
9	702572.02	8614587.86	-12.525805	130.864256
10	702730.79	8614745.85	-12.524367	130.865707
11	702759.22	8614754.41	-12.524288	130.865968
12	702789.35	8614784.54	-12.524013	130.866243
13	702838.09	8614735.81	-12.524451	130.866694
14	702850.77	8614748.50	-12.524335	130.866810
15	703004.60	8614594.68	-12.525716	130.868235
16	703030.50	8614620.57	-12.525480	130.868472
17	703095.75	8614630.96	-12.525382	130.869071
18	703136.57	8614590.14	-12.525748	130.869450
19	703155.17	8614603.90	-12.525623	130.869620
20	703374.23	8614828.28	-12.523581	130.871620
21	703394.41	8614837.02	-12.523500	130.871806
22	703456.10	8614773.79	-12.524068	130.872377
23	703512.82	8614833.49	-12.523525	130.872895
24	703441.05	8614904.30	-12.522889	130.872230
25	703528.72	8614996.59	-12.522049	130.873031
26	703802.65	8614722.66	-12.524508	130.875569
27	703862.00	8614782.00	-12.523968	130.876111
28	703664.75	8614978.98	-12.522200	130.874283
29	703671.97	8614986.20	-12.522134	130.874349
30	703658.48	8614999.69	-12.522013	130.874224
31	703582.46	8615061.15	-12.521463	130.873521
32	703601.46	8615080.15	-12.521290	130.873694
33	703192.09	8615520.40	-12.517337	130.869900
34	703016.29	8615520.48	-12.517347	130.868283
35	702951.98	8615456.16	-12.517933	130.867695
36	702951.98	8615392.40	-12.518509	130.867699
37	702687.61	8615128.04	-12.520915	130.865285
38	702656.19	8615155.63	-12.520668	130.864994
39	702481.86	8615188.86	-12.520379	130.863388
40	702377.90	8615088.65	-12.521291	130.862438
41	702411.76	8614897.05	-12.523021	130.862762
42	702205.78	8614897.05	-12.523034	130.860867
43	702206.32	8614810.79	-12.523813	130.860878
44	702265.69	8614810.72	-12.523810	130.861424
45	702272.35	8614762.80	-12.524243	130.861488
46	702273.38	8614669.50	-12.525086	130.861504
47	702902.05	8614898.08	-12.522980	130.867272
48	703136.33	8615132.35	-12.520848	130.869412
49	703302.49	8614966.19	-12.522339	130.870952
50	703166.52	8614830.21	-12.523576	130.869710
51	703074.66	8614760.03	-12.524217	130.868869
52	703000.59	8614685.97	-12.524891	130.868193
53	702886.76	8614799.79	-12.523869	130.867138
54	702939.77	8614860.35	-12.523319	130.867622

Point	Easting	Northing	Latitude	Longitude
1	703490.42	8615071.94	-12.521371	130.872673
2	703534.03	8615027.44	-12.521770	130.873078
3	703536.12	8615021.48	-12.521824	130.873097
4	703456.17	8614941.47	-12.522552	130.872367
5	703408.07	8614989.53	-12.522121	130.871921

Figure 2-1 DLNG facility locality map

2.2 NT EPA Licence

The Licence commenced on 19 September 2022 and will expire on 18 September 2025. The boundary of the Licence is shown in Figure 2-1. The licence is also publicly available on the NT EPA website.

Monitoring conditions are outlined in the Licence in Condition 57 to 71. Requirements from the Licence monitoring conditions, along with reference to the section of the report in relation to the associated monitoring, are summarised in Table 2-1.

Table 2-1 Summary of monitoring-related Licence conditions and relevant sections of this report

Condition	Summary	Relevant sections within this report
General (Conditions 57 and 58)	• Monitoring sample collection must provide for sample chain of custody documentation • Monitoring equipment must measure the parameters of interest and results must be stored appropriately.	The sample collection points, and monitoring equipment used are dependent on the discharge stream and parameters being monitored. Information relating to these conditions is included in each of the discharge monitoring sections: • Monitoring discharges to water (Section 3.0), • Monitoring air discharges (Section 4.0), and • Monitoring Discharges to Land and Surrounding Areas (Section 5.0).
Monitoring discharges to water (Conditions 59 to 65)	Water Quality • Water quality monitoring must be in accordance with the conditions and tables appended to the Licence, which specify monitoring locations and parameters • Water quality monitoring locations must be clearly labelled and able to be accessed • Water quality sampling must be carried out in accordance with specified New South Wales (NSW) EPA methods. Mangrove Monitoring • Mangrove monitoring must be in accordance with the tables appended to the Licence, which specify monitoring locations and parameters • Revisions to the mangrove monitoring program must be reviewed by a suitably qualified	Water quality monitoring objectives, methods, results, and discussion are presented in the following section: • Irrigation discharge – Section 3.1, • Jetty outfall discharge and mixing zone – Section 3.1.4, and • Sediment ponds 1, 2 and 3 discharge – Section 3.1.5. Mangrove monitoring objectives, methods, results, and discussion are presented in Section 3.2.

	professional and provided to the NT EPA • The NT EPA may require Santos to revise or amend and resubmit the mangrove monitoring program.	
Monitoring air discharges (Conditions 66 to 68)	• Air quality monitoring program must be in accordance with the tables appended to the Licence, which specify monitoring locations and parameters • Air quality sampling and analysis must be carried out in accordance with specified NSW EPA methods • Monitoring must be undertaken at least once per year under steady-state operational conditions.	Air quality monitoring is presented in Section 4.0, which includes results from these locations specified in the Licence: • Power generation turbines, • Compressor turbines, • AGI, • Solvent regenerator reflux drum, and • Boiler.
Monitoring discharges to land and surrounding environment (Conditions 69 to 71)	• Maintain and implement the monitoring program in accordance with the tables appended to the Licence and the DLNG groundwater monitoring plan • Groundwater sampling and analysis must be carried out in accordance with specified NSW EPA methods • Sampling undertaken by a qualified sampler	Groundwater monitoring is presented in Section 5.1, which includes results from monitoring and control bores at the locations specified in the Licence.

2.2.1 Licence Performance Improvement Condition

In accordance with Licence Conditions 90 and 91, Santos must prepare a Performance Improvement Plan (PIP) for managing wastewater discharge over time, so as to minimise the extent and impact of discharges to Darwin Harbour from the jetty outfall. The PIP was concluded in 2020 refer to the 2020 Annual Environmental Monitoring Report (Santos 2021) for more information.

2.3 DLNG Environmental Monitoring

Several aspects of the operation of the DLNG facility may impact upon the environment. A conceptual model of the interactions of these aspects with the environment is provided in Figure 2-2 The Licence requires that Santos undertake environmental monitoring of these aspects and the environmental receptors that may be impacted. These are outlined in the DLNG facility Operations Environmental Management Plan (OEMP). The monitoring aspects include:

- Discharges to water, including:
    - Irrigation discharge monitoring
    - Jetty outfall monitoring
    - Sediment ponds monitoring and

- Mangrove monitoring.
- Discharges to air, including:
  - Stack emission monitoring
  - Ambient air quality monitoring
  - Flaring and venting and
- Discharges to land and surrounding environment, including:
  - Groundwater monitoring.

Santos has developed and implements routine monitoring programs to meet the requirements of the Licence.

The objectives, methods and results of these monitoring programs have been included in the relevant sections of this report.

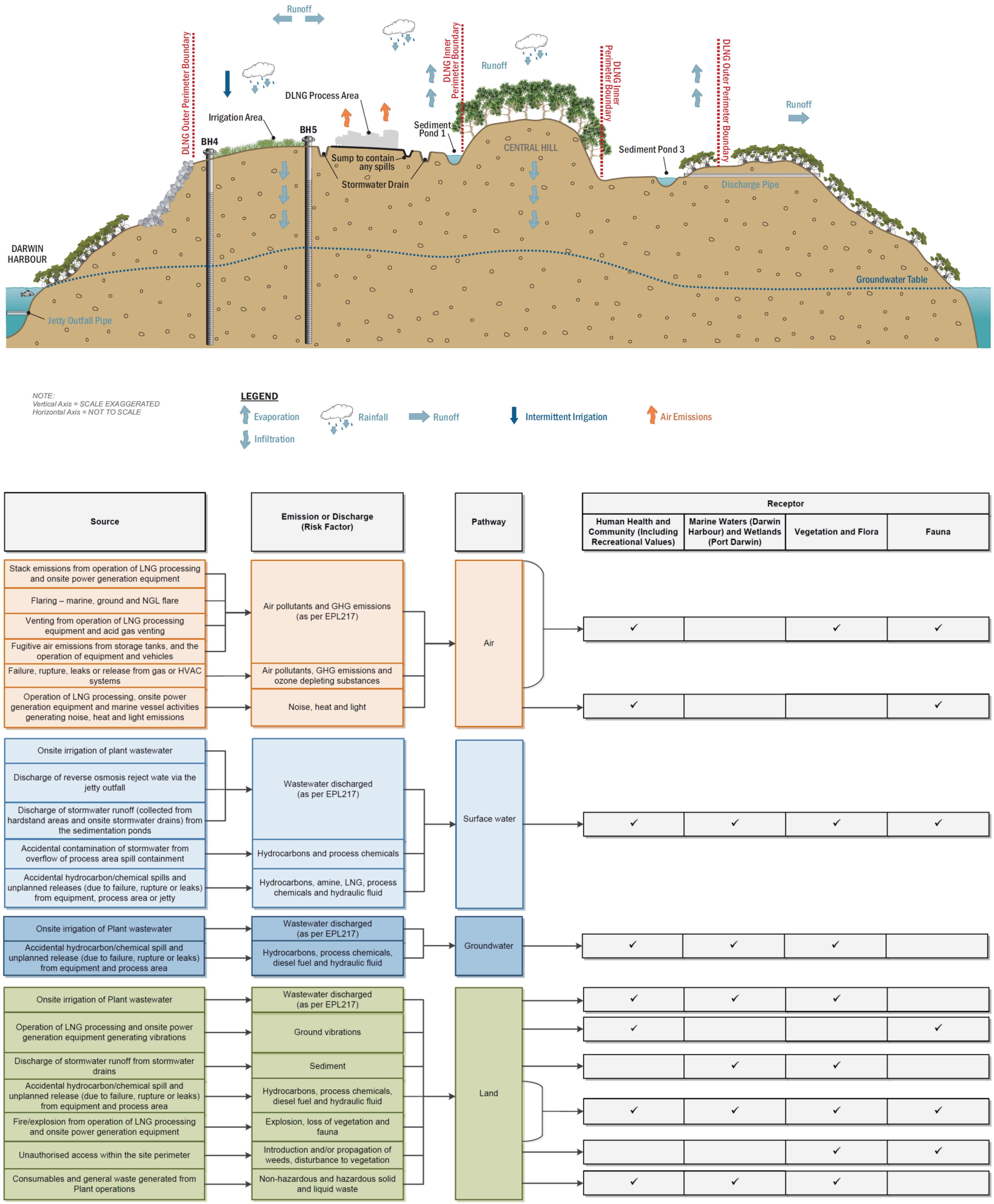

Figure 2-2 DLNG environmental conceptual model

3.0 Monitoring Discharges to Water

Conditions 59 to 65 of the Licence outline requirements to monitor a range of liquid discharges, including:

- Irrigation discharge (Section 3.1)
- Jetty outfall discharge and mixing zone (Section 3.1)
- Sediment ponds discharge (Section 3.1). and
- Mangrove monitoring (Section 3.2).

The objectives, methods, analysis, and discussion of results for each of these monitoring programs are provided in the sections below.

3.1 Irrigation, Jetty Outfall and Sediment Pond Discharge Monitoring Program

As part of operations several water and wastewater streams are authorised to be discharged from the DLNG facility under EPL 217. Authorised discharge occurs via the irrigation field, the jetty outfall, and Sediment Ponds 1, 2 and 3. A schematic of processes associated with these water and wastewater streams are shown in Figure 3-1.

The irrigation discharge comprises several streams arising from the operation of DLNG:

- Treated wastewater from the Sanitary Treatment Plant (STP). The STP receives wastewater from bathroom and kitchen facilities. The STP utilises biological (e.g., activated sludge) and physical (e.g., filters, settlement) treatment to reduce the nutrient levels, biological oxygen demand and suspended solid levels in the treated sewage.
- Wastewater from the process area sumps which is treated by an oily water separator (Corrugated Plate Interceptor/Dissolved Air Filtration Flotation (CPI/DAFF) to remove hydrocarbons. The separated hydrocarbons are stored and disposed of offsite by a licenced waste contractor.
- Water from boiler blowdown and the turbine air humidifier system.

Each of these discharge streams are sent to the irrigation water holding tank and the combined stream is periodically discharged to the irrigation areas within DLNG shown in Figure 3-2.

The jetty outfall discharge comprises reject water from the Reverse Osmosis (RO) process, which uses water supplied by the Power and Water Corporation (PWC) as feed water. The jetty outfall pipe is shown in Figure 3-3. The estuarine waters of Darwin harbour surrounding the discharge pipe are sampled as part of the jetty outfall mixing zone monitoring program.

The sediment ponds are designed to allow for the collection of surface water runoff prior to release into the receiving environment. Sediment Ponds 1, 2 and 3 receive stormwater run-off. Sediment Pond 1 also receives backwash water from the greensand filter (part of the water RO plant). Overflow water from these ponds is passively discharged to Darwin Harbour. A typical view of a sediment pond is provided in Figure 3-4. Sediment Ponds are only sampled when they are actively discharging to the environment.

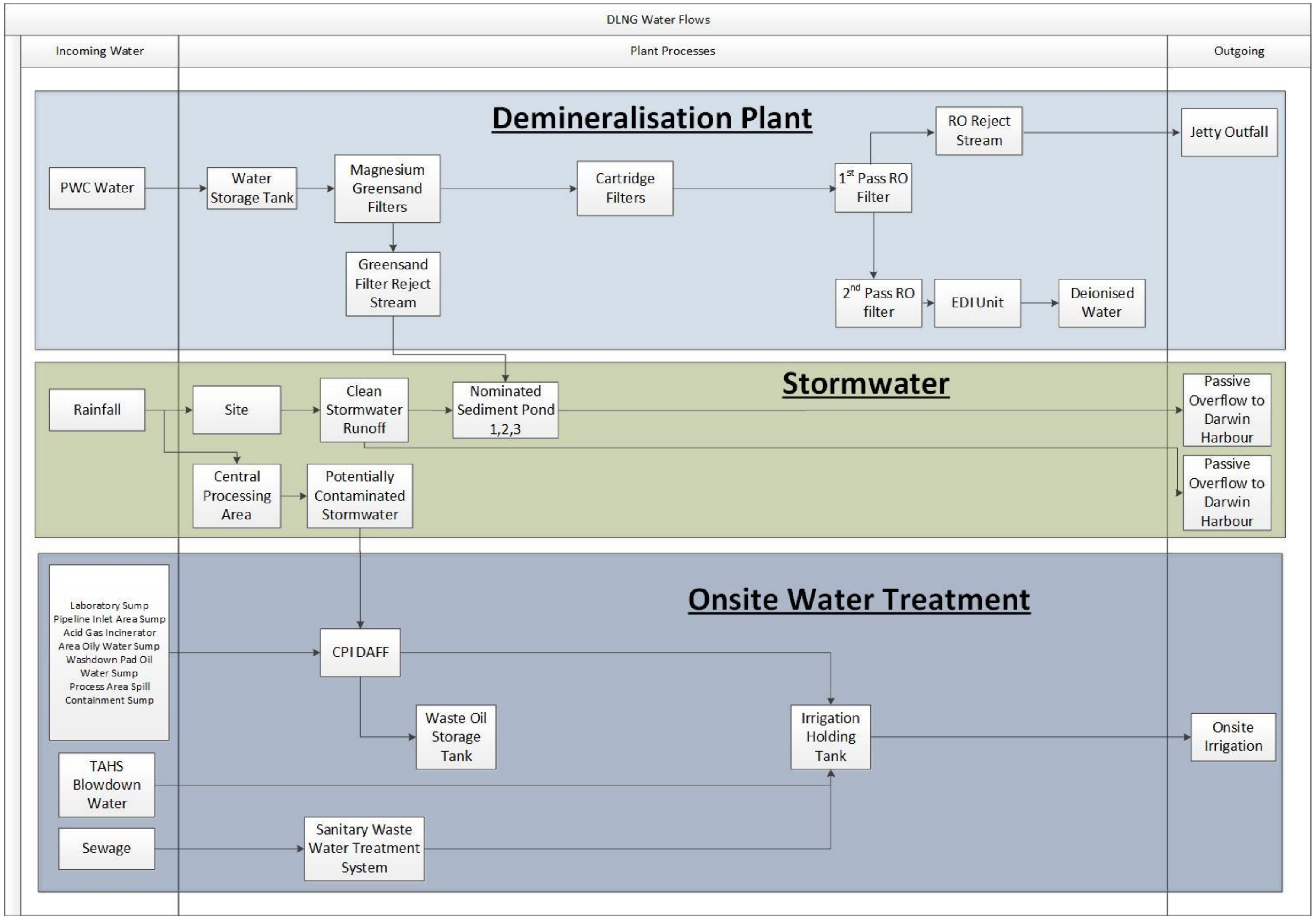

Figure 3-1 Schematic of water inputs, processes, and discharge points for the DLNG facility

Figure 3-2 Irrigation discharge area

Figure 3-3 DLNG jetty outfall pipe (Secured to Pylon)

Figure 3-4 DLNG sediment pond outflow sampling location

3.1.1 Monitoring Objective

The objectives of the irrigation, jetty outfall and sediment pond discharge monitoring programs are to:

- Characterise the quality of the discharge stream; and
- Assess compliance with the trigger values in the Licence (refer to Appendix B Table 2 within the licence).

Characterising the quality of the discharge stream allows Santos to identify the potential for the discharge stream to result in environmental impacts or risks. As outlined in the conceptual model of environmental aspects at DLNG (Figure 2-2), discharges may interact with groundwater and Darwin Harbour. The results of the irrigation, jetty outfall discharge and mixing zone and sediment pond discharge monitoring programs are also used to interpret results from other monitoring programs, such as the mangrove monitoring program (Section 3.2).

3.1.2 Monitoring Methods

Discharges to water locations are stipulated in the Licence. These locations are shown in Figure 3-5 and Figure 3-6. The coordinates, sampling frequencies and the discharge sources are provided within the Licence (Appendix B Table 1 and Table 2 and Condition 60, Table 2)

Samples are collected by DLNG laboratory staff or environmental consultants trained and experienced in the collection of water quality samples. The irrigation and jetty outfall discharge samples are collected via a sample valve along the discharge pipe within the plant, the sediment pond samples are collected at the overflow weir within the pond (Figure 3-4) and the jetty outfall mixing zone samples are collected via a vessel. The samples are then sent to analytical laboratories for analysis. All laboratories used maintain National Association of Testing Authorities (NATA) accreditation for the analyses being carried out.

Concentrations of the monitoring parameters are often very low and many sampling results are below the laboratory limit of reporting (LOR). Where analytical results indicated the concentration of an analyte was below the LOR, the analyte was assumed to be present at a concentration equal to the LOR. This approach is environmentally conservative.

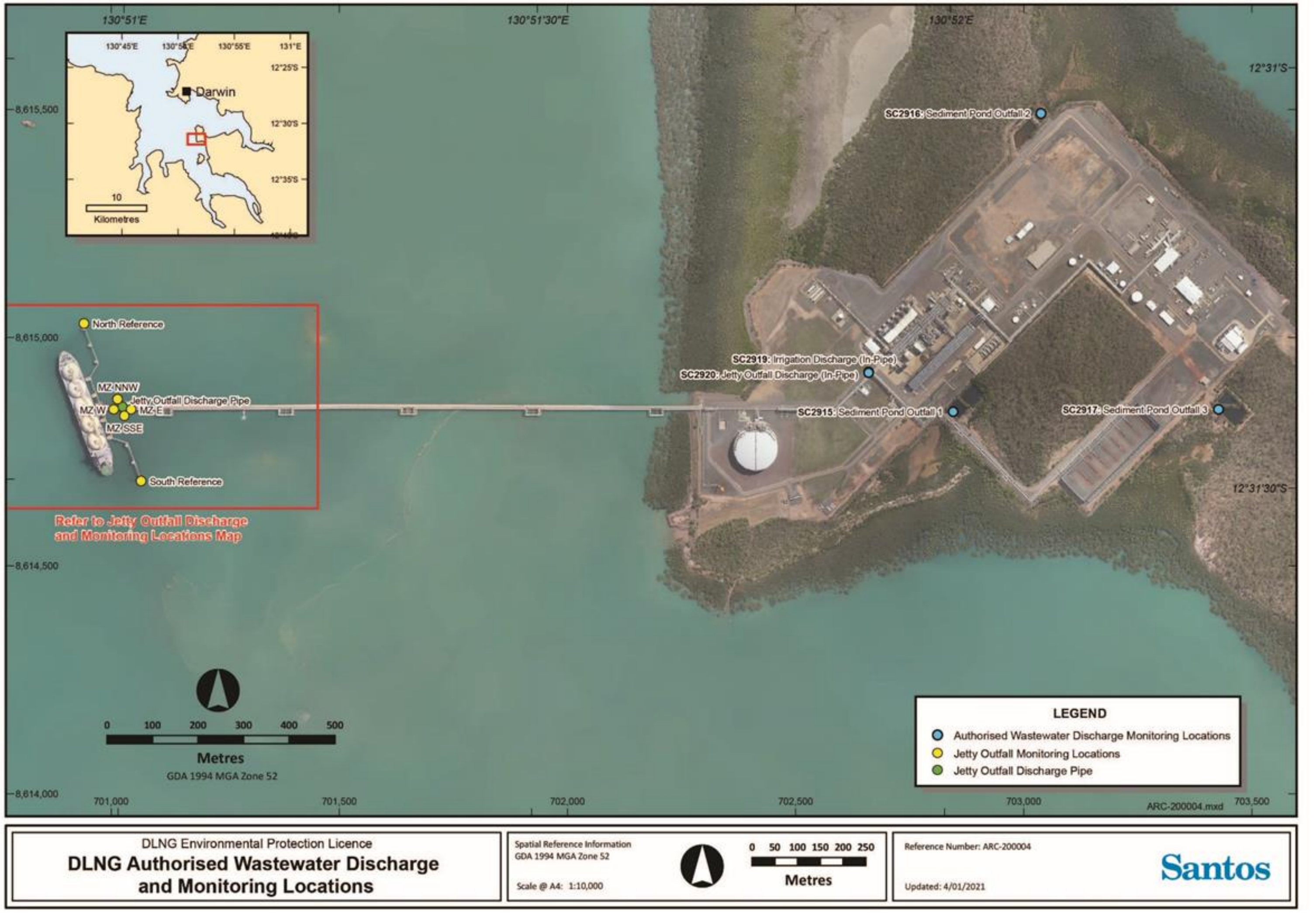

Figure 3-5 Map of authorised wastewater discharge locations

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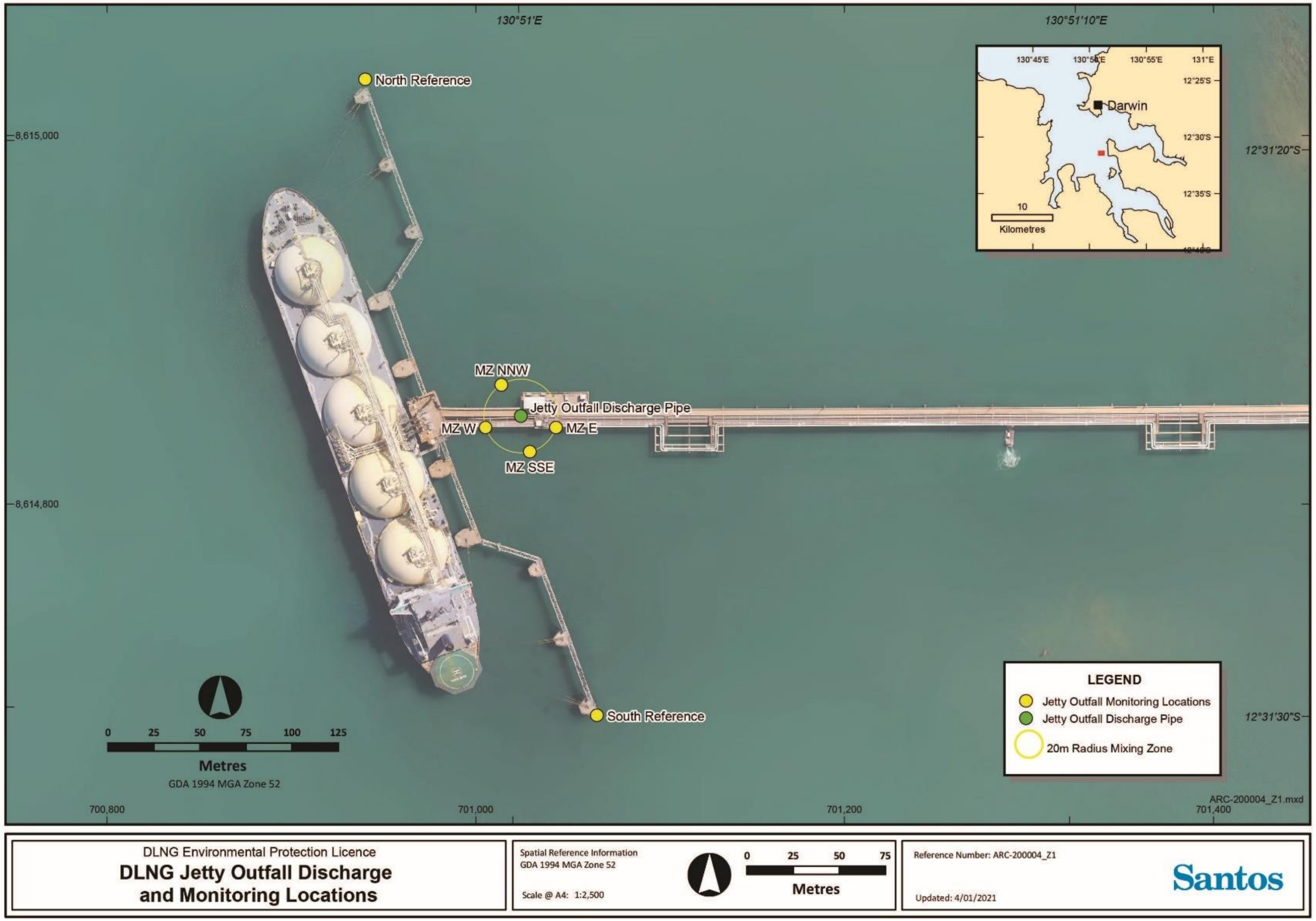

Figure 3-6 Map of jetty outfall discharge and monitoring locations

3.1.3 Monitoring Results – Irrigation Discharge

Volume Discharged

A total of 4205 m^3 was discharged to the irrigation area during the reporting period (Figure 3-7). This is approximately 16% of the 26 ML limit in the Licence. This volume is significantly lower compared to 2021 and lower than 2016-2020 annual volumes.

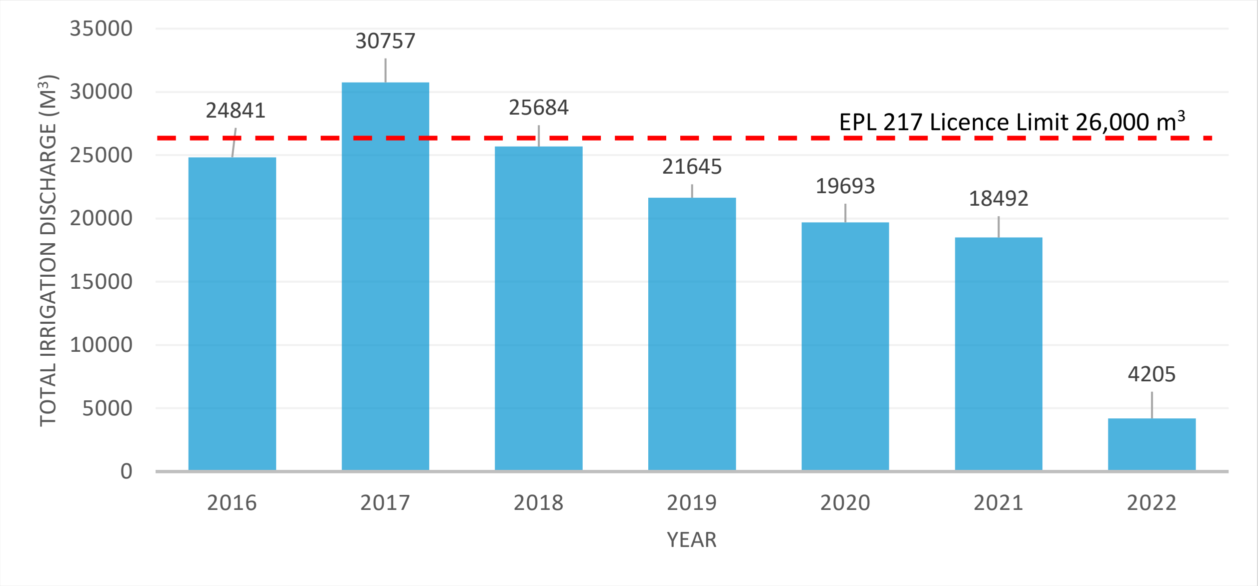

Figure 3-7 Water volumes discharged to the irrigation area

Discharge water quality results

A summary of the irrigation water quality results for 2022, long term trends from 2016-2022 and Licence trigger value exceedances are presented in Table 3-1 and discussed below.

The annual monitoring of environmental indicators was undertaken in February. Voluntary monitoring has also been conducted for parameters of interest during 2022. The 2016-2022 dataset of both compliance and voluntary irrigation discharge water quality results is provided in Attachment A – Irrigation Discharge; values exceeding current Licence trigger values are bolded.

Key findings from a review of the irrigation discharge water quality results include:

- Biological oxygen demand (BOD) spiked above the Licence trigger value in January 2022 (up to 46.0 mg/L compared to a trigger value of 25 mg/L) (Figure 3-8). It remained under the trigger limit for the rest of 2022.
- Ammonium nitrogen (NH_3-N), nitrate (NO_3-N), nitrite (NO_2-N) and dissolved reactive phosphorus (PO_4-P) exceeded the Licence trigger values in 2022 (Figure 3-9, Figure 3-10, Figure 3-11 and Figure 3-12), including an instance of values over triple the trigger values. This is an ongoing non-compliance that the NT EPA is aware of. Compared to the long term 2016 to 2022 average, ammonium nitrogen and dissolved reactive phosphorus concentrations were on par. Historical data for nitrate and nitrite also shows that this spike in concentrations in not abnormal. The new STP is expected to rectify the cause of these exceedances that resulted in these non-conformances. Given a significant wastewater source to the irrigation discharge stream is from the STP, nutrients are expected to be present and the current Licence trigger values for speciated

nutrients are not considered to be appropriate indicators for sewerage. This is because they are based on the Darwin Harbour Water Quality Objectives (DHWQO) which do not reflect the receiving groundwater environment.

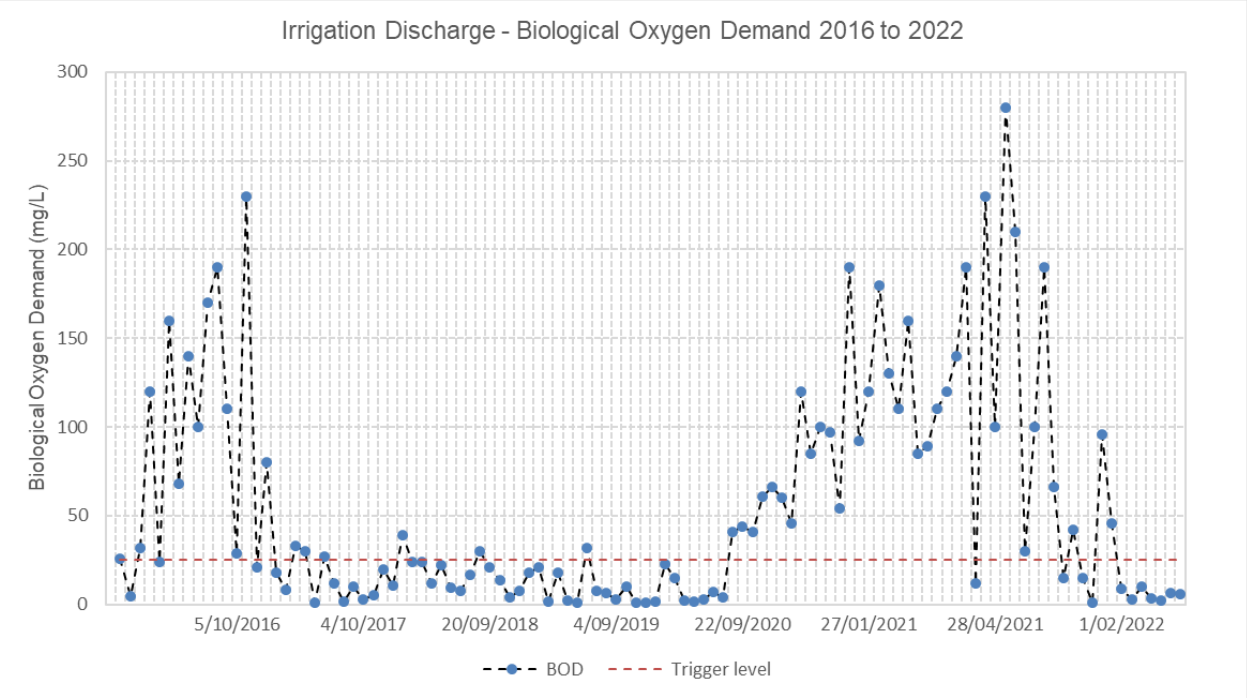

Figure 3-8 Irrigation discharge BOD concentrations 2016-2022

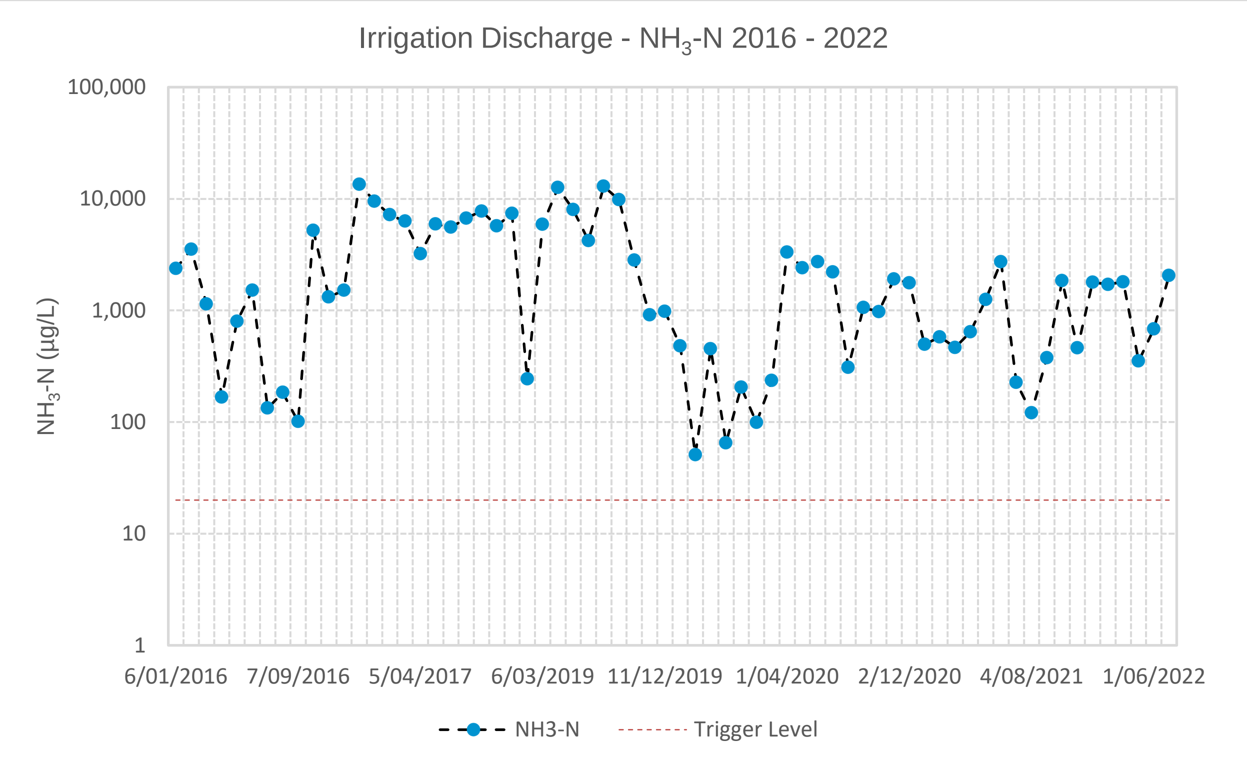

Figure 3-9 Irrigation Discharge NH3-N 2016 - 2022

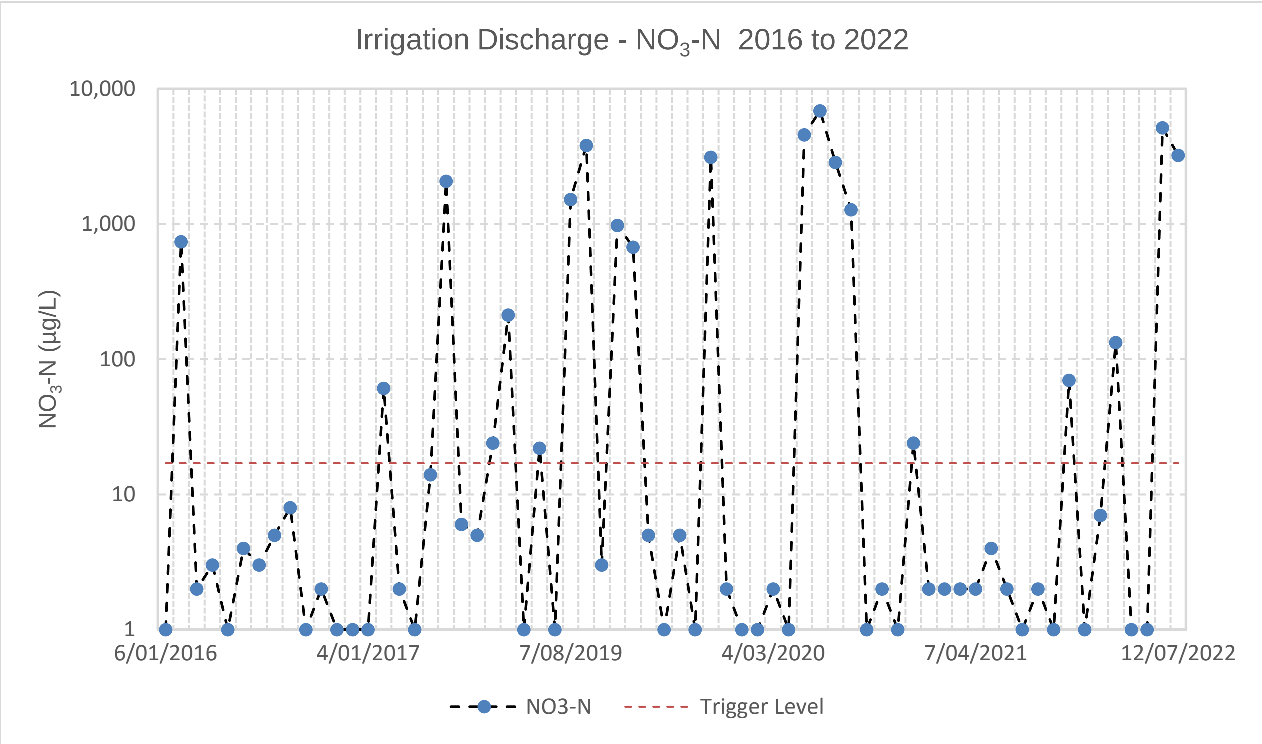

Figure 3-10 Irrigation discharge NO_3-N 2016 - 2022

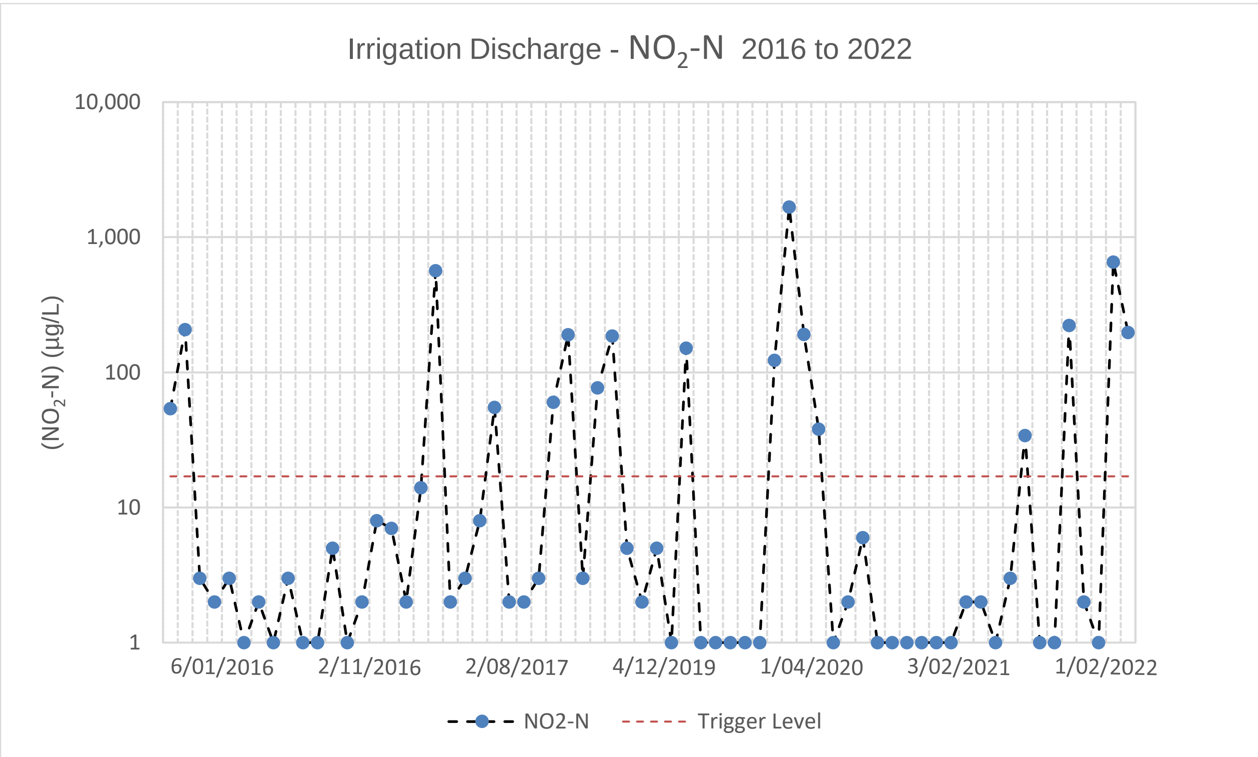

Figure 3-11 Irrigation discharge NO2-N 2016-2022

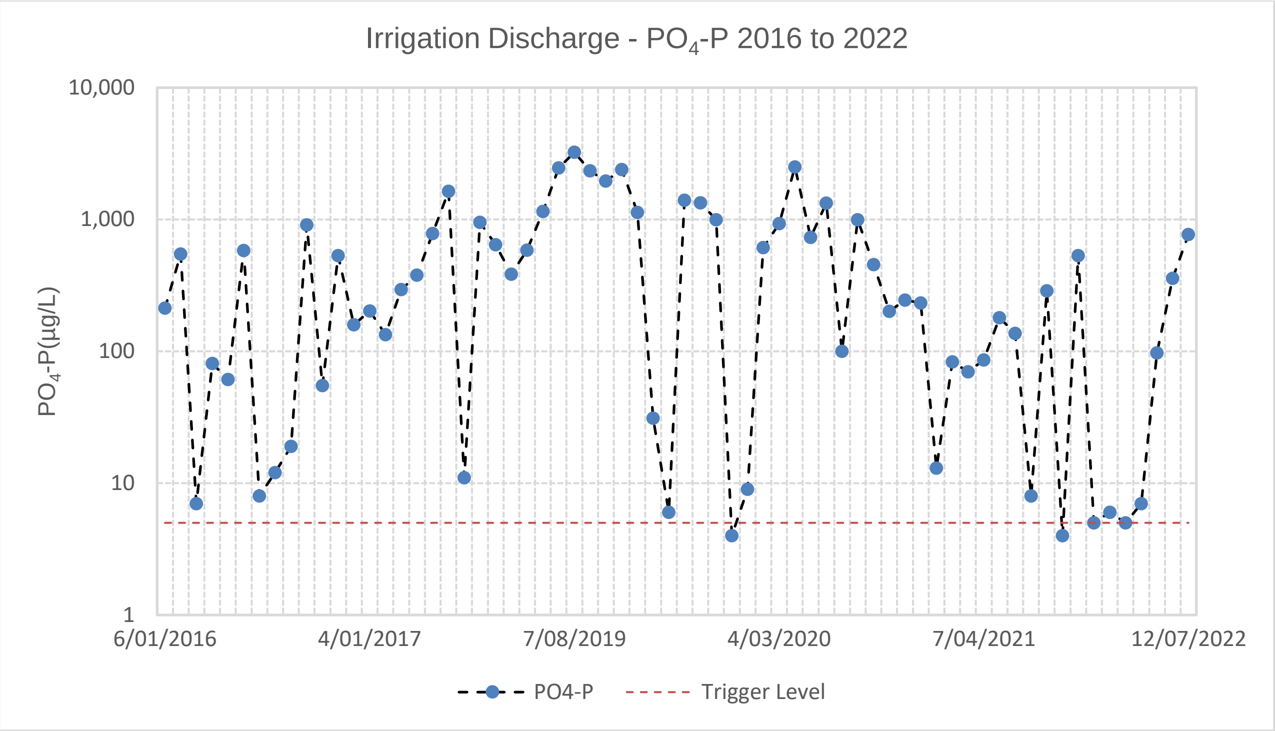

Figure 3-12 Irrigation discharge PO4-P 2016-2022

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Table 3-1 Summary of irrigation water quality results

Parameter	Monitoring Frequency	Licence Trigger Value	2022 Maximum	2022 Minimum	2022 Average	Long-term Average (2016-2022)	2022 Reportable Non-Conformance [1]
Field Parameters							
pH	Monthly	7-8.5	7.63	7.00	7.24	7.20	No
Electrical conductivity(µs/cm)	Monthly	No trigger	344	125	201	238	N/A
TSS (mg/L)	Monthly	≤ 30	20	0.00	15	16	No
Turbidity (NTU)	Monthly	No trigger	19.8	0.310	6.16	12.3	N/A
DO (mg/L)	Monthly	No trigger	2.26	0.0700	0.430	0.220	N/A
Temperature (°C)	Monthly	No trigger	37.8	27.4	34.3	35.1	N/A
Environmental Indicators							
Ammonium nitrogen (NH_3-N) (µg/L)	Annual	20.00	2,050	351.0	1263	2892	**Yes**
Nitrate (NO_3-N) (µg/L)	Annual	17.00	5160.	<1.000	1422	835.1	**Yes**
Nitrite (NO_2-N) (µg/L)	Annual	17.0	656.0	<1.00	180	99.5	**Yes**
DRP (PO_4-P) (µg/L)	Annual	5.00	769	5.00	178	99.5	**Yes**
Total Nitrogen (mg/L)	Annual	≤ 40.	7.9	2.2	5.09	7.6	No
Total Phosphorous (mg/L)	Annual	≤ 10.	0.81	0.35	0.58	1.3	No
Chlorophyll-a (µg/L)	Biannual	2	<1	<1	1	1	No
BOD (mg/L)	Monthly	≤ 25	46.0	2.30	10.8	57.5	**Yes**
TRH (mg/L)	Annual	< 6	NR	NR	NR	NR	No
E. coli (MPN/100 mL)	Biannual	≤ 75	10.0	10.0	10.0	316	No
Enterococci (MPN/100 mL)	Biannual	50	<10	<10	N/A [2]	70	No
Metals & BTEX							
Arsenic (µg/L)	Annual	10	<1	<1	N/A [2]	N/A [2]	No
Cadmium (µg/L)	Monthly	3.2	<0.10	<0.10	N/A [2]	0.10	No
Chromium (µg/L)	Annual	10	<1	<1	N/A [2]	N/A [2]	No

Parameter	Monitoring Frequency	Licence Trigger Value	2022 Maximum	2022 Minimum	2022 Average	Long-term Average (2016-2022)	2022 Reportable Non-Conformance [1]
Copper (µg/L)	Monthly	69	68	11	27	24	No
Iron (µg/L)	Annual	1,300.	510.0	N/A [3]	N/A [3]	251.7	No
Lead (µg/L)	Annual	10	<1	N/A [3]	N/A [3]	N/A [2]	No
Manganese (µg/L)	Annual	15,500	32.0	32.0	32.0	36.7	No
Mercury (µg/L)	Monthly	0.1	<0.1	<0.1	N/A [2]	N/A [2]	No
Nickel (µg/L)	Annual	290.	<1	<0.0500	N/A [2]	1.75	No
Silver (µg/L)	Annual	1.4	<1.0	N/A [2]	N/A [2,3]	N/A [1]	No
Zinc (µg/L)	Monthly	1,780	51.0	<5.00	16.0	20.8	No
BTEX (µg/L)	Monthly	700.	4.00	<3.00	4.00	3.71	No

Note:

1. Results from mandatory sampling are only considered when determining reportable non-conformances under the Licence
2. All results below LOR
3. Only one sample taken (annual requirement)

3.1.4 Monitoring Results – Jetty Outfall

Volume Discharged

A total of 14,465m^3 was discharged from the jetty outfall during the reporting period (Figure 3-13). This is approximately 24% of the Licence limit. This volume is significantly lower than 2021 and the lowest annual discharge volume in the six-year period from 2016-2022. This is primarily due operational changes in 2022, with the plant being turned down to a minimum throughout the year.

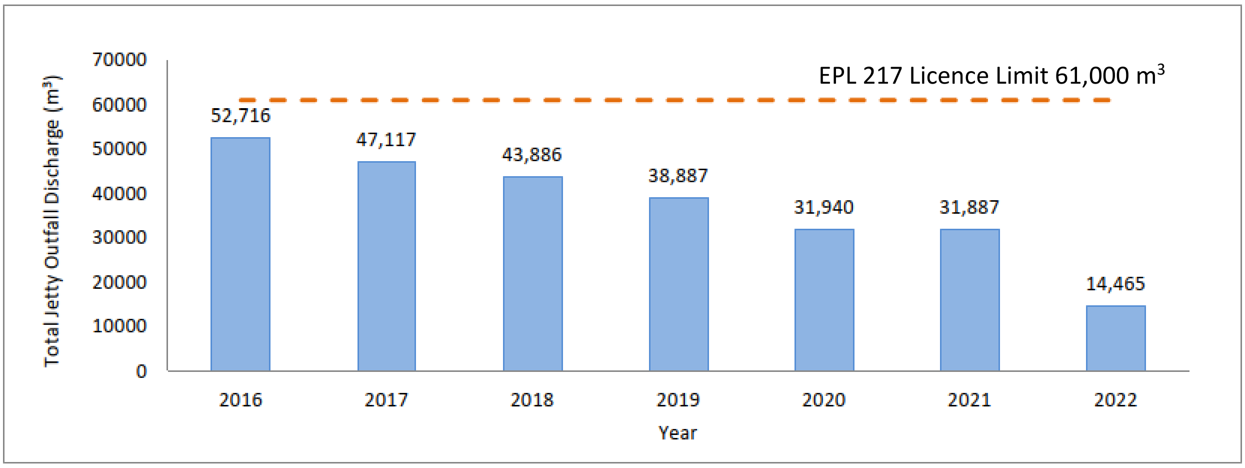

Figure 3-13 Water volumes discharged to jetty outfall

Discharge Water Quality Results

The annual monitoring of environmental indicators was undertaken in January 2022 and the biannual indicators in May 2022. Additionally, voluntary monitoring has also been conducted for parameters of interest during 2022. The 2015-2022 dataset of both compliance and voluntary jetty outfall discharge water quality results is provided in Attachment A – Jetty Outfall Discharge; values exceeding current Licence trigger values are bolded. It should be noted that an exceedance does not trigger a reportable non-conformance.

Key findings from a review of the jetty outfall discharge water quality results include:

- Field measurements of the jetty outfall discharge during 2022 were generally consistent with or below the 2016-2022 average and were within the Licence trigger values except for the following:
- Ammonium nitrogen (NH_3-N) exceeded the Licence trigger values on one occasion in 2022 (Figure 3-14). This did not result in an exceedance in the jetty outfall mixing zone or trigger a reportable non-conformance. The source of ammonium nitrogen in the RO reject water was thought to be mostly attributable to the biocide dosing chemical injected in the Demineralisation Plant. A biocide reduction trial was initiated in Q2-3 2019 which progressively reduced the dosing concentration. Despite the exceedances noted in select speciated nutrients, total nitrogen and total phosphorus were consistently well below the Licence trigger values in 2022.
- Metal concentrations in the jetty outfall discharge during 2022 were generally within the Licence trigger values, apart from zinc. Zinc exceeded the Licence trigger value on two occasions in February 2022, before returning to complaint levels for the remainder of the year (Figure 3-15). This did not result in an exceedance in the jetty outfall mixing zone or

trigger a reportable non-conformance with the Licence. The remaining metals sampled were consistent with or below the 2016-2022 average.

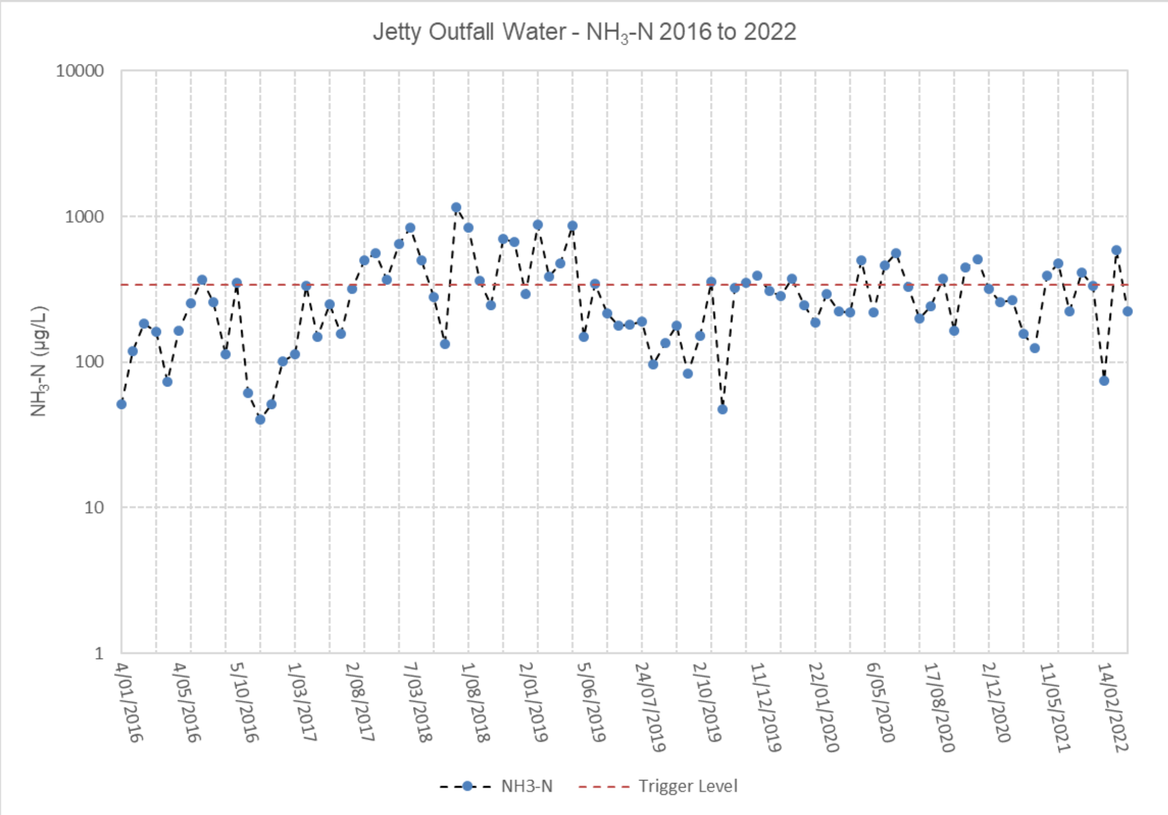

Figure 3-14 Jetty outfall discharge ammonium nitrogen (NH3-N) concentrations 2016-2022

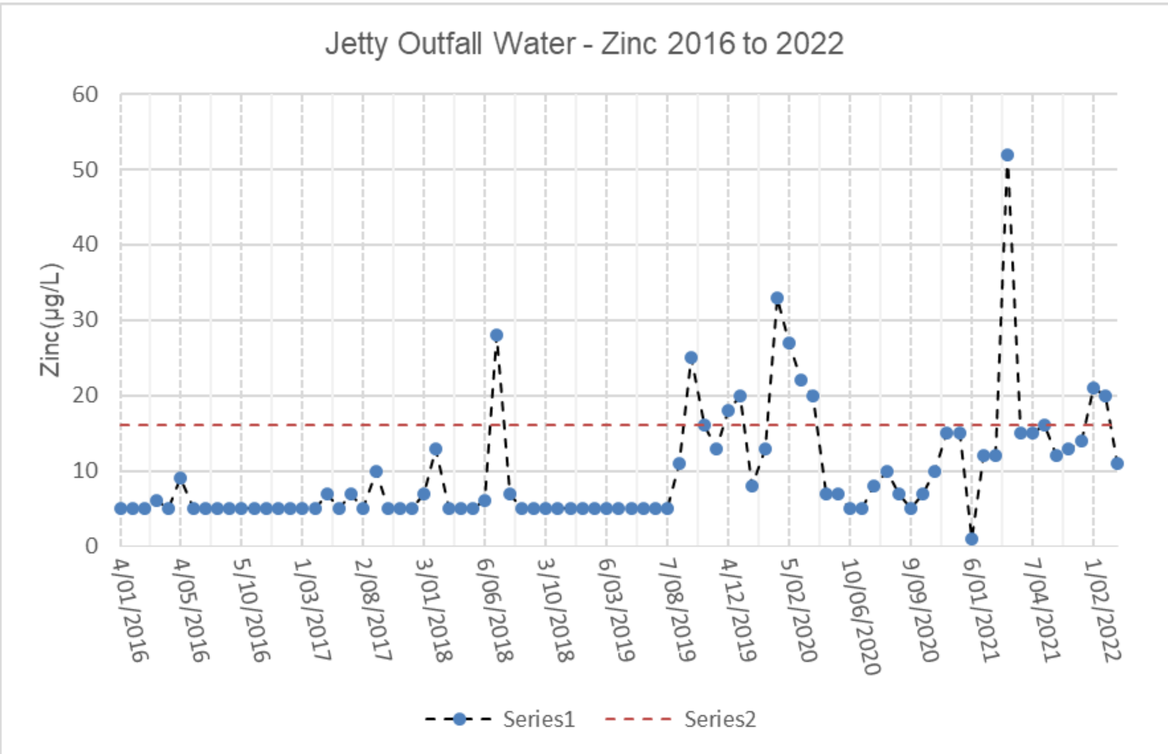

Figure 3-15 Jetty outfall discharge zinc concentrations 2016-2022

Table 3-2 Summary of 2022 jetty outfall discharge monitoring results

Parameter	Monitoring Frequency	Licence Trigger Value	2022 Maximum	2022 Minimum	2022 Average	Long-term Average (2016-2022)	2022 Reportable Non-Conformance [1]
Field Parameters							
pH	Monthly	7-8.5	8.0	7.53	7.76	7.78	No
Electrical conductivity(µs/cm)	Monthly	No trigger	1,021	750	870.7	740.6	N/A
TSS (mg/L)	Monthly	≤ 30	6	0	1.33	0.47	No
Turbidity (NTU)	Monthly	20	2.04	0.31	0.76	1.16	No
DO (mg/L)	Monthly	No trigger	5.37	0.08	3.02	3.04	N/A
Temperature (°C)	Monthly	No trigger	35.8	25.7	32.1	32.49	N/A
Environmental Indicators							
Ammonium nitrogen (NH_3-N) (µg/L)	Annual	337	584	75	294.3	315.3	No
Nitrate (NO_3-N) (µg/L)	Annual	764	513	157	329.3	312.3	No
Nitrite (NO_2-N) (µg/L)	Annual	27	21.0	8.00	16.0	22.47	No
DRP (PO_4-P) (µg/L)	Annual	51	13	8.00	11.0	22.9	No
Total Nitrogen (mg/L)	Annual	≤ 40	1.73	1.37	1.58	1.73	No
Total Phosphorous (mg/L)	Annual	≤ 10	0.04	0.02	0.02	0.07	No
BOD (mg/L)	Monthly	≤ 25	2.0	1.1	1.55	6.23	No
TRH (mg/L)	Annual	< 6	NR	NR	NR	NR	No
E. coli (MPN/100 mL)	Biannual	≤ 75	52	N/A [2]	N/A [2]	N/A [1]	No
Enterococci (MPN/100 mL)	Biannual	50	<10	N/A [2]	N/A [2]	334[3]	No
							Metals & BTEX
Arsenic (µg/L)	Annual	No trigger	1	<1	1	1	N/A
Cadmium (µg/L)	Monthly	5.5	<0.1	<0.1	N/A [2]	N/A [2]	No
Chromium (µg/L)	Annual	4.4	<1	<1	N/A [2]	1.5[3]	No
Copper (µg/L)	Monthly	3.0	2	1	1.7	2.30	No
Iron (µg/L)	Annual	No trigger	31	26	28.5	184	N/A
Lead (µg/L)	Annual	4.4	<1	<1	N/A [2]	N/A [2]	No

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Parameter	Monitoring Frequency	Licence Trigger Value	2022 Maximum	2022 Minimum	2022 Average	Long-term Average (2016-2022)	2022 Reportable Non-Conformance [1]
Manganese (µg/L)	Biannual	No trigger	17.00	5.000	11.00	16.11	N/A
Mercury (µg/L)	Monthly	0.4	<0.0001	<0.0001	N/A [2]	N/A [2]	No
Nickel (µg/L)	Annual	70	2.00	2.00	2.00	3.61	No
Silver (µg/L)	Annual	1.4	<1	<1	N/A [2]	N/A [2]	No
Zinc (µg/L)	Monthly	16.0	21	11	17.31	13.91	No
BTEX (µg/L)	Monthly	700	<3	<3	N/A [2	3.6	No

Notes:

1. Results from mandatory sampling are only considered when determining reportable non-conformances under the Licence
2. All results below LOR.
3. Average based on a single detection.

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Mixing Zone Water Quality Results

In August 2019, Condition 60 was added to the Licence. This condition requires the 20 m mixing zone around the jetty outfall to be monitored quarterly and compared against the new jetty outfall mixing zone trigger values added to Appendix B Table 2 of the Licence.

The Licence is currently non-specific about how to assess results from the mixing zone sites against the reference sites in relation to select physicochemical parameters. In response, the following trigger value definitions have been developed to standardise comparison of mixing zone values and determination of compliance with the intent of the Licence. These nominated assessment criteria are calculated based on the reference value and are summarised in Table 3-3.

Table 3-3 Internal assessment criteria for physicochemical parameters

Parameter	Trigger Value (TV) – Relative to Upstream Reference Location
pH	If median of mixing zone (MZ) value is greater or less than + / - 0.5 units of the reference value
Oxidation Reduction Potential (ORP)	If median of MZ value is greater or less than + / - 5% of the reference value
Temperature	If median of MZ value is greater or less than + / - 1 °C of the reference value
Electrical Conductivity (EC)	If median of MZ value is greater or less than + / - 5% of the reference value
Total Suspended Solids (TSS)	If median of MZ value is greater than the reference value
Total Dissolved Solids (TDS)	If median of MZ value is greater than the reference value
Dissolved Oxygen (DO)	If median of MZ value is less than - 5 % saturation of the reference value
Biological Oxygen Demand (BOD)	If median of MZ value is greater than the reference value

A summary of results of the 2022 monitoring campaign undertaken by are presented in Table 3-4. The full 2022 dataset of the mixing zone water quality results is provided in Attachment A – Jetty Outfall Mixing Zone; values exceeding current Licence trigger values are bolded and/or shaded. The following is a summary of the Report provided in the quarterly Jetty outfall Monitoring Reports (CDM Smith 2022a, b, c, and d)

The key findings from a review of the jetty outfall mixing zone water quality results include:

- The median concentration in the mixing zone for various parameters exceeded the reference site concentration for various quarters in 2022; physiochemical parameters (EC, turbidity and DO).
- The median concentration in the mixing zone exceeded the Licence trigger value for dissolved oxygen in Q3 and Q4. In Q2 there were exceedances in total nitrogen, phosphorous, ammonia, PO4-P, chromium, copper, lead, silver, and zinc.
- There were no reportable non-conformances in 2022.

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Table 3-4 Summary of 2022 jetty outfall mixing zone monitoring results

Parameter	Units	EPL 217-02 Jetty Outfall Mixing Zone Trigger Values	Q1 2022		Q2 2022		Q3 2022		Q4 2022	
			North Reference (NORTHERN)	Median of Sites 1-3	South Reference (SOUTHERN)	Median of Sites 1-3	Southern Reference (SOUTHERN)	Median of Sites 1-3	North Reference (Northern)	Median of Sites 1-3
pH	pH units	7-8.5	7.79 (7.36-8.36)	7.82	7.54 (7.36-8.36)	8.78	7.93 (7.36-8.36)	8.02	8.13 (7.36-8.36)	8.17
ORP	mV	NA	117.9 (57.855-60.945)	89.8	-98.8 (57.855-60.945)	-156.7	76.4 (57.855-60.945)	75.9	159.6 (57.855-60.945)	139.1
Temperature	°C	NA	30.3 (30.6-32.6)	30.3	31.7 (30.6-32.6)	30.9	26.15 (30.6-32.6	26.0	31.1 (30.6-32.6)	31.2
Electrical Conductivity	µs/cm	NA	42,500 (47,975-53,025)	**42,800**	43,500 (47,975 -53,025)	30,800	53,600 (47,975 -53,025)	53,300	57,400 (47,975-53,025)	**57,518**
Total Suspended Solids (TSS)	mg/L	≤10	<5.0	8	13	9	<5.0	<5	<5.0	<5
Turbidity	NTU	20	2.5	2.4	0.8	**5.9**	11.4	4.6	1.6	**1.7**
Total Dissolved Solids (TDS)	mg/L	N/A	NR	NR	NR	NR	NR	NR	NR	NR
Dissolved Oxygen (DO)	%	80-100	97.1 (>81.1)	97.5	NA (>81.1)	NA	103.2 (>81.1)	**107.4**	58.4 (>81.1)	57.9
Biological Oxygen Demand (BOD)	mg/L	NA	NA	NA	<2	<2	NA	NA	0.080	<2
Total Nitrogen	mg/L	<0.27	0.229	0.255	<0.5	<0.5	<1.0	<1.0	<2	0.082
Total Phosphorus (P)	mg/L	<0.02	NA	NA	<0.05	<0.05	NA	NA	<0.005	<0.005
Ammonia	mg/L	<0.02	<0.005	<0.005	0.25	<0.1	0.17	0.11	<0.005	<0.005
Nitrate (NO_3)	mg/L	0.7	0.012	0.011	0.05	<0.01	<0.01	<0.01	<0.002	<0.002
Nitrite (NO_2)	mg/L	NA	<0.002	<0.002	0.01	<0.01	<0.01	<0.01	<0.002	<0.002
Dissolved reactive phosphorus (PO_4-P)	mg/L	0.005	NA	NA	<0.01	<0.01	NA	NA	<0.001	<0.001
Total Kjeldahl Nitrogen	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	-
Chlorophyll a	mg/L	<0.002	0.003	0.002	<0.001	<0.001	<0.001	<0.001	0.002	0.002
Escherichia coli (E. coli)	MPN /100mL	<200	NA	NA	<10	<10	NA	NA	<10	<10
Enterococci	MPN /100mL	50	NA	NA	<10	<10	NA	NA	<10	<10
Arsenic[1]	µg/L	NA	NA	NA	<10	<10	NA	NA	1.9	2.0
Cadmium[1]	µg/L	5.5	<0.2	<0.2	<1	<1	<0.2	<0.2	<0.2	<0.2
Chromium[1]	µg/L	4.4	NA	NA	<10	<10	NA	NA	<0.5	<0.5
Copper[1]	µg/L	1.3	<1	<1	<10	<10	NA	NA	<1	<1
Iron[1]	µg/L	NA	NA	NA	<10	<10	NA	NA	12	13
Lead[1]	µg/L	4.4	NA	NA	<10	<10	NA	NA	<0.2	<0.2
Manganese[1]	µg/L	NA	NA	NA	<10	<10	NA	NA	1.0	0.9
Mercury[1]	µg/L	0.4	NA	NA	<0.1	<0.1	NA	NA	<0.00004	<0.00004
Nickel[1]	µg/L	70	<0.5	<0.5	<10	<10	0.5	<0.5	<0.5	<0.5
Silver[1]	µg/L	1.4	NA	NA	<10	<10	NA	NA	<0.1	<0.1
Zinc[1]	µg/L	15	10	<5	<50	<50	<5	<5	<5	<5
BTEX	µg/L	700	NA	NA	<1	<1	NA	NA	NA	NA
Total Recoverable Hydrocarbons (TRH)	mg/L	LOR (<0.1)	NA	NA	<0.1	<0.1	NA	NA	<0.1	<0.1

Notes: NA indicates no Trigger Values available.
LOR indicates trigger value or detection below limit of reporting.

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Yellow shading denotes values that exceed / are outside of the EPL 217-02 Jetty Outfall Mixing Zone Trigger Value.
Bold denotes values that exceed Reference Site Value.
Blue shading denotes medians that exceed the EPL 217-02 Jetty Outfall Mixing Zone Trigger Value and Reference Site Value

3.1.5 Monitoring Results – Sediment Ponds

Discharge Water Quality

A summary of the sediment water quality results for 2022 for Sediment Ponds 1-3, as well as the 2016-2022 trend and Licence trigger value exceedances are presented in Table 3-5, Table 3-6 and Table 3-7 and are discussed below.

Discharges from sediment ponds are affected primarily by the amount of rainfall except for Sediment Pond 1 which also receives greensands filter backwash discharge from the Demineralisation Plant year-round. The following is a summary of the sediment pond discharge and sampling undertaken in 2022:

- SP1: Discharges occurred year-round and monthly samples were collected with annual samples collected in January.
- SP2: Discharges occurred between February to March, then not again until wet season rains in November. The annual samples were collected in March.
- SP3: Discharges occurred between January to April, then not again until wet season rains in November. The annual samples were collected in January.

In addition to mandatory monitoring under the Licence, voluntary monitoring has also been conducted for parameters of interest during 2022. The 2016-2022 dataset of both compliance and voluntary sediment pond water quality results is provided in Attachment A – Sediment Ponds 1,2 and 3; values exceeding current Licence trigger values are bolded.

Key findings from a review of the sediment pond discharge water quality results include:

- Field measurements for the discharge of all sediment ponds during 2022 were generally consistent with the 2016-2022 average and were within the Licence trigger values with the following exceptions:
    - Turbidity in Sediment Pond 2 went above the trigger limit twice in 2022 (June and August) Figure 3-16
    - Copper in Sediment Pond 2 went above the trigger limit twice in 2022 (June and August) Figure 3-17. Spikes in Cu concentrations have been seen in historical data, with trends usually showing a quick return to normal.
- None of these events triggered a reportable non-conformance to the NT EPA.
- All other parameters were below the Licence limits for 2022.

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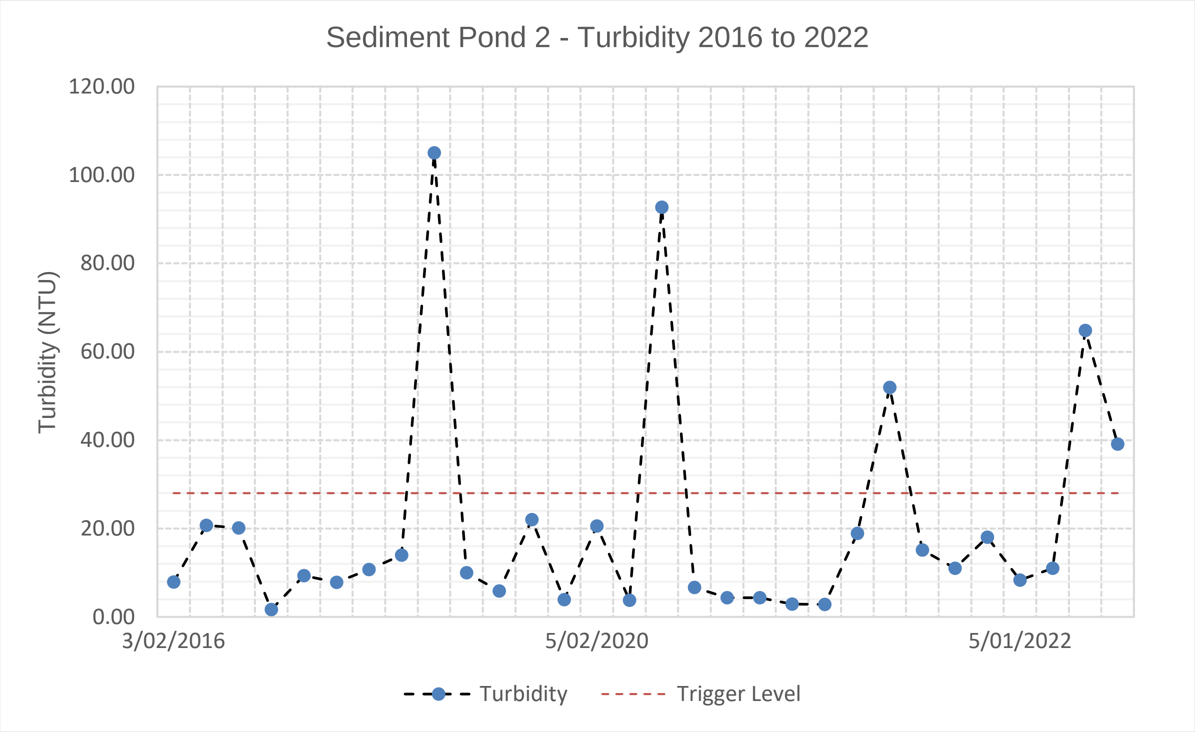

Figure 3-16 Turbidity measured in Sediment Pond 2 2016 - 2022

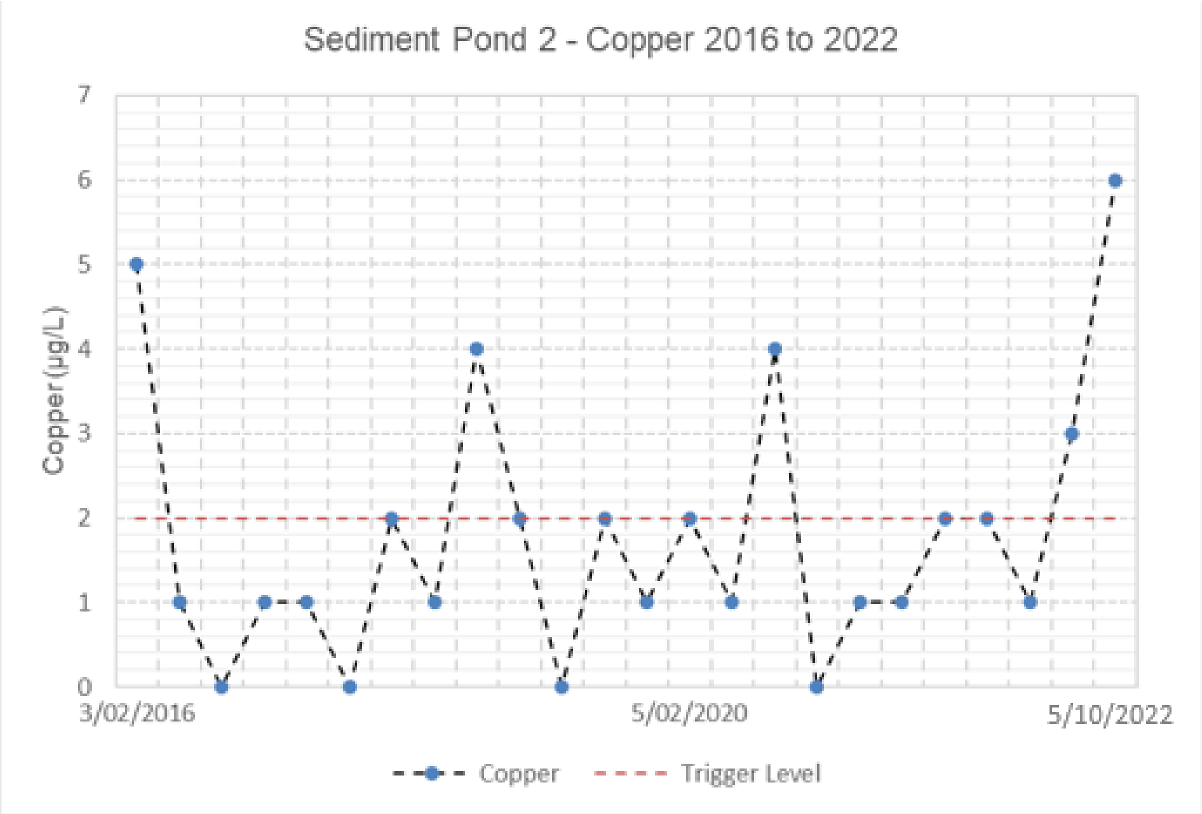

Figure 3-17 Copper measured in the Sediment Pond 2 2016 - 2022

Table 3-5 Summary of 2022 Sediment Pond 1 water quality monitoring results

Parameter	Monitoring Frequency	Licence Trigger Value [1]	2022 Maximum	2022 Minimum	2022 Average	Long-term Average (2016-2022)	2022 Reportable Non-Conformance [1]
Field Parameters							
pH	Monthly	6-8.5	7.3	6.4	6.8	6.8	No
Electrical conductivity(µs/cm)	Monthly	No trigger	452.3	85.30	164.9	136.0	N/A
TSS (mg/L)	Monthly	≤ 75	4.0	0.0	1.0	0.46	No
Turbidity (NTU)	Monthly	28.0	8.94	0.960	2.50	2.06	No
DO (mg/L)	Monthly	No trigger	7.70	3.59	5.43	5.47	N/A
Temperature (°C)	Monthly	No trigger	35.10	21.50	29.59	28.95	N/A
Environmental Indicators							
Ammonium nitrogen (NH_3-N) (µg/L)	Annual	94.0	14.0	14.0	14.0	22.7	No
Nitrate (NO_3-N) (µg/L)	Annual	145	39.0	39.0	39.0	35.6	No
Nitrite (NO_2-N) (µg/L)	Annual	17	<1.0	<1.0	<1.0	2.4	No
DRP (PO_4-P) (µg/L)	Annual	5	<1	<1	N/A [2]	3	No
Total Nitrogen (mg/L)	Annual	≤ 40	0.2	0.2	0.2	0.3	No
Total Phosphorous (mg/L)	Annual	≤ 10.	0.15	0.15	0.15	0.010	No
BOD (mg/L)	Monthly	≤ 25	3.7	1.0	1.9	1.8	No
TPH (mg/L)	Annual	< 6.0	<0.65	<0.65	N/A [2]	N/A [2]	No
E. coli (MPN/100 mL)	Biannual	≤ 305	41.0	41.0	41.0	54.3	No
Enterococci (MPN/100 mL)	Biannual	261	10.0	10.0	10.0	48.4	No
Metals & BTEX							
Arsenic (µg/L)	Annual	No trigger	<1	<0.5	N/A [1]	N/A [1]	N/A
Cadmium (µg/L)	Monthly	5.5	0.70	<0.10	0.25	0.23	No
Chromium (µg/L)	Annual	4.4	<1.0	<0.50	N/A [2]	N/A [2]	No
Copper (µg/L)	Monthly	2.0	<1.0	<1.0	<1.0	<1.0	No

Parameter	Monitoring Frequency	Licence Trigger Value [1]	2022 Maximum	2022 Minimum	2022 Average	Long-term Average (2016-2022)	2022 Reportable Non-Conformance [1]
Iron (µg/L)	Annual	No trigger	5.00	5.00	5.00	152	N/A
Lead (µg/L)	Annual	4.4	<1.0	<0.20	N/A [2]	N/A [2]	No
Manganese (µg/L)	Annual	No trigger	190.0	190.0	190.0	369.2	N/A
Mercury (µg/L)	Monthly	0.4	<0.1	<0.1	N/A [2]	N/A [2]	No
Nickel (µg/L)	Annual	70	<1	<1	<1	1	No
Silver (µg/L)	Annual	1.4	<1.0	<1.0	N/A [2]	N/A [2]	No
Zinc (µg/L)	Monthly	1,000.	420.0	7.000	126.3	105.8	No
BTEX (µg/L)	Monthly	700	<3	<2	N/A [2]	N/A [2]	No

Note:

1. Results from mandatory sampling are only considered when determining reportable non-conformances under the Licence.
2. No samples above LOR in the period.

Table 3-6 Summary of 2022 Sediment Pond 2 water quality monitoring results

Parameter	Monitoring Frequency	Licence Trigger Value [1]	2022 Maximum	2022 Minimum	2022 Average	Long-term Average (2016-2022)	2022 Reportable Non-Conformance [1]
Field Parameters							
pH	Monthly	6-8.5	6.6	6.3	6.4	6.6	No
Electrical conductivity(µs/cm)	Monthly	No trigger	354.3	87.40	169.1	200.8	N/A
TSS (mg/L)	Monthly	≤ 75.0	24.0	2.00	11.5	9.04	No
Turbidity (NTU)	Monthly	28.0	**64.8**	8.32	30.8	20.5	No
DO (mg/L)	Monthly	No trigger	6.38	4.32	5.34	5.43	N/A
Temperature (°C)	Monthly	No trigger	30.50	28.40	28.98	30.03	N/A
Environmental Indicators							
Ammonium nitrogen (NH_3-N) (µg/L)	Annual	94.0	8.00	8.00	8.00	76.7	No
Nitrate (NO_3-N) (µg/L)	Annual	145	56.0	56.0	56.0	163	No

Parameter	Monitoring Frequency	Licence Trigger Value [1]	2022 Maximum	2022 Minimum	2022 Average	Long-term Average (2016-2022)	2022 Reportable Non-Conformance [1]
Nitrite (NO_2-N) (µg/L)	Annual	17	<1.0	<1.0	<1.0	6.3	No
DRP (PO_4-P) (µg/L)	Annual	5	3	3	3	4	No
Total Nitrogen (mg/L)	Annual	≤ 40.	0.18	0.18	0.18	1.0	No
Total Phosphorous (mg/L)	Annual	≤ 10.	0.015	0.015	0.015	0.020	No
BOD (mg/L)	Monthly	≤ 25	2.3	<1	1.5	6.6	No
TPH (mg/L)	Annual	< 6.0	<0.65	<0.65	<0.65	<0.65	No
E. coli (MPN/100 mL)	Biannual	≤ 305	41.0	31.0	36.0	166	No
Enterococci (MPN/100 mL)	Biannual	261	20.0	20.0	20.0	202	No
Metals & BTEX							
Arsenic (µg/L)	Annual	No trigger	<1	<1	N/A [2]	N/A [2]	N/A
Cadmium (µg/L)	Monthly	5.5	0.40	<0.10	0.23	0.19	No
Chromium (µg/L)	Annual	4.4	<1.0	<1.0	N/A [2]	N/A [2]	No
Copper (µg/L)	Monthly	2.0	**6.0**	1.0	3.0	2.2	No
Iron (µg/L)	Annual	No trigger	93.0	93.0	93.0	144	N/A
Lead (µg/L)	Annual	4.4	<1.0	<1.0	N/A [2]	N/A [2]	No
Manganese (µg/L)	Annual	No trigger	190.	190.	190.	676	N/A
Mercury (µg/L)	Monthly	0.4	<0.1	<0.1	N/A [2]	N/A [2]	No
Nickel (µg/L)	Annual	70	<1	<1	N/A [2]	5	No
Silver (µg/L)	Annual	1.4	<1.0	<1.0	N/A [2]	N/A [2]	No
Zinc (µg/L)	Monthly	1,000.	340.0	69.00	163.0	101.2	No
BTEX (µg/L)	Monthly	700	<3	<3	N/A [2]	N/A [2]	No

Note:

1. Results from mandatory sampling are only considered when determining reportable non-conformances under the Licence.
2. No samples above LOR in the period.

Table 3-7 Summary of 2022 Sediment Pond 3 water quality monitoring results

Parameter	Monitoring Frequency	Licence Trigger Value	2022 Maximum	2022 Minimum	2022 Average	Long-term Average (2015-2022)	2022 Reportable Non-Conformance [1]
Field Parameters							
pH	Monthly	6-8.5	7.0	6.4	6.7	7.0	No
Electrical conductivity(µs/cm)	Monthly	No trigger	163.3	77.20	110.8	144.6	N/A
TSS (mg/L)	Monthly	≤ 75	7.0	0.0	3.6	1.3	No
Turbidity (NTU)	Monthly	28.0	14.9	2.53	7.76	6.18	No
DO (mg/L)	Monthly	No trigger	7.79	4.13	6.09	5.96	N/A
Temperature (°C)	Monthly	No trigger	30.90	28.00	29.64	29.71	N/A
Environmental Indicators							
Ammonium nitrogen (NH_3-N) (µg/L)	Annual	94	8.0	8.0	8.0	20.	No
Nitrate (NO_3-N) (µg/L)	Annual	145	39.0	39.0	39.0	48.0	No
Nitrite (NO_2-N) (µg/L)	Annual	17	<1.0	<1.0	<1.0	2.8	No
DRP (PO_4-P) (µg/L)	Annual	5	4	<1	4	7	No
Total Nitrogen (mg/L)	Annual	≤ 40.	0.17	0.17	0.17	0.26	No
Total Phosphorous (mg/L)	Annual	≤ 10.	0.015	0.015	0.015	0.020	No
BOD (mg/L)	Monthly	≤ 25	2.9	<1.0	1.7	1.5	No
TPH (mg/L)	Annual	< 6.0	<0.65	<0.65	<0.65	<0.65	No
E. coli (MPN/100 mL)	Biannual	≤ 305	52.0	52.0	52.0	1,090	No
Enterococci (MPN/100 mL)	Biannual	261	63.0	63.0	63.0	100.	No
Metals & BTEX							
Arsenic (µg/L)	Annual	No trigger	<1.0	0	N/A [2]	0.75	N/A
Cadmium (µg/L)	Monthly	5.5	<0.10	<0.050	N/A [2]	0.12	No
Chromium (µg/L)	Annual	4.4	<1.0	<1.0	<1.0	1.3	No
Copper (µg/L)	Monthly	2.0	2.0	<1.0	1.3	1.6	No

Parameter	Monitoring Frequency	Licence Trigger Value	2022 Maximum	2022 Minimum	2022 Average	Long-term Average (2015-2022)	2022 Reportable Non-Conformance [1]
Iron (µg/L)	Annual	No trigger	180	180	180	186	N/A
Lead (µg/L)	Annual	4.4	<1.0	<1.0	N/A [2]	N/A [2]	No
Manganese (µg/L)	Annual	No trigger	3.00	3.00	3.00	45.9	N/A
Mercury (µg/L)	Monthly	0.4	<0.1	<0.1	N/A [2]	N/A [2]	No
Nickel (µg/L)	Annual	70.	<1.0	<1.0	<1.0	2.5	No
Silver (µg/L)	Annual	1.4	<1.0	<1.0	N/A [2]	N/A [2]	No
Zinc (µg/L)	Monthly	1,000.	140.0	31.00	61.00	77.50	No
BTEX (µg/L)	Monthly	700	<3.00	<2.00	N/A [2]	N/A [2]	No

Note:

1. Results from mandatory sampling are only considered when determining reportable non-conformances under the Licence.
2. No samples above LOR in the period.

3.1.6 Data Management and Quality Control

As outlined in Section 3.1.2, all samples are collected by DLNG laboratory staff or environmental consultants, who are trained and experienced in the sampling methodologies. All samples are analysed by laboratories with NATA accreditation for the analyses performed. The field parameters are an exception to this pH, DO, EC, TSS, turbidity, temperature all have short holding times, and hence are analysed by DLNG laboratory or with field meters.

Results are reviewed upon completion of analysis, and the data is recorded in the Santos database. Any results that are considered to be unreliable are investigated further and additional sampling undertaken if required.

3.1.7 Discussion and Interpretation of Results

Irrigation Area

- There was one reportable non-conformance relating to the irrigation water during 2022, this was deemed to be of low risk and low impact to the environment:
- Speciated Nutrients above trigger levels - ammonium nitrogen (NH_3-N), Nitrate (NO_3-N), Nitrite (NO_2-N) and dissolved reactive phosphorus (PO_4-P). Groundwater monitoring results do not indicate any linkages between nutrient trends in irrigation water quality and groundwater quality. Accordingly, impacts to the receiving environment are likely to be negligible.
- BOD was above the EPL at the beginning of 2022, however the values dropped within the Licence limits for the remainder of the year. These values will be continued to be monitored in 2023 and are expected to improve significantly once the new STP is operating.

Based on the irrigation flow data, evapotranspiration rates, groundwater hydraulic head data and rainfall data, there is a low likelihood that the irrigation water applied has discharged to, or is impacting on the receiving environments, including groundwater and stormwater, either by surface or subsurface mechanisms. In addition, BOD is not expected to cause groundwater quality issues given that it is expected to be naturally high in the organic matter rich mangrove environment.

Jetty Outfall discharge and Mixing Zone

Metal concentrations in the jetty outfall discharge during 2022 were generally within the Licence trigger values, apart from zinc. Zinc exceeded the licence trigger value on two occasions in January 2022 before returning to compliant levels for the remainder of the year. This did not result in an exceedance in the jetty outfall mixing zone or trigger a reportable non-conformance to the NT EPA and is likely due to concentration of low levels in the source water from the NT Power and Water Authority (POWA) through the demineralisation plant. The remainder of metals were also consistent with or below the 2016-2022 average.

Ammonium nitrogen in the jetty outfall discharge exceeded the licenced trigger value on one occasion in February 2022. However, this exceedance does not trigger a non-compliance as it was neither consecutive nor three times the trigger value. In Q2 Total Nitrogen, Total Phosphorous, Ammonia, Dissolved reactive phosphorous, chromium, copper, lead, silver and zinc concentrations all exceeded the trigger value however as the previous two monitoring events were within the trigger value range, this exceedance is considered compliant. In Q3 Dissolved oxygen concentrations in the mixing zone exceeded trigger value, however as the previous two monitoring events were within the trigger value range, this exceedance is considered compliant.

In summary, the results of the jetty outfall mixing zone sampling program were compliant with Condition 77. In addition, the dilutions generally met the reference site, Licence trigger or DHWQO trigger values, therefore the risk of environmental impact from the jetty outfall discharge is considered low.

Sediment Ponds 1,2&3

Overall, in 2022 the monitoring results were consistent with data from previous years with the averages for all parameters meeting the licence triggers with the exception of turbidity and copper in Sediment Pond 2.

In previous years there have been problems with nutrients in the sediment ponds, which were likely attributable to vegetative matter in the stormwater drainage network that leads to the sediment ponds as well as surrounding and within the sediment ponds. In addition, wildlife frequents the sediment ponds to source freshwater and contribute faecal matter which is expected to be the primary source for the microbiological spikes, as well as contributing to the nutrient concentrations. The spikes coincide with the onset of the wet season and rainfall events which is typical for tropical environments and is considered natural. The spikes are also typically of short duration. The data in 2022 did not present these same issues, however there were elevated levels of turbidity, which may be attributed to these same conditions.

In addition, field data shows that the sediment ponds do not generally appear to be affected by algal blooms, odour issues, mortality, or any other sources of contamination. For these reasons, the discharge water quality from the sediment ponds is of low environmental risk or impact.

3.2 Mangrove Monitoring

There is mangrove habitat surrounding the DLNG facility, which is monitored to determine if there is any environmental impact from the operation of the facility. Condition 63 of the Licence requires Santos to undertake mangrove monitoring program. The requirements for this program are outlined in Appendix D of the Licence, and are summarised below:

- Mangrove health monitoring (including groundwater monitoring) – regular ongoing monitoring of indices related to mangrove health, such as:
  - Canopy density
  - Tree density
  - Species composition
  - Defoliation index
  - Changes in sediment height and
  - Groundwater characteristics.
- Chemical monitoring – analysis of sediments and biota in mangrove habitats for hydrocarbon and heavy metal contamination, including:
  - Sediment particle size and
  - Concentrations of metals and hydrocarbons in sediments and biota (mudwhelks).

The mangrove monitoring program is required to be undertaken annually.

CDM Smith, with the support of EcoScience, were commissioned by Santos to collect, review, and interpret mangrove related data in accordance with the mangrove monitoring plan. The results of this analysis were provided in an annual mangrove monitoring report (CDM Smith, 2022e) and are summarised in this section.

3.2.1 Monitoring Objectives

The objective of the mangrove monitoring program is to identify and quantify potential impacts from the operation of the DLNG facility on the environment surrounding the facility. The monitoring program provides information on the health of this ecosystem. The information collected by the mangrove monitoring and chemical surveillance program is considered in conjunction with results from other monitoring programs implemented by Santos.

The mangrove monitoring and chemical surveillance program is also intended to maintain compliance with Condition 63 and Appendix D of the Licence.

3.2.2 Monitoring Methods

The annual mangrove monitoring was undertaken at the DLNG facility during August 2022. The methods used to undertake the monitoring are summarised in Table 3-8 and are in accordance with the Mangrove Surveillance and Chemical Monitoring Program outlined in Appendix D of the Licence. The sampling locations are shown in Figure 3-18 and Figure 3-19.

Table 3-8 Summary of 2021 mangrove monitoring and chemical surveillance methods

Element	Indicator	Method	Information Provided
Mangrove Monitoring			
Mangrove Health	Canopy cover	Densiometer readings of foliage or canopy cover	Quantitative estimates of mangrove canopy density used to determine changes in canopy cover over time
	Photo-monitoring	Comparison of photo-monitoring from current year with baseline imagery and previous years	Standardised set of photos used for comparison of forest health over time
	Tree condition	Defoliation index (score of health on scale of 0-5)	Visual assessment using standardised method of tree health used for comparison of forest health over time
	Tree density and species composition	Percentage species composition Tree density per hectare	Mangrove species richness, diversity and density measures used for comparison over time
	Resilience	Abundance of seedlings (<1 m) and saplings (<2 m) is ranked from 0 to 5	Assessment of the presence and abundance of mangrove seedlings and saplings as an indicator of forest health and potential for rapid regeneration
Groundwater monitoring	Water table depth	Water quality monitoring probes in monitoring bores	Data on groundwater quality (water table depth, TDS, and pH) for comparison of water quality to

Element	Indicator	Method	Information Provided
	Total dissolved solids (TDS) pH		previous monitoring data and water quality standards
Sediment / erosion monitoring	Sediment levels	Measurements of sediment height taken from fixed reference post	Sediment height in relation to reference post for comparison over time
Chemical Monitoring			
Sediment characterisation	Particle size distribution (PDS)	Wet sieving Laser diffraction	Sediment particle size distribution for comparison over time
	Metal and hydrocarbon concentrations in sediments	Sediment samples for laboratory analysis	Concentrations of metals and hydrocarbons in sediments for comparison to previous monitoring data and sediment quality standards
Bioaccumulation	Metal and hydrocarbon concentrations in mudwhelks	Tissue samples for laboratory analysis	Concentrations of metals and hydrocarbons in mudwhelk tissue for comparison to previous monitoring data

The following changes have been made to the monitoring methods:

- During the August 2015 survey, two new sites (SS15A and SS16A) were established as replacement sites for SS15 and SS16 whose value had become limited due to location of plots within the flare dyke footprint during the construction phase. The new sites were selected to provide monitoring coverage in this area and were also located adjacent the outlet of discharge from Sedimentation Pond 1 (Figure 3-18).
- During monitoring surveys conducted between 2003 to 2017 canopy cover was measured using a standard densiometer. In 2017 and 2018 the Stickler's modified 17-point densiometer was trialled alongside the standard densiometer method. The 17 point densiometer has been widely adopted as the standard instrument in mangrove monitoring in Darwin Harbour since 2011. After reviewing the trial data and other benefits, this was adopted as the sole method for measuring canopy at DLNG since the 2019 mangrove surveillance monitoring campaign.
- Historically all photo monitoring has been undertaken using the corner post to centre method. Since the 2018 survey a second set of photographs has been taken using the centre to corner post method. This additional set of high-quality images improves the ability to detect short-term and localised changes in mangroves, eliminating the redundancy of older, occasionally mis-matched photos and allows detailed visual monitoring of post-cyclone recovery and future changes in mangrove forest health.
- Three new chemical monitoring sites were installed during in 2020 and have been retained in the 2022 program to help assess potential contamination downstream of Sediment Ponds 2 and 3 (SP2A – sediment only, SP3 – sediment only and SP3-A – sediment and biota). Biota is not typically present at SP2A and SP3.
- In 2021 two new photo monitoring sites were installed downstream from the sediment ponds (SP1-C and SP3-B)

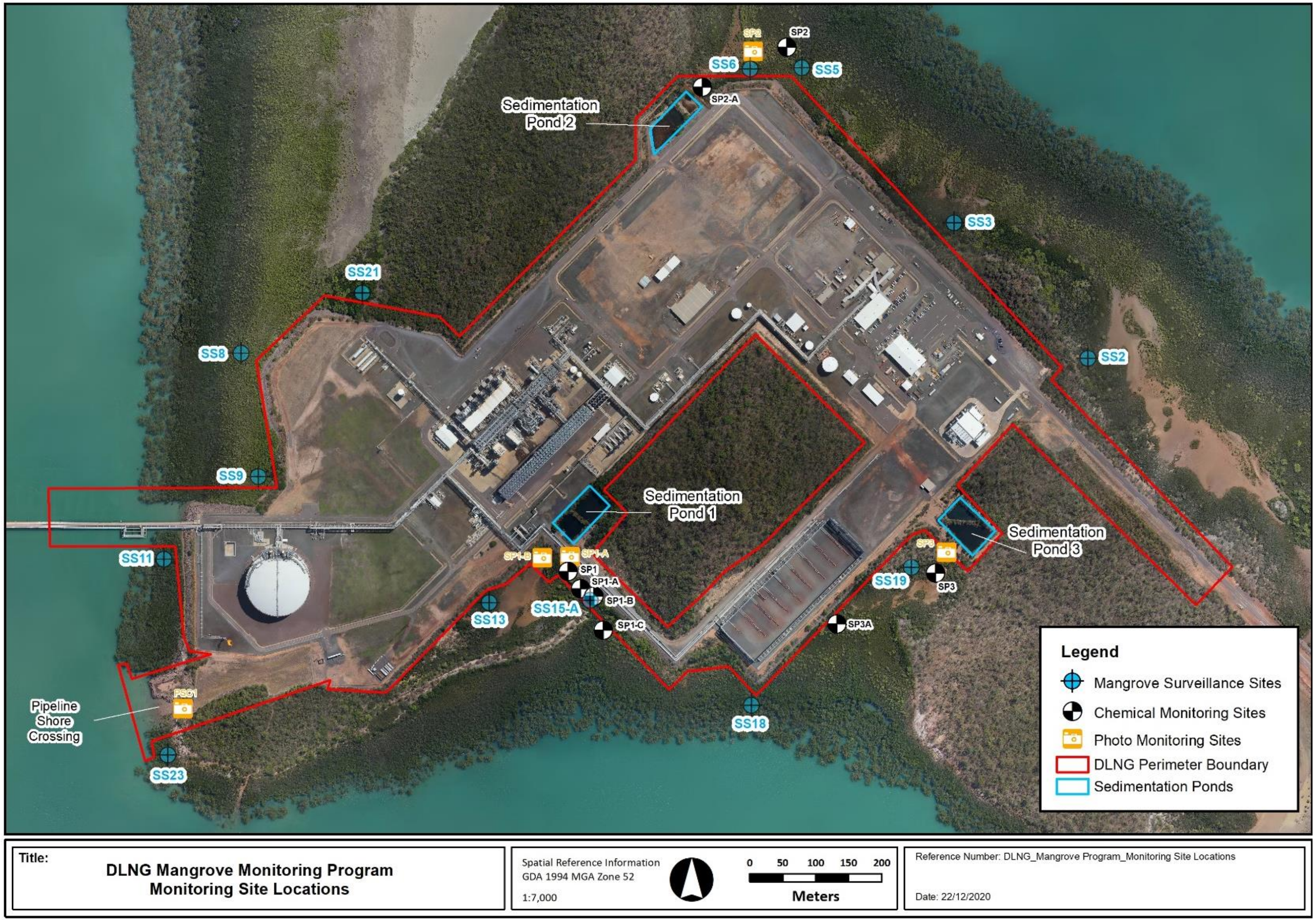

Figure 3-18 Location of sampling sites for the mangrove monitoring program

Santos

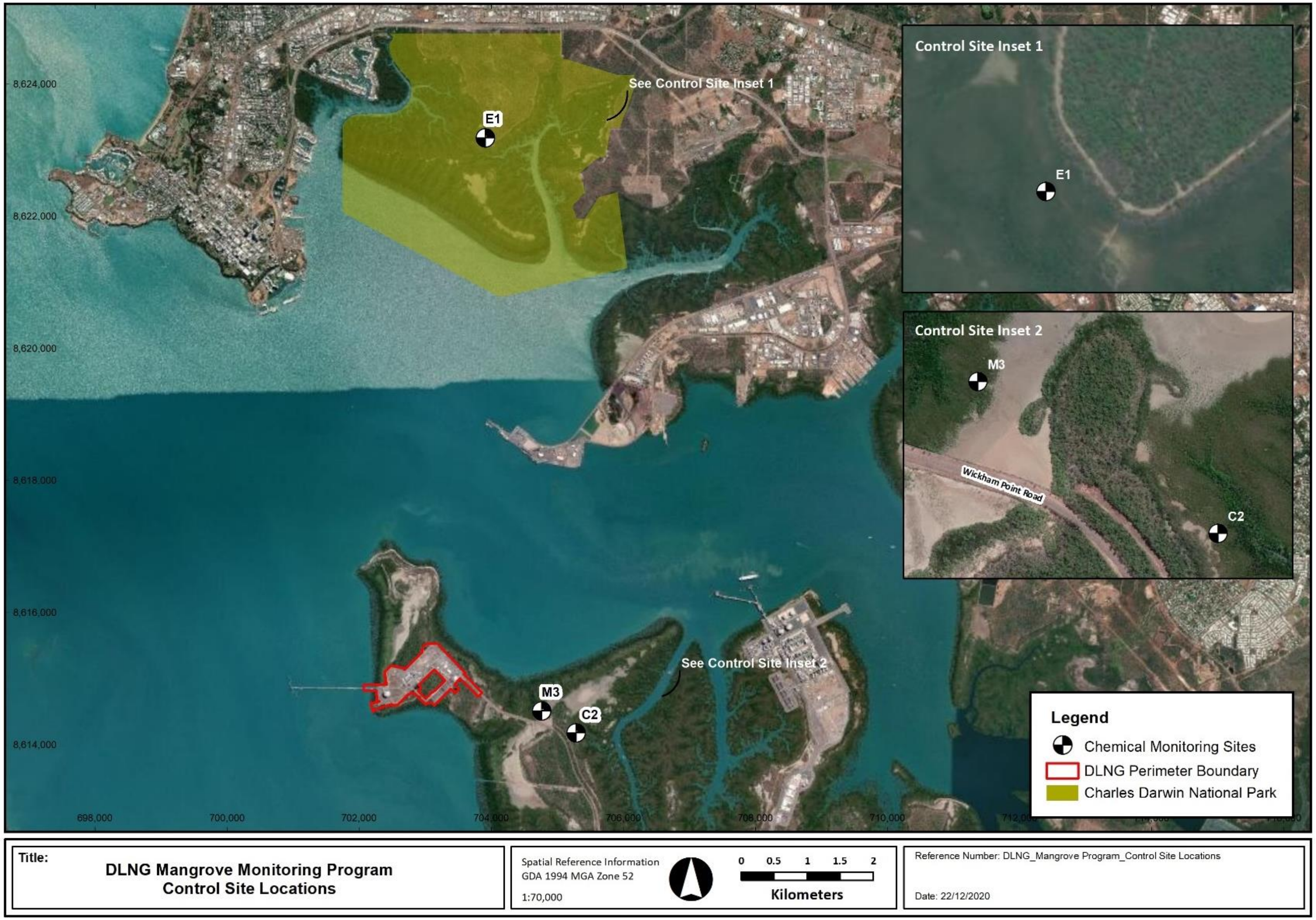

Figure 3-19 Location of control sites for the mangrove monitoring program

Mangrove monitoring sites around the DLNG facility represent several mangrove assemblages, which are distinguished by the degree of tidal inundation experienced as illustrated in the conceptual model (Metcalfe, 2007) (Figure 3-20) DLNG monitoring sites are in the hinterland margin, tidal flat and tidal creek assemblages. Most sampling locations (11 of 23) are located in the most landward assemblage (hinterland margin), which typically abuts the DLNG facility boundary. The hinterland margin assemblage is dominated by mid-high *Ceriops australis* and *Lumnitzera racemosa* and in some areas this assemblage may be only 10 m in width. Three of the 23 surveillance sites occur within Ceriops forests of the tidal flat assemblage, which occurs slightly lower in the intertidal zone and are dominated by low Ceriops australis. Nine sites occur within forests dominated by *Rhizophora stylosa* (the tidal creek or Rhizophora zone) which typically occur further to seaward but are also associated with minor tidal channels draining the tidal flat.

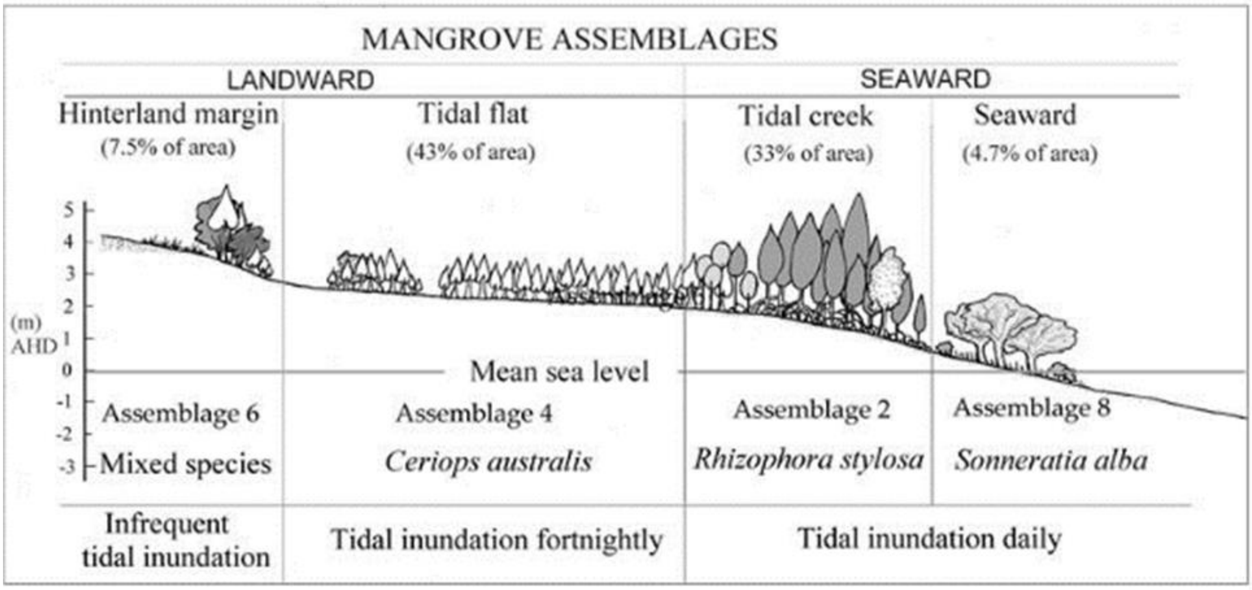

Figure 3-20 Conceptual model of the four main mangrove assemblages found within Darwin Harbour

3.2.3 Monitoring Results

A summary of the mangrove monitoring results is provided in the following sections with a dataset (2003-2022) provided in Attachment B.

Canopy Density

Canopy cover, which is determined by leaf growth and senescence, is sensitive to a wide range of environmental factors. Hence the density of the tree canopy is a useful gauge of forest condition and is typically a key indicator of mangrove health. During monitoring surveys conducted between 2003 and 2017 the canopy cover was measured using a standard densiometer. In 2017 and 2018, the Stickler's modified 17-point densiometer was trialled and is now the preferred and sole method since 2019.

From the 2021 monitoring event onwards, long-term changes in canopy cover (%) now incorporate the initial 2003-2004 baseline survey as well as the subsequent 2015 and 2017 baseline surveys. In contrast, all previous reports only examined long-term change between the initial 2003-2004 baseline survey and the most recent monitoring programme, omitting the additional sites SS15A & SS16A established in 2015, and site SS06 which has only recently been included in canopy cover monitoring in 2017.

Changes in canopy cover data for each monitoring site is presented in Table 3-9. Key findings include:

- Survey results for 2022 indicated that mangroves remain in good condition, with canopy cover characteristic of healthy mangrove assemblages. Examination of long-term trends in canopy data demonstrate that mangrove health has remained stable or slightly improved during the 17 years since program commencement.
- Short and long-term assessment of percentage change in canopy cover indicated that change was well below trigger levels.
- Declines in canopy cover at sites SS03, SS10, SS11 and SS23 are considered to be likely due to natural declines in mangrove health associated with localised forest senescence and is unrelated to anthropogenic impacts associated to the DLNG plant.
- Notable increases in canopy cover since baseline at in upper Tidal flat and Hinterland margin habitats may be associated with increased inflows of freshwater near Sediment Ponds 2 and 3 respectively. These results may also be slightly exaggerated by apparent increases in low forests (2–4m in height) by use of the tripod-mounted 17-point densiometer which captures a greater portion of low-growing tree canopies. Increases in percentage change in canopy cover since baseline are regarded as positive changes and not of concern in terms of anthropogenic impacts to mangroves.

Table 3-9 Differences in mean canopy cover (%) between baseline (2003) and 2015-2022

Assemblage	Site	Standard Densiometer			17 Point Densiometer				
		2015	2016	2017	2018	2019	2020	2021	2022
Hinterland margin	SS01	-1	1	1	6.3	6.5	4	6	2
	SS02	-2	4	3	9.1	8.2	7.9	7	7
	SS03	-18	-18	-16	-14.0	-16.2	-12.5	-11	-11
	SS04	-2	-1	-1	2.1	2.5	2.9	3	2
	SS07	-2	-5	-7	5.9	-1.6	5	2	1
	SS09	-1	2	5	11.7	11.1	12.1	13	14
	SS13	1	2	3	7.2	6.3	8.2	9	7
	SS14	-4	-1	0	10.4	-0.1	0.5	2	-1
	SS19	0	0	-1	28.3	18.5	17.8	11	4
	SS20	2	-7	-16	15.4	3.3	5.9	2	-3
	SS21	1	0	0	1.2	3.1	2.3	4	-2
Rhizopora forest	SS10	-3	-5	-5	-8.4	-6.8	-4.2	-2	-1
	SS11	-6	-5	-8	-6.3	-6.5	-4.1	-3	-7
	SS12	-2	-6	-3	1.0	2.1	2.9	4	2
	SS15A [2]	N/A	2	-3	13	9	9	7	5
	SS16A [2]	N/A	4	10	13	10	16	15	15

Assemblage	Site	Standard Densiometer			17 Point Densiometer				
		2015	2016	2017	2018	2019	2020	2021	2022
	SS17	-3	-2	-4	2.2	0.6	1.1	2	1
	SS18	-6	-4	-10	2.2	-3.6	-1.1	0	-3
	SS22	-3	-3	-6	1.1	0.0	1.8	6	1
	SS23	-1	-5	-5	-9.7	-14.2	-13.8	-14	-14
Ceriops forest / tidal flat	SS05	8	8	14	40.6	35.7	37.2	33	33
	SS06[2,3]	N/A	N/A	N/A	2	-8	4	1	-1
	SS08	12	11	5	32.8	28.2	22.1	19	19

[1] N/A indicates data unavailable for previous years

[2] Surveillance sites SS15A & SS16A and SS06 which were established in 2015 and 2017 respectively: Mean change (%) calculated from the four subplots at each site.

[3] Change from Baseline data for SS06 is now derived from the 2017 Baseline survey 17-point densiometer data. NB: all previous reports displaying change were derived from the Standard densiometer method.

Photographic Monitoring

Photo-monitoring images are used as a reference and to monitor mangrove health by detection of any changes in forest structure, regeneration, species composition and physiognomy over time. Digital photographs were taken from the four corner posts of each of the 23 monitoring plots directed toward the centre of each plot, as well as from the centre outwards towards the four corner posts.

Key findings from the photographic monitoring results include:

- Photo-monitoring supplemented results for defoliation index and percentage canopy change, showing the following:
  - Little or no short-term change was observed in images from hinterland margin sites (e.g., SS13, SS14 and SS20) except for some active regrowth of seedlings within canopy gaps (SS03).
  - Some distinct, largely positive, changes were detected by detailed examination of imagery from several tidal flat sites dominated by Ceriops and Avicennia. Increases in forest height and canopy cover with increased sapling and tree density were evident within several mid- to upper-intertidal forests (e.g., SS05, SS06 and SS09).
  - Minor structural post-cyclone changes (e.g., disintegration of logs and attrition of dead trees) were evident in shoreline Rhizophora forests (e.g., SS10, SS23) but overall, lower intertidal sites appeared stable and in healthy condition.
- Photo-monitoring during the 2022 was a useful rapid surveillance monitoring technique survey, effective in demonstrating that the healthy status of mangroves remains unchanged at the 23 monitoring sites surrounding the DLNG.

Defoliation Index

To supplement canopy cover data and to provide a rapid assessment of forest health within each surveillance site, the health of the canopy, as indicated by the degree and extent of leaf loss (or defoliation) is estimated. To estimate defoliation index, the observer stands within the centre of each of the four 5 m x 5 m quadrants of the monitoring plot to assess tree health within the subplot.

A ranked estimate of the cover of foliage (i.e., above and surrounding that central point), is derived from the mean of four visual assessments per plot.

Mean defoliation index data, averaged from four ranked estimates obtained from each site for the period 2016 and 2021 is presented in Table 3-10. Key findings were:

Overall, defoliation index or tree condition recorded at each surveillance site during the 2022 survey showed minimal changes from the previous survey. Overall defoliation index results combined with field observations show that all changes recorded during the 2022 survey were naturally occurring, confirming that the mangrove forests surrounding the DLNG site remain in a stable and healthy condition.

Table 3-10 Annual mean defoliation index data for 2016-2022

Assemblage	Site	2016	2017	2018	2019	2020	2021	2022	Difference between 2021-2022
Hinterland margin	SS01	4.0	4.0	4.25	4.25	4.3	4.0	4.0	0.0
	SS02	4.0	4.0	4.75	4.25	4.3	4.3	4.3	0.0
	SS03	3.5	3.5	2.0	2.5	2.5	2.5	2.5	0.0
	SS04	4.0	4.0	4.0	5.0	5.0	5.0	5.0	0.0
	SS07	4.0	4.0	3.5	4.0	3.5	3.5	3.5	0.0
	SS09	4.0	4.0	4.25	4.25	4.3	4.0	4.0	0.0
	SS13	4.0	4.0	4.75	5.0	4.8	5.0	5.0	0.0
	SS14	4.0	4.0	4.25	4.0	4.0	3.8	3.8	0.0
	SS19	4.0	4.0	2.75	3.0	3.0	2.8	2.8	0.0
	SS20	4.0	4.0	3.0	3.0	3.0	2.8	2.8	0.0
	SS21	4.0	4.0	3.25	4.0	4.0	4.8	4.8	-0.3
Rhizopora forest	SS10	4.0	4.0	4.25	4.5	4.3	4.3	4.3	0.0
	SS11	4.0	4.0	4.0	4.0	4.0	4.0	4.0	0.0
	SS12	4.0	4.0	4.75	4.75	4.8	4.8	4.8	0.0
	SS15A	4.0	4.0	3.75	4.0	4.0	3.8	3.8	0.0
	SS16A	4.0	4.0	4.0	4.0	4.0	4.0	4.0	0.0
	SS17	4.0	4.0	4.25	4.25	4.3	4.3	4.3	0.0
	SS18	4.0	4.0	4.0	4.0	4.3	4.3	4.3	0.0
	SS22	4.0	4.0	4.5	4.25	4.0	4.0	4.0	0.0
	SS23	4.0	4.0	3.25	3.5	3.3	3.3	3.3	0.0
Ceriops forest / tidal flat	SS05	4.0	4.0	4.0	4.0	4.0	4.0	4.0	0.0
	SS06	N/A	N/A	4.0	4.0	4.3	4.3	4.3	0.0
	SS08	4.0	4.0	4.25	4.0	4.0	4.0	4.0	0.0

Defoliation Index: 0 = Nil canopy; complete defoliation, 1 = <25% canopy, 2 = 25-50% canopy, 3 = 50-75% canopy, 4 = >75% canopy, 5 = complete full canopy.

Species Composition and Tree Density

The species composition and density of mangrove forests within each of the 23 surveillance monitoring sites was documented during program establishment in 2003 (URS, 2004). This data was recorded to provide a baseline for comparison of future change in mangrove health, forest

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structure and composition. Mangrove trees were defined in accordance with Brocklehurst and Edmeades (1996) as plants exceeding a height of 2 m and a diameter of 2 cm or more. Monitoring of tree density and species composition was conducted on a once-only data collection basis which may be repeated should any major change in forest health be detected, or at conclusion of the monitoring program.

Relative Ground Levels

Increased sedimentation rates have the potential to stress mangrove trees by burying or uncovering root systems. To understand sedimentation trends the relative mean sediment heights were surveyed from the top of each corner post at the surveillance sites. Net difference was then calculated to compare the sedimentation rate trend since baseline to each annual monitoring event. The last six years (2016 to 2022) net difference since baseline results are presented in Table 3-11 together with the change recorded between 2021 and 2022. For sites SS04, SS07, SS22 and SS23, where new posts were installed in 2018 post cyclone Marcus, a new baseline was set by establishing the difference between the 2017 height data and the newly established height in 2018 and subtracting this from the height data measured in 2022.

A positive result, indicating a higher ground level, suggests a potential sediment deposition whilst a negative net difference indicates lower ground level and potentially sediment erosion. Figure 3-21 represents graphically the net difference since baseline to 2022 at all sites.

Key findings include:

- There was no evidence that substantial sedimentation or erosion has occurred that potentially impacts mangrove health:
  - Changes in sediment heights were consistent with previous years data and most changes were below the trigger value for accretion of 5-10 cm sediment deposition over a 6-12 month period. Sites SS10 and SS18 recorded a net difference greater than 2 cm over the 2021 to 2022 monitoring period, with an increase (i.e., sediment deposition) of 13.6 cm and 10.4 cm respectively.
  - Since baseline monitoring in 2003, there has been a small increase in sediment height (1 cm – 7.9 cm) at majority of the sites, indicating small sediment accretion rates over the 19 year period. Greater increases in sediment height (13.9 cm – 41.4 cm) since baseline have been recorded at sites SS8 to SS12 (located in the southwest section of Wickham Point, near the LNG jetty) and SS18, located southwest of Sediment Pond 3.
  - The data recorded in 2022 remains consistent with previous monitoring events, and no indication of mangrove health deterioration can be noted.

Table 3-11 Net difference in mean relative sediment height (cm) between baseline (2003) and 2016-2022

Assemblages	Site Number	2016	2017	2018	2019	2020	2021	2022	Difference between 2021-2022
Hinterland margin	SS01	1.8	2.3	2.9	2.4	2.5	2.2	2.9	0.6
	SS02	1.2	2.0	2.3	1.5	1.5	4.3	2.9	-1.4
	SS03	1.7	1.9	1.1	2.1	2.2	1.4	1.7	0.3
	SS04[1]	0.3	0.3	0.1	1.4	1.6	1.1	-10.4	-11.4

	SS07[1]	-2.5	-3.0	-2.8	-2.8	-2.8	0.0	1.0	1.0
	SS09	12.7	12.9	16.8	15.8	15.9	16.0	17.8	1.8
	SS13	3.8	4.8	5.3	5.5	5.6	5.8	5.3	-0.4
	SS14	2.7	2.7	2.5	1.8	2.2	3.4	4.7	1.3
	SS19	-0.2	0.6	0.2	0.1	0.1	0.5	0.5	0.0
	SS20	1.8	2.3	1.8	2.5	2.6	2.4	2.1	0.3
	SS21	8.4	7.9	6.2	6.5	6.9	7.1	7.9	0.8
Rhizopora forest	SS10	11.5	13.6	21.0	24.9	27.5	27.8	41.4	13.6
	SS11	10.8	11	8.3	10.5	11.3	16.4	17.0	0.6
	SS12	10.6	12.6	13.8	13.9	14.6	15.4	15.8	0.4
	SS15A [2]	N/A	1.3	2.3	-4.1	-4.3	5.6	4.7	-0.9
	SS16A [2]	N/A	0	1.0	0.4	0.3	3.2	2.5	-0.7
	SS17	3.2	3.2	4.2	4.2	4.4	5.0	4.7	-0.3
	SS18	7.1	7.1	9.5	9.1	8.9	9.9	20.3	10.4
	SS22[1]	0.3	-0.3	0.5	0.5	0.5	1.6	0.8	-0.8
	SS23[1]	1.0	-0.5	1.3	-2.1	-1.0	-0.1	-0.3	-0.2
Ceriops forest / tidal flat	SS05	2.8	2.6	2.1	3.1	4.1	3.6	3.7	0.1
	SS06	1.4	1.2	0.8	1.3	0.9	1.7	2.1	0.5
	SS08	8.9	10.1	11.1	11.4	11.6	13.3	13.9	0.6

Notes:
1 New corner posts were installed in 2018 after damages from cyclone Marcus. A new baseline was establish resulting in significant different data from the previous years.
2 Sites 15A and 16A were established in 2015
3 N/A indicates data unavailable

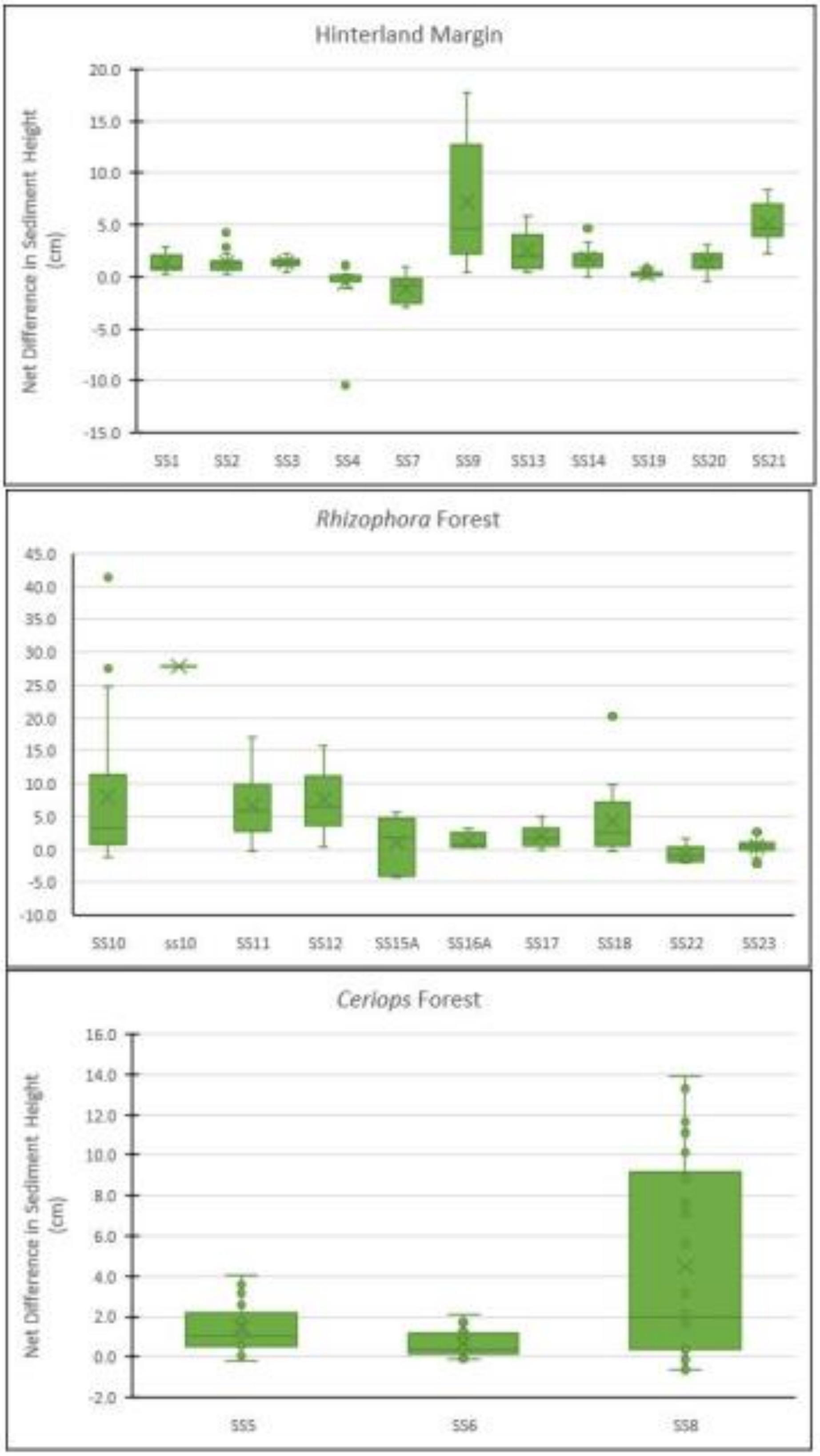

Figure 3-21 Change in sediment height distribution since baseline (2003 to 2022)

Groundwater

Groundwater monitoring is undertaken at sites potentially exposed to modification by freshwater input from the DLNG site, thus representing a potential impact to the mangrove health. A total of 15 shallow (<2m) groundwater monitoring bores were installed in the "hinterland fringe" mangrove zone and are monitoring for depth below ground level to the water table, salinity (TDS) and pH.

Groundwater monitoring results from hinterland monitoring sites from 2016 to 2022 are presented in Table 3-12. Boxplots of all monitoring results from baseline to 2022 are presented in Figure 3-22. Key findings include:

- Between 2003 and 2006, groundwater monitoring conditions were analysed quarterly. During the wet seasons, salinity concentrations were lower and water levels were elevated closer to the ground surface by comparison with the dry season when salinity levels increase, and water was lower in the bores. This data demonstrates the seasonal variability of rainfall patterns between annual wet and dry seasons.
- Since the end of the construction phase in 2006, mangrove monitoring events have been undertaken only during the dry season and mostly coincided with neap tides. In 2022 mangrove monitoring was undertaken during elevated coefficient tides. Spring tides occurring on the days immediately prior to the survey were likely to have inundated the entire mangrove zone, including the hinterland fringe sites. As this was the case, sites SS1, SS2, SS4, SS13, SS14 and SS21 were not sampled due to dry conditions.
- The 2022 salinity results demonstrated consistency with 2021 data and previous monitoring since baseline
- Comparison of salinity for the 12 sites over the last five years indicates there was minimal change.

Table 3-12 Groundwater salinity (TDS ‰) from hinterland mangrove monitoring sites from 2016 to 2022

Site No.	2016	2017	2018	2019	2020	2021	2022	Salinity Range and Mean (‰) [2]
SS1	N/A	NC	NC	NC	NC	NC	NC	49(6 – 78)
SS2	NC	70	73	NC	65	NC	NC	67(56 – 73)
SS3	NC	69	67	68	66	64	64	65(51 – 72)
SS4	NC	66	NC	NC	63	62	62	67(61 – 73)
SS5	60	59	58	55	60	52	52	60(48 – 66)
SS6	70	61	NC	NC	62	56	56	63(52 – 76)
SS7	NC	48	NC	NC	45	42	42	48(32 – 70)
SS9	67	70	72	70	60	68	68	66(33 – 73)
SS13	NC	NC	24	NC	52	50	50	50(24 – 61)
SS14	68	67	69	66	37	58	58	64(37 – 71)
SS19	65	22	NC	NC	54	50	50	59(22 – 68)
SS20	NC	NC	NC	NC	26	NC	NC	59(26 – 70)
SS21	NC	40	41	NC	41	22	22	39(19 – 67)

Note: 1. "NC" indicates that sample/data was not collected due to lack of water in the bore
2. Salinity range and mean data 2003 to 2022.

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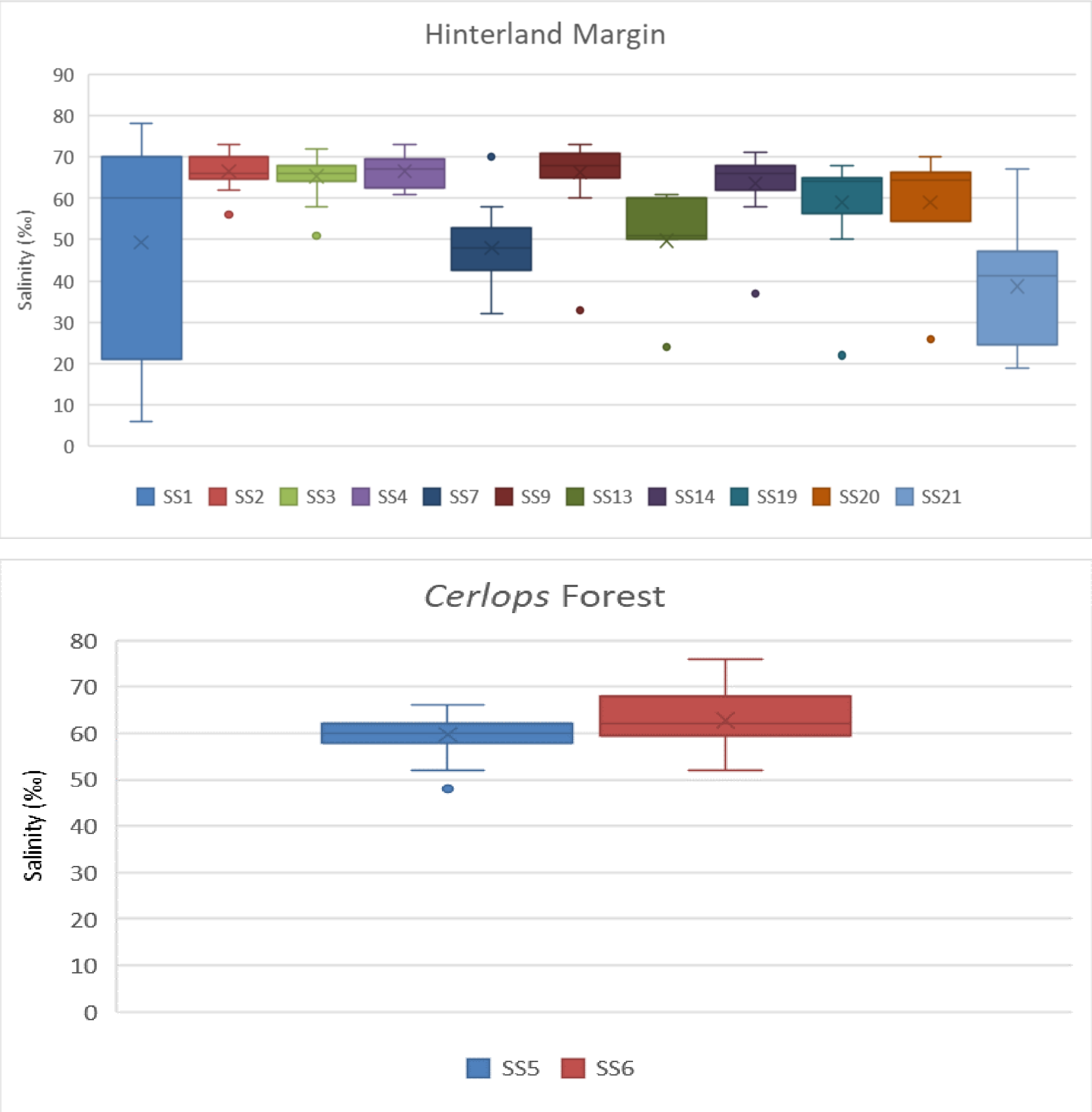

Figure 3-22 Boxplots of groundwater salinity (TDS ‰) for all monitoring periods (baseline to 2022)

Sediment

Mangrove ecosystems are known to act as physical and biogeochemical barriers to pollutant transport. Sediments in mangrove ecosystems are also reservoirs of heavy metals and hydrocarbons due to their physical and chemical properties. Mangrove sediments are anaerobic and reduced, as well as rich in sulphide and organic matter, properties which have strong influences on metal mobilisation and bioavailability (Silva et al. 1990; Clark et al. 1998).

Sediment sampling was undertaken at 14 sites (refer to Figure 3-18 and Figure 3-19). Sediment samples were analysed for particle size and metals (cadmium, chromium, copper, iron, manganese, nickel, lead and zinc).

Metal concentrations in sediment samples were compared against the ANZG (2018) sediment guideline values. ANZG (2018) provide two sediment quality guideline values, the 'DGV' (Default Guideline Value) and 'GV-high' values. The DGVs indicate the concentrations below which there is a low risk of unacceptable effects occurring, and should be used, with other lines of evidence, to protect aquatic ecosystems. In contrast, the ‘upper’ guideline values (GV-high) provide an indication of concentrations at which you might expect to observe toxicity-related adverse effects. As such, the GV-high value should only be used as an indicator of potential high-level toxicity problems, not as a guideline value to ensure protection of ecosystems. The ANZG (2018) guidelines therefore provide values which can be used to assess whether contaminant concentrations at the sites are likely to have adverse impacts on the biotic communities at those sites.

The 2022 results were compared with historical data and relevant criteria. Key findings include:

- During the 2022 monitoring seven out of the fourteen chemical monitoring sites adjacent to the Darwin LNG facility recorded a greater amount of fine material (clay and silt) than coarse material (gravel and sand). There was no clear distinction between sediment grain size between the impact and reference monitoring sites.
- The sediment results of metals indicate sediments are predominantly un-influenced chemically by DLNG operations. Exceedances of default sediment environmental criteria were limited to zinc at one site downstream of Sediment Pond 1 only.
- Concentrations of zinc derived from the acid soluble metals analysis did not exceed the ANZG (2018) DGV value (200 mg/kg) at site SP1 (150 mg/kg) (Table 3-13 and Table 3-14). This is an improvement on previous annual monitoring which has recorded elevated levels of total zinc downstream from Sedimentation Pond 1 (sites SP1, SP1-A and SP1-B) since 2006, except for the period 2013, 2014, 2015 and 2017. Sediment analysis has moved from total metal analysis to acid soluble metals analysis only in 2020 as this represents the biologically available fraction.
- The proximity to the pond and decreasing concentrations of zinc with distance indicate that some form of anthropogenic influence in the area immediately downstream of Sedimentation Pond 1. The scale of this influence appears to have been localised and confined to areas within the DLNG Approved Disturbance Boundary. This influence appears to be variable with historical data showing higher zinc concentration at SP1 or SP1-A. However, historical zinc concentration data for Sediment Pond 1 water includes the dissolved fraction only and is insufficient to assess discharge loads from this point source. Dissolved zinc discharge concentrations between 2020 and 2022 range from <5 µg/L to 360 µg/L.
- The ANZG state that the GV-high value should only be used as an indicator of potential high-level toxicity problems, not as a guideline value to ensure protection of ecosystems. They recommend using multiple lines of evidence as part of the weight-of-evidence process to better assess the risk to a sediment ecosystem if a DGV is exceeded or even where toxicant concentrations in the sediment are trending towards the DGV. Assessments of toxicity may also be refined by assessing the organic carbon content. Using this assessment process, the occurrence of the zinc concentration exceedances is considered low risk based on the following conclusions:
    - No consistent increasing trends
    - The extent of elevated concentrations appears small and localised
    - The environmental exposure is limited and
    - The broader mangrove metrics demonstrate system health.

It should be noted that monitoring is ongoing, and that further assessment may be warranted in the future.

- Santos have undertaken multiple investigations to identify the potential operational sources of zinc. The investigations identified that sediments from the greensand filter backwash discharge may be the primary cause. This is because it contains zinc which can be mobilised through physical and chemical processes. This discharge is approved under the Licence to discharge to the stormwater network which generally reports to Sediment Pond 1 (on occasion it is diverted to Sediment Pond 3).
- Corrective actions have and are continuing to be implemented with a focus on removal of sediment from the stormwater drain adjacent the greensand filter backwash discharge. Corrective actions have included:
  - In 2016, the drainage channel discharging into the sedimentation pond 1 was cleaned out to remove built up sediments and associated metals.
  - In 2017, water that usually discharged to the Sedimentation Pond 1 was temporarily re-diverted to Sedimentation Pond 3. This was to enable Sedimentation Pond 1 to be emptied and the sediment removed. In addition to these works, the Sedimentation Pond 1 galvanised iron culvert was replaced by stainless steel to eliminate this as a potential zinc source.
  - In 2018, 2019, 2020 and 2021 the drainage channel discharging into the Sedimentation Pond 1 was cleaned out again to remove built up sediments and associated metals.
  - In 2019-2020 a review of management options was undertaken. The outcome resulted in budget allocation to design and implement a treatment system on the greensands filter backwash discharge to remove the sediment load in 2021.This project is expected to be completed in 2023.
- Historically hydrocarbons in sediments have been detected. However, in more recent years (2012-2020) levels have been below laboratory limits of reporting. In 2021 hydrocarbons were detected across all sites, however it was discovered that they were not associated with site activities and likely reflect the regional conditions. During the 2022 mangrove monitoring program, most of the sediment samples (except for four sites) reported Total Recoverable Hydrocarbons (TRH) were below the laboratory limit of reporting (LOR) (Table 3-14). Sites SP1 (830 mg/kg), SP2-A (2,000 mg/kg), SP3 (250 mg/kg) and E1 (410 mg/kg) reported levels greater than the historical range, with a large spike observed at SP2-A of 2,000 mg/kg. Silica-gel clean-up was run on the samples to confirm levels reflected mineral hydrocarbons and not naturally occurring organic sources. Analysis of hydrocarbons in the pond water was discontinued in 2018 and hence association with pond water is not possible, however no hydrocarbon spills from site have been reported. Logically if the hydrocarbon source was Sediment Pond 2 then levels would be observed at SP2 however levels at this site were below detect, further suggesting the levels represent external sources unlinked to the DLNG site and operations. Notwithstanding, this will continue to be monitored in line with Licence requirements, and repeated high spikes in these areas investigated.

Table 3-13 Weak acid Zinc concentrations in mangrove sediments (mg/kg dry weight) 2018-2022

Location	Site	2018	2019	2020	2021	2022
ANZG (2018) DGV (Default Guideline Value)		**200**				
ANZG (2018) GV-high		**410**				
Wickham Pt	LG1	2	27	27	12	9.7
	LG2	3	18	30	17	11
	LG3	1	13	11	11	8.1
	SP1	170	33	**520**	**210**	150
	SP1-A	170	48	**340**	98	57
	SP1-B	73	64	13	51	18
	SP1-C	3	27	9	16	14
	SP2	9	30	64	37	17
	SP2-A	ND	ND	100	140	79
	SP3	ND	ND	46	70	44
	SP3-A	ND	ND	13	9	6.2
Control Site	M3	11	24	35	18	11
	E1	15	15	4	6	10
	C2	4.6	6	6	5	3.6

Note: ND means no data collected. Bold data means it has met or exceeded an ISQG trigger Value

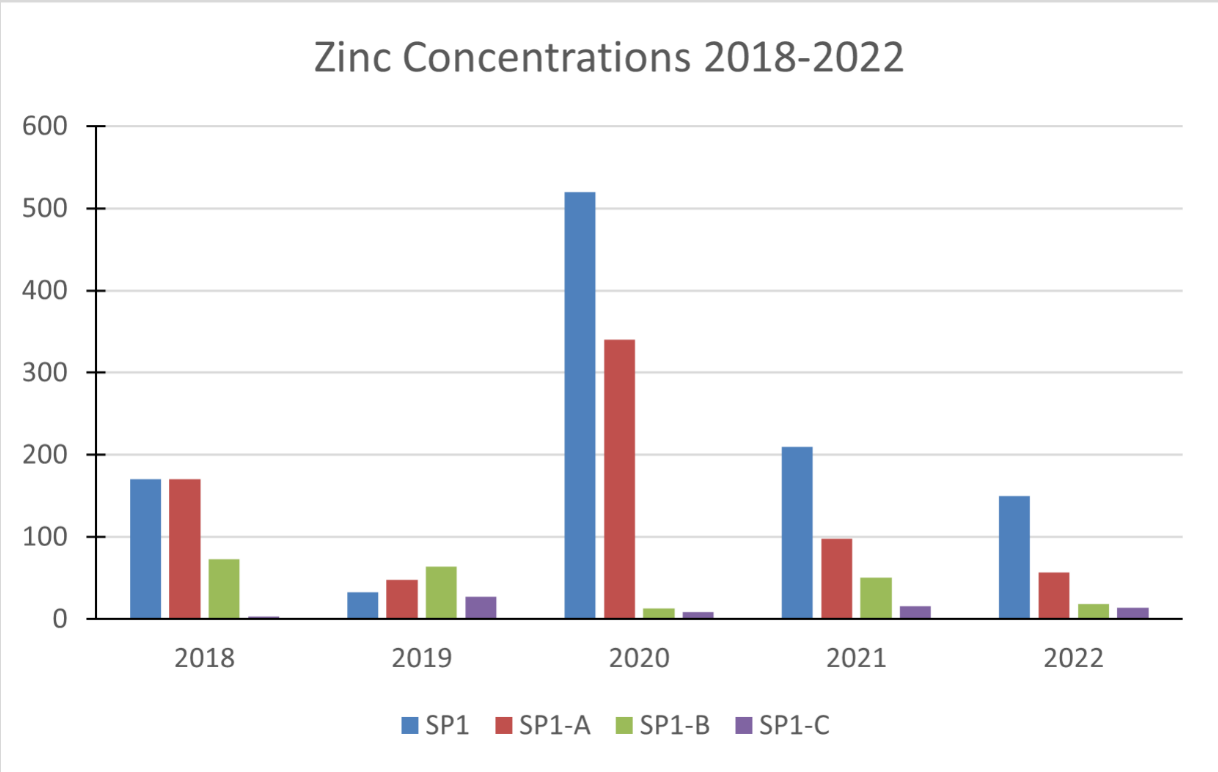

Figure 3-23 Weak acid soluble zinc concentrations at sites located downstream to Sediment Pond 1 SP1 (23 m), SP1-A (60 m), SP1-B (80 m) and SP1-C (120 m) (2018 to 2022)

Table 3-14 Hydrocarbons Concentrations in Sediments at all Sites since 2006 to 2022

TPH in sediments (mg/kg)																		
LOR		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2
DGV		N/G																
GV-High		N/G																
Location	Site	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Wickham Pt	LG1	<0.1	65	82	28	5.5	28	<0.1	<2	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	150	<0.2
Wickham Pt	LG2	<0.1	25	52	22	<0.1	7.7	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	42	<0.2
Wickham Pt	LG3	<0.1	41	73	7.4	26	28	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	170	<0.2
Wickham Pt	SP1	ND	ND	53	1.2	<0.1	26	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	120	830
Wickham Pt	SP1-A	ND	85	54	1.9	66	4.6	<0.1	<2	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	160	<0.2
Wickham Pt	SP1-B	<0.1	31	45	23	4.6	72	<0.1	<2	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	160	<0.2
Wickham Pt	SP1-C	ND	88	46	21	8.8	27	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	150	<0.2
Wickham Pt	SP2	<0.1	63	48	8.1	<0.1	12	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	96	<0.2
Wickham Pt	SP2-A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<0.2	58	2,000
Wickham Pt	SP3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<0.2	110	250
Wickham Pt	SP3-A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<0.2	100	<0.2
Control Site	M3	<0.1	94	100	10	20	21	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	220	<0.2
Control Site	E1	<0.1	54	43	<0.1	22	20	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	120	410
Control Site	C2	ND	ND	ND	ND	ND	ND	<0.1	<0.2	<0.1	<0.1	<0.1	<0.1	<0.2	<0.2	<0.2	150	<0.2

N/G" indicates no guidelines; "ND" indicates no data

Bioaccumulation

Biota analysis allows an assessment of bioavailability of specific elements in sediments and water which may be influenced by site activities. Telescopium or mudwhelks are an appropriate organism to assess bioavailability of sediments and pore waters. This is because they are benthic feeders and have limited mobility between areas and hence are likely to ingest surface contaminants representative of an area.

Mudwhelks were collected from a total of twelve sites (refer to Figure 3-18 and Figure 3-19) and tested for moisture, lipids, metals, and hydrocarbons and compared against the Food Standards Australia New Zealand (FSANZ 2005) guidelines. The FSANZ (2005) criteria for molluscs provides maximum levels (MLs) for contaminants to not be exceeded in the specified food items. Generally Expected Levels (GELs) have been introduced to maintain the lowest achievable levels of contaminants in food. GELs were derived from analysis of uncontaminated samples of various foods, with the 90th percentile representing the value below which 90% of the values fell. It should be emphasised that the criteria levels relate to potential human health risk and do not imply that the health of the molluscs would be adversely affected at metal concentrations exceeding these levels.

Key findings include:

- Metal concentrations observed in the 2022 mudwhelk samples were below the recommended FSANZ ML and GEL for all metals except lead. A lead concentration of 2.38 mg/kg was recorded against the maximum level of 2 mg/kg at site SP2. However, lead concentrations reported for sediment at location SP2, was detected at a concentration of 2.2 mg/kg. Although this is an unusual spike in the data set there is no evidence to suggest this is associated with site activities, considering Irrigation and Jetty Outfall discharge had detected concentrations of lead less than the limit of reporting (1 µg/l, respectively).
- The copper concentrations in mudwhelks recorded in 2022 are consistent with historical data and the range of previous studies undertaken in Darwin Harbour. Copper concentrations in the mudwhelk colonies occurring in the mangroves next to the Darwin LNG site do not suggest exposure to copper contamination.
- Previous years have recorded elevated zinc concentrations in mudwhelks and have seen some relationship between levels in sediments and mudwhelks. In 2022, elevated zinc levels within mudwhelks were recorded at SP3-A, however, no relationship was observable with sediment concentrations
- There was no evidence of any hydrocarbon contamination within the mudwhelks sampled. All mudwhelk samples reported TPH below the laboratory limit of reporting in 2022.

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Table 3-15 Metal concentrations in mudwhelks in 2022

Location	Site	Metal Concentrations (mg/kg wet weight)							
		Cd	Cr	Cu	Fe	Mn	Pb	Ni	Zn
FSANZ Maximum		**2**	**N/G**	**N/G**	**N/G**	**N/G**	**N/G**	**N/G**	**N/G**
GEL 90th Percentile		**N/G**	**N/G**	**30**	**N/G**	**N/G**	**N/G**	**N/G**	**290**
Wickham Pt	LG1	0.14	0.58	6.90	345	101.20	0.94	0.76	25.30
	LG2	0.08	0.32	16.95	174.30	149.10	0.84	2.10	20.16
	LG3	0.33	<0.1	7.50	137.50	162.50	0.75	1.58	40
	SP1	0.11	<0.1	5.75	48.60	37.80	0.49	0.25	8.64
	SP1-A	0.12	0.36	11.28	360	225.60	1.25	0.62	84
	SP1-B	0.02	<0.1	2.72	57.80	6.63	0.73	0.65	6.12
	SP1-C	0.02	0.28	5.20	60	28	0.84	0.36	7.20
	SP2	0.08	0.76	8.91	378	48.60	**2.38**	0.95	27
	SP3-A	0.62	0.43	28.20	182.40	384	0.36	2.30	160.8
Control Site	M3	0.18	2.30	7.50	700	25	0.98	0.88	22.25
	E1	0.32	1.02	4.00	106	72	0.42	1.58	22
	C2	0.22	0.36	14.88	175.20	84	0.41	1.32	38.40

Note: Exceedances are highlighted in bold. Results of <1 denote where the dry weight concentrations were below the limit of reporting therefore wet weight concentrations could not be calculated.

N/G indicated no guideline

Figure 3-24 Zinc concentrations for biota and sediment in 2022

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Data Management and Quality Control

Mangrove monitoring data and chemical analysis samples were collected by qualified professional environmental consultants who followed standard QA/QC procedures. The data validation procedure employed in the assessment of the field and laboratory QA/QC data showed the field and laboratory results to be representative of the conditions at the sample locations at the time of sampling and that the analytical data can be relied upon.

Discussion and Interpretation of Results

Canopy cover and defoliation index monitoring indicated that the mangroves surrounding DLNG remain in a healthy and stable condition with no significant deterioration in plant health detected. Where notable declines were observed these were due to natural events (past cyclones and natural senescence) and not associated with DLNG activities. Increases in cover were noted in the hinterland and tidal flats sites. This may be due to possible increased freshwater inflows or sea level rise. Long term results show no canopy declines greater than 20% since baseline. Forest resilience monitoring during the 2022 survey indicate that mangrove forests surrounding the DLNG site are in a healthy condition. Photo monitoring showed that the forest structure and composition has remained stable, with some active regrowth of seedlings within canopy gaps and some damage still evident from the 2018 cyclone. Changes in sediment heights were consistent at most sites with previous years monitoring and there was no evidence of substantial erosion or sedimentation that has the potential to affect mangrove health.

Metal results in sediments indicate concentrations of Zinc did not exceed the ANZG. This is an improvement on previous years. There was evidence of elevated levels of possible hydrocarbon contamination at several sediment sites across the DLNG as-well as the control sites, indicating it is highly unlikely linked to activities at the DLNG facility.

Lead concentrations in mudwhelks has exceed the trigger values at two sites at Wickham Point in 2022. Although this is an unusual spike in the data set there is no evidence to suggest this is associated with site activities as previously discussed. There was no evidence of any hydrocarbon contamination within mudwhelks sampled.

Overall, the results of mangrove monitoring indicate that surface water discharged from the DLNG facility has not had a significant impact on mangrove sediment and biota surrounding the facility since post-commissioning monitoring began in 2006. In addition, the sediment ponds do not generally appear to be affected by algal blooms, odour issues, mortality or any other sources of contamination and spikes in water quality are of short duration. For these reasons, the discharge water quality from the sediment ponds is of low environmental risk or impact.

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4.0 Monitoring Discharges to Air

Conditions 45 to 53 of the Licence permits Santos to discharge emissions to air from the following sources:

- Stack emissions from the power generation turbines, compressor turbines, acid gas incinerator and process boiler (Section 4.1); and
- Hydrocarbon flaring and venting (Section 4.2).

In addition, Condition 54 relates to ambient air quality and Conditions 67 to 69 of the Licence outline requirements to monitor air emissions.

The following section is also included in relation to monitoring discharges to air:

- Ambient air quality monitoring program (Section 4.3).

The objectives, methods, analysis, and discussion of results for each of these monitoring programs are provided in the sections below.

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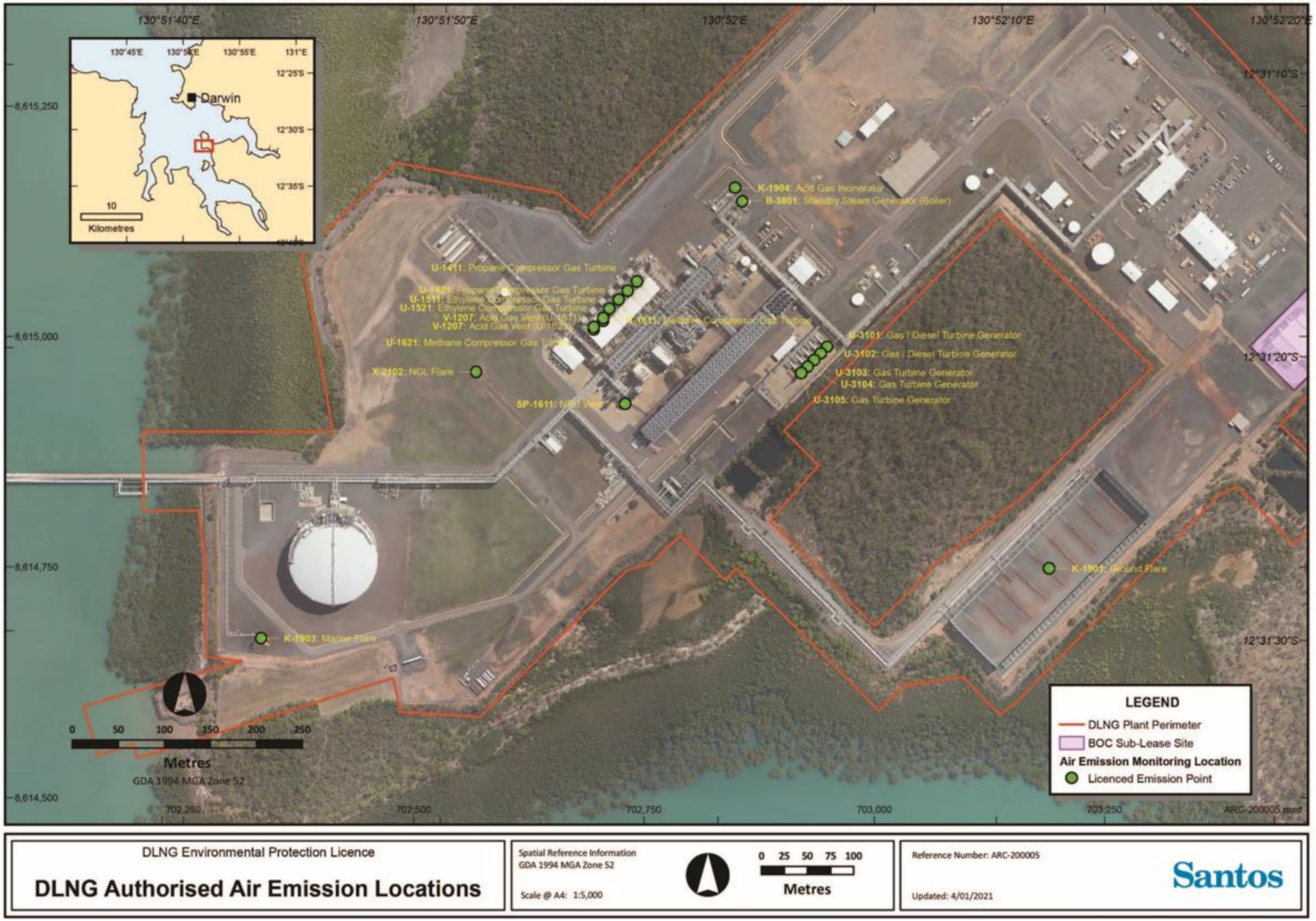

Figure 4-1 Map of emissions to air locations permitted by the Licence

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4.1 Stack Emissions Monitoring Program

Most of the emissions from the DLNG facility are from point sources, such as exhaust stacks. These stacks are a source of atmospheric pollutants, which are regulated under the Licence. The Licence specifies the locations of stack emissions that are permitted, the concentrations of pollutants that are allowed, the mass emission rates for pollutants and the frequency at which these must be monitored.

4.1.1 Monitoring Objectives

The objective of the stack emission monitoring program is to quantify the mass emission rates and concentrations of potential atmospheric pollutants at the point of emission. These results are considered in conjunction with other atmospheric monitoring programs, such as the ambient air quality monitoring program (Section 3.3). The monitoring program is also intended to ensure compliance with Conditions 67 to 69 of the Licence.

4.1.2 Monitoring Methods

The Licence requires stack sampling to be completed in accordance with NSW EPA document *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales*. Santos has developed a stack emissions monitoring program, which is implemented by a specialist contractor in accordance with the approved methods stipulated by the Licence.

The required locations, parameters and frequency of monitoring is outlined in Appendix B Table 3 of the Licence. Stack emissions monitoring was undertaken in 2019 in accordance with these requirements. The locations are shown in Figure 4-1.

Biannual testing of the power generation turbines and compressor turbines was undertaken in April, June, and October 2022. Boiler stack emissions was undertaken in April 2022. Quarterly testing of AGI and AGV was undertaken in February, April, August, and October 2022. Due to the continued decline in production (with the current gas sources estimated to be exhausted in 2023), only power generators U3101, U3102, U3103, U3104 & U3105 and power generators of each propane (U1411, U1421) ethylene (U1511, U1521) and methane (U-611, U1621) refrigerant compressor units were required to be online to support the plants production rates (some units were not operational for significant periods during 2022 (e.g. U3104). Similarly, B3801 steam boiler has been offline (except transient / start-up scenarios) for majority of 2022, as it's not required to supplement steam generation at current production rates where all steam required is supplied by waste heat from the turbines. As such, the following locations were not monitored for the following periods:

- AGV during October 2022 was not venting to atmosphere at time of testing. Emission rates recorded were calculated using emission concentrations measured by Etkimo together with instrument derived gas flow measurements recorded by Santos.
- U3103, U3104, U1421, U1521, U1621 and B3801 were not available for sampling during October 2022.
- U3104 was not available for sampling during April 2022.

Stack Testing was undertaken by external consultants and reported on a quarterly basis (Etkimo 2022 a, b, and c). The results of these reports are summarised in the following sections.

4.1.3 Monitoring Results

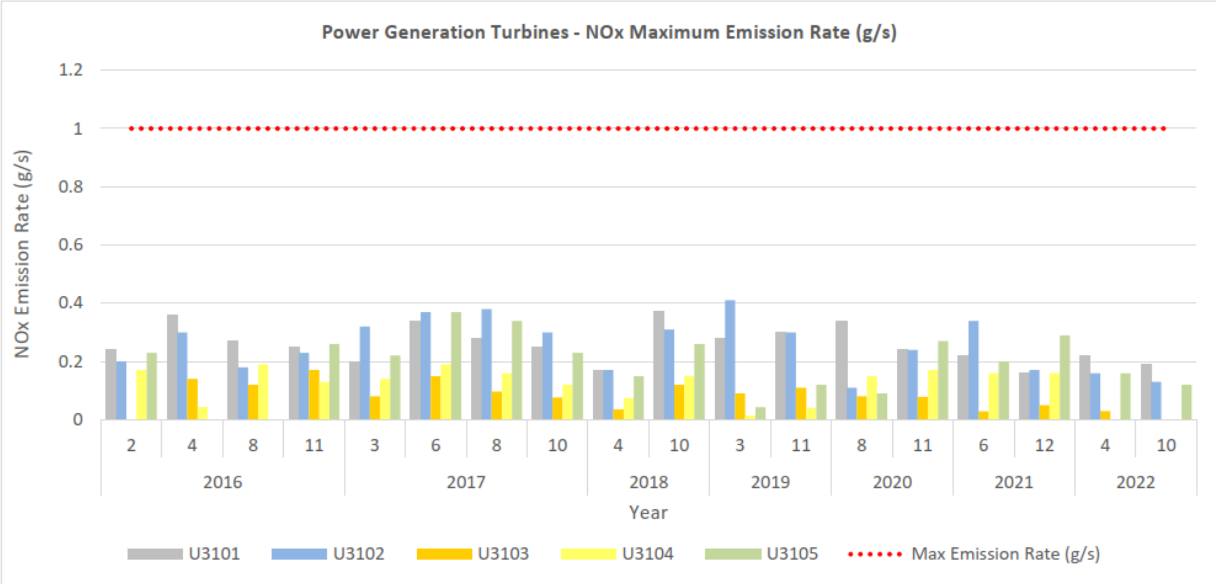
A summary of the stack emissions monitoring results, since commencement of the revised Licence emissions conditions in September 2017, is provided in the following sections. The historical dataset is provided in Attachment C.

Power Generation Turbines

Comparison of the maximum emission concentrations and emission rates for each operating unit show:

- Compliant nitrogen oxides (NO_x) mass emissions rates and concentrations for 2022 and overall, for the 2016-2022 period (Figure 4-2)
- Compliant carbon monoxide (CO) mass emissions rates and concentrations for 2022 and overall, for the 2016-2022 period (Figure 4-3) and
- Compliant sulphur dioxide (SO_2) mass emissions rates and concentration for 2022 and overall, for the 2016-2022 period. All results were below the LOR in 2022 (Figure 4-4).

Variability in NO_x and CO mass emissions rates and concentrations between each unit occurred due to different operation requirements and tuning of the management system. The results were aligned with vendor-specified measurement units for expected NO_x and CO emissions concentrations for the respective units. The low SO_2 concentrations can be attributed to low H_2S concentrations in the feed gas.



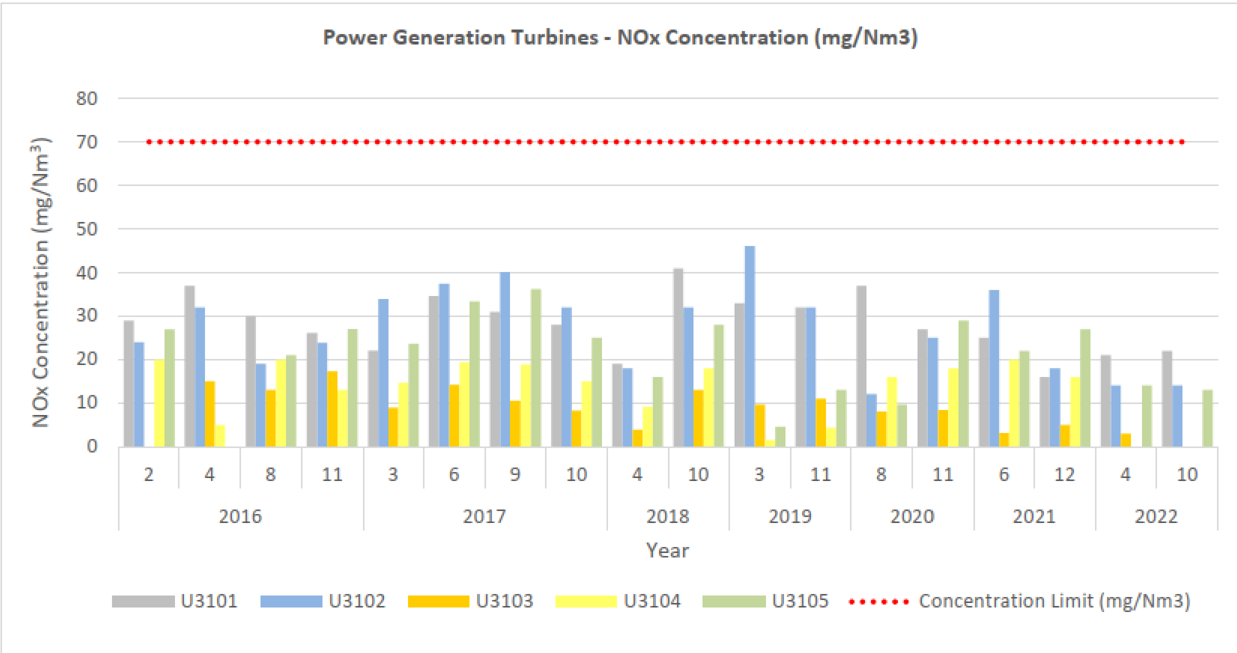
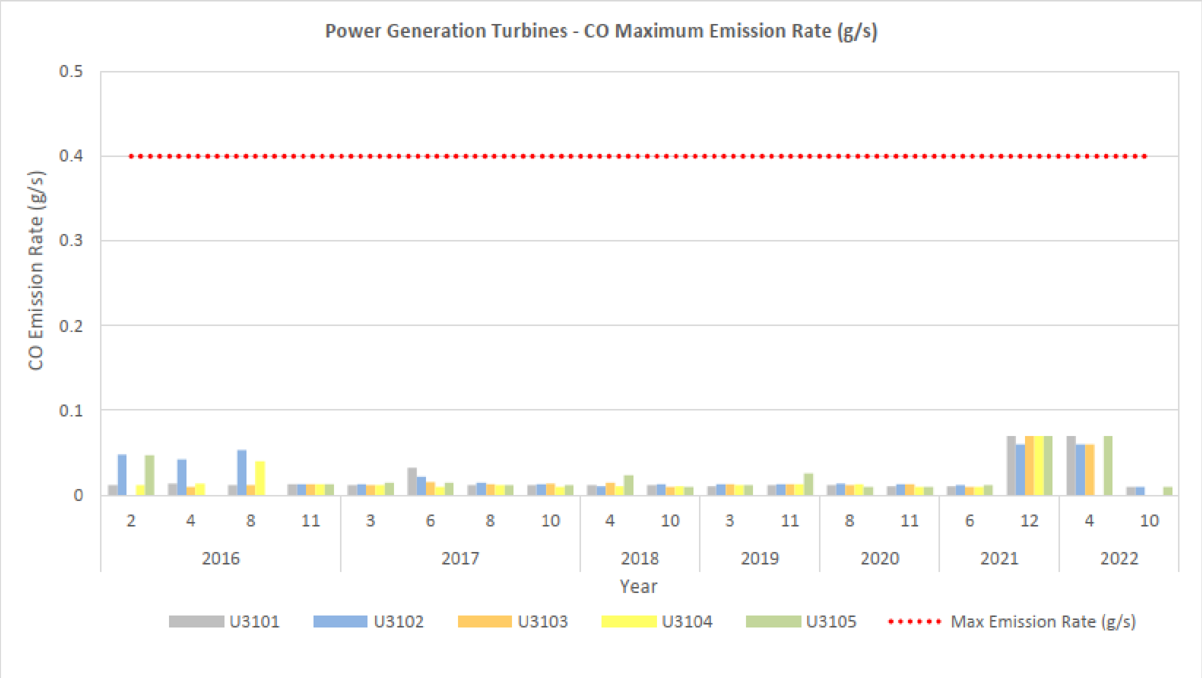


Figure 4-2 Power generation turbines NO_x emissions from 2016-2022



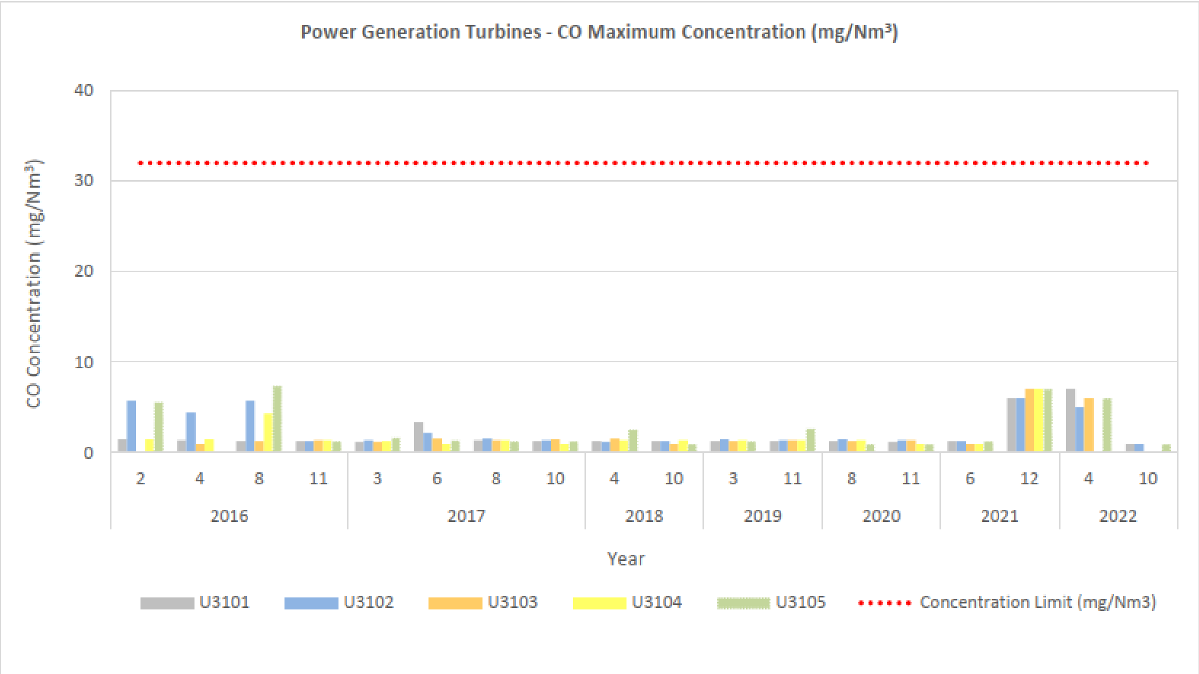
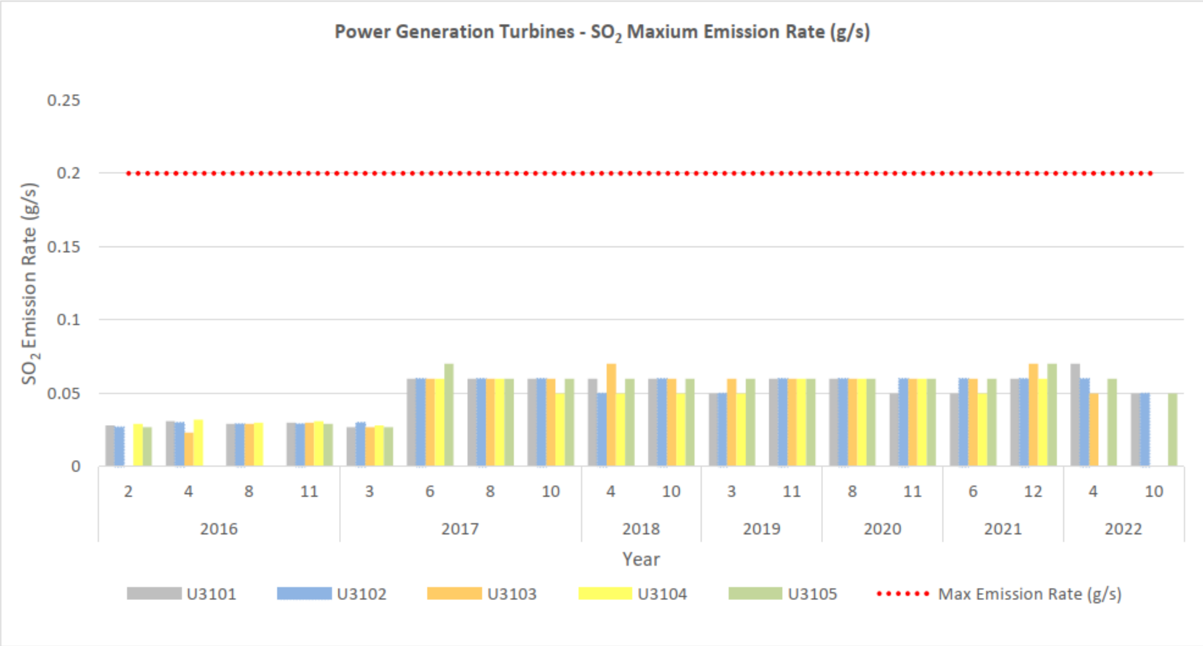


Figure 4-3 Power generation turbines CO emissions from 2016-2022



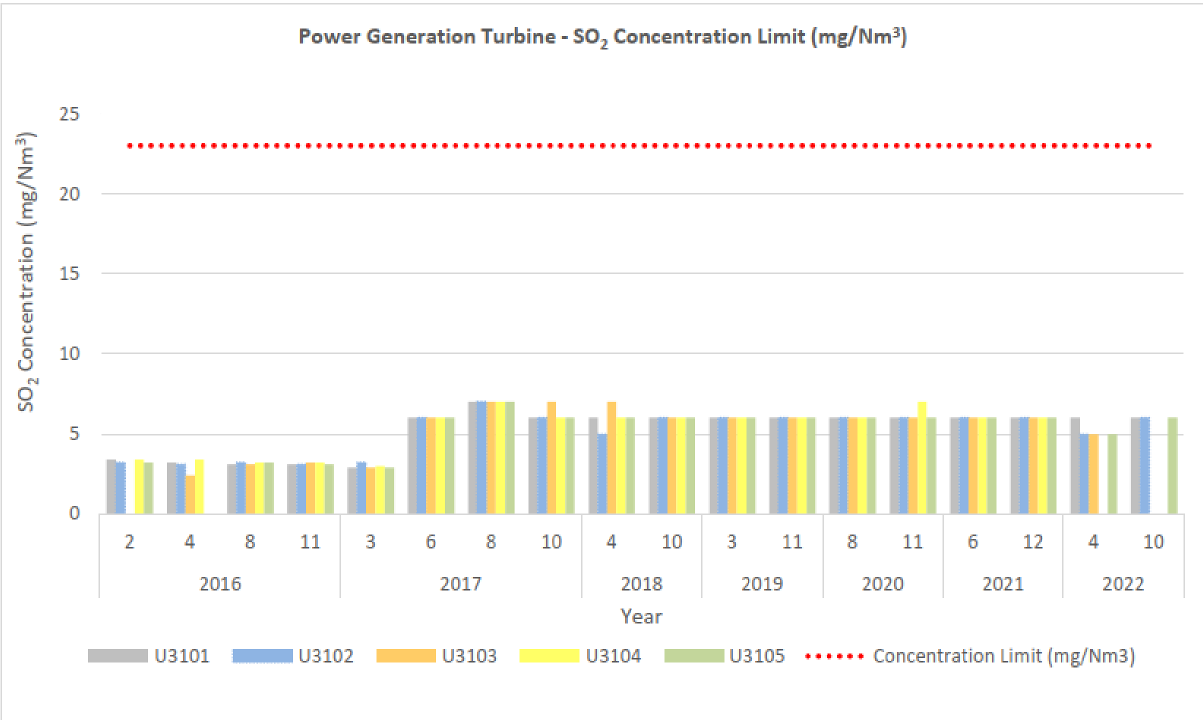


Figure 4-4 Power generation turbines SO2 emissions from 2016-2022

Compressor Turbines

Comparison of mass emissions rates and concentrations for compressor turbines shows the following observations:

- Compliant NO_x mass emissions rates and concentrations for 2022 and overall, for the 2016-2021 period (Figure 4-5)
- Compliant CO mass emissions rates and concentrations for 2022 and overall, for the 2016-2022 period (Figure 4-6) and
- Compliant SO_2 mass emissions rates and concentrations for 2022 and overall, for the 2016-2022 period (Figure 4-7).
- NO_x emissions from compressor turbines are controlled by water injection, to optional set-points of 25, 50 or 68 parts per million (ppm), plus an incremental controller. During the reporting period, effective NO_x suppression settings were employed on the compressor turbine units resulting in efficient scrubbing of NO_x in the gas stream and continued emission rates and concentrations below limits.

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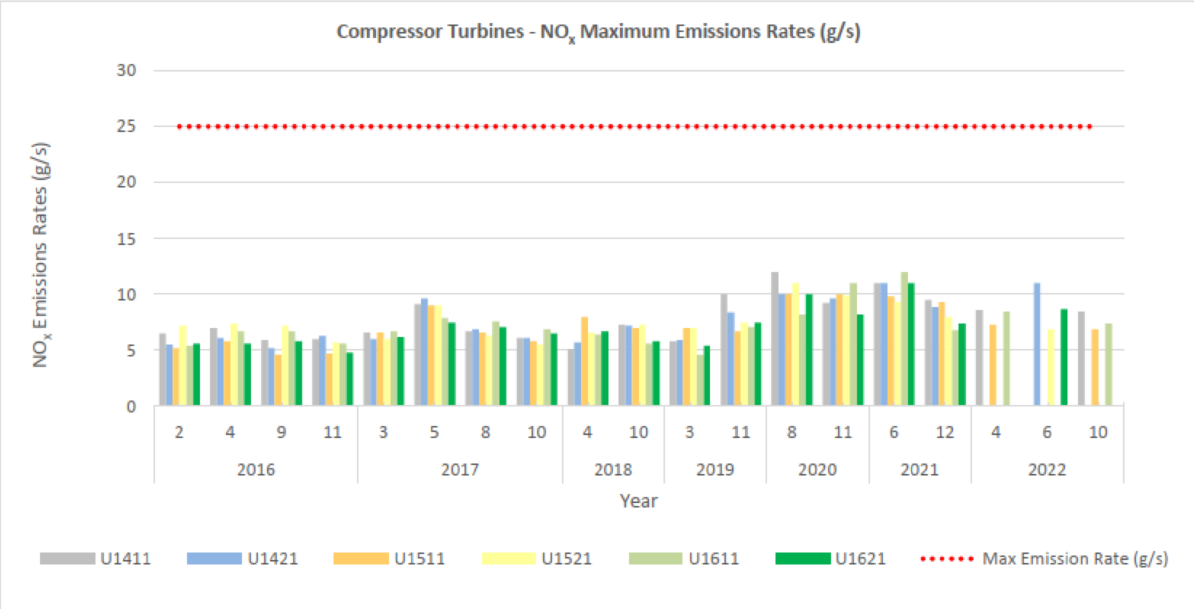


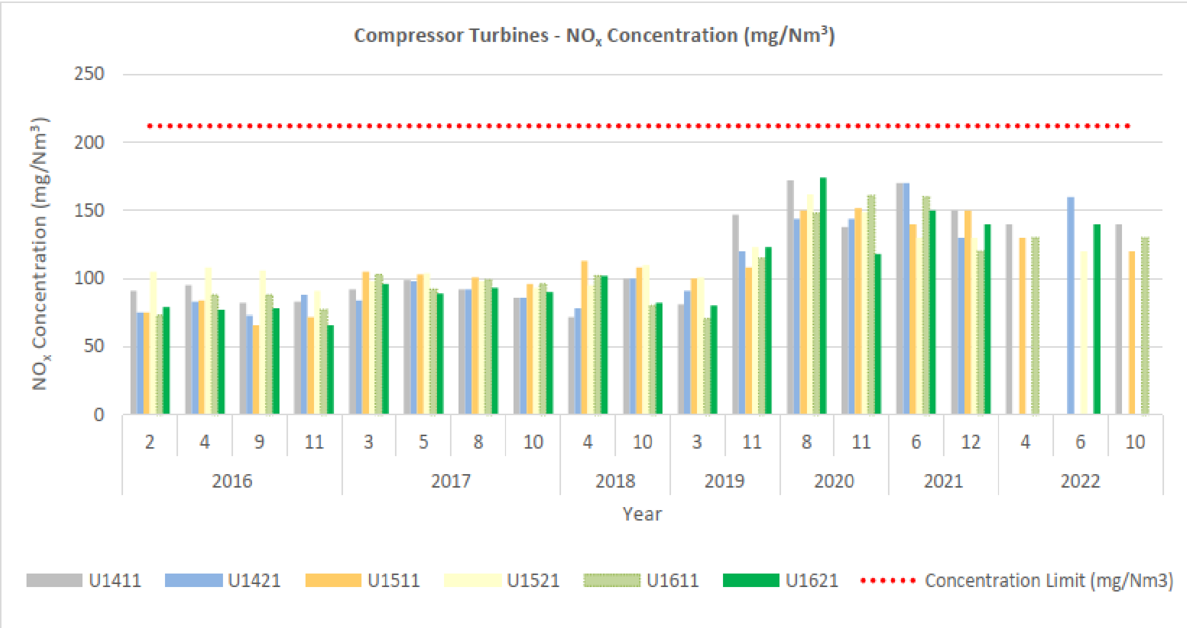
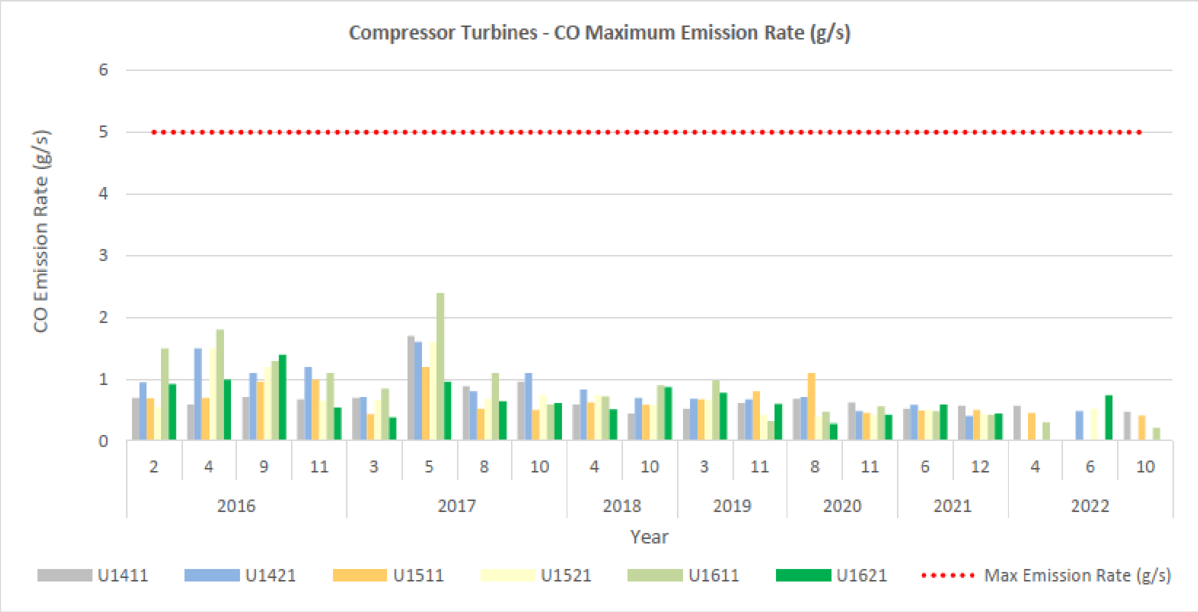


Figure 4-5 Compressor gas turbine NO_x emissions 2016-2022



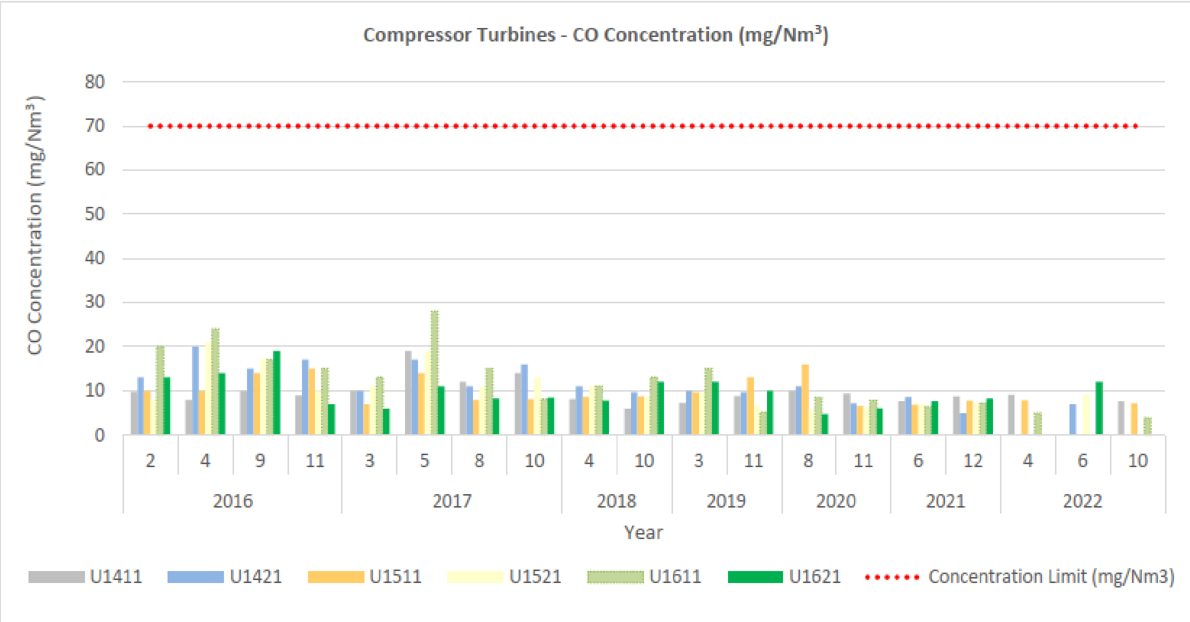
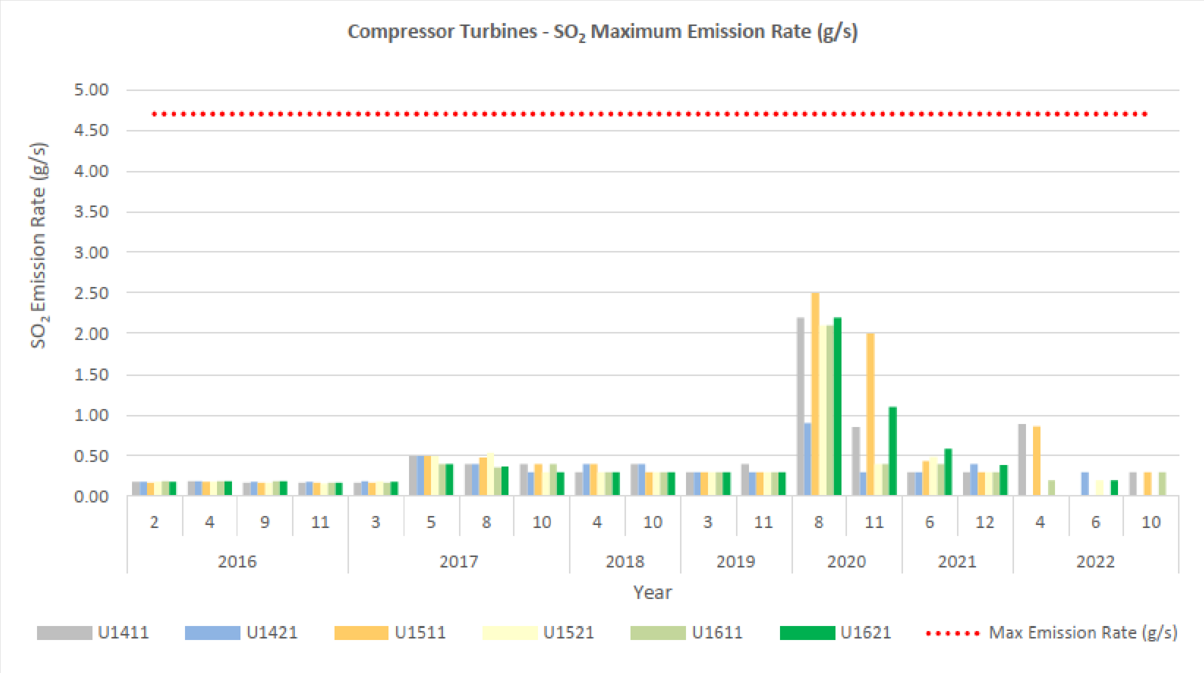


Figure 4-6 Compressor gas turbine CO emissions 2016-2022



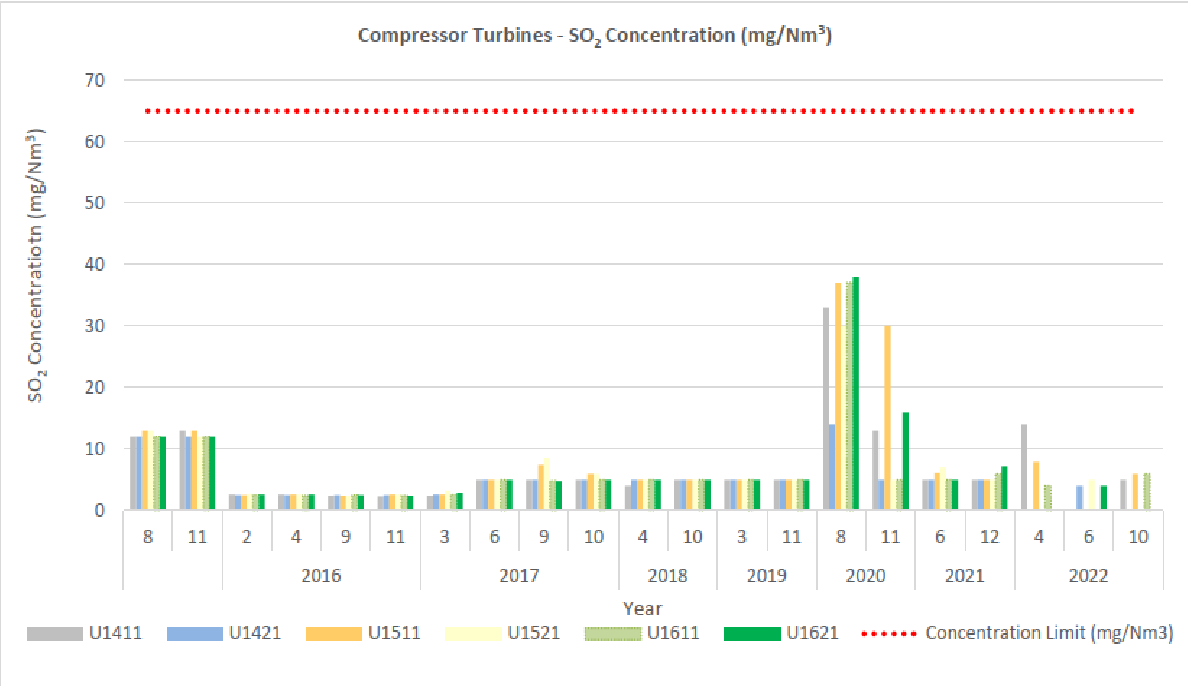


Figure 4-7 Compressor gas turbine SO_2 emissions 2016-2022

Acid Gas Incinerator

The AGI was the primary disposal method for acid gas in 2022 since the hot vent trial was suspended in Q3 2019.

Comparison of mass emissions rates and concentrations for the AGI shows the following observations:

- Compliant NO_x mass emissions rates and concentrations for 2022 and overall, for the 2016-2022 period with the exception of an isolated spike recorded in April 2022 (Figure 4-8).
- Compliant CO mass emissions rates and concentrations for 2022 and overall, for the 2016-2022 period (Figure 4-9)
- Compliant SO_2 mass emissions rates and concentrations for 2022 and for overall for the 2016-2022 period (Figure 4-10) and
- Compliant hydrogen sulphide (H_2S) mass emissions rates and concentrations for 2022 and overall, for the 2017-2022 period (Figure 4-11).

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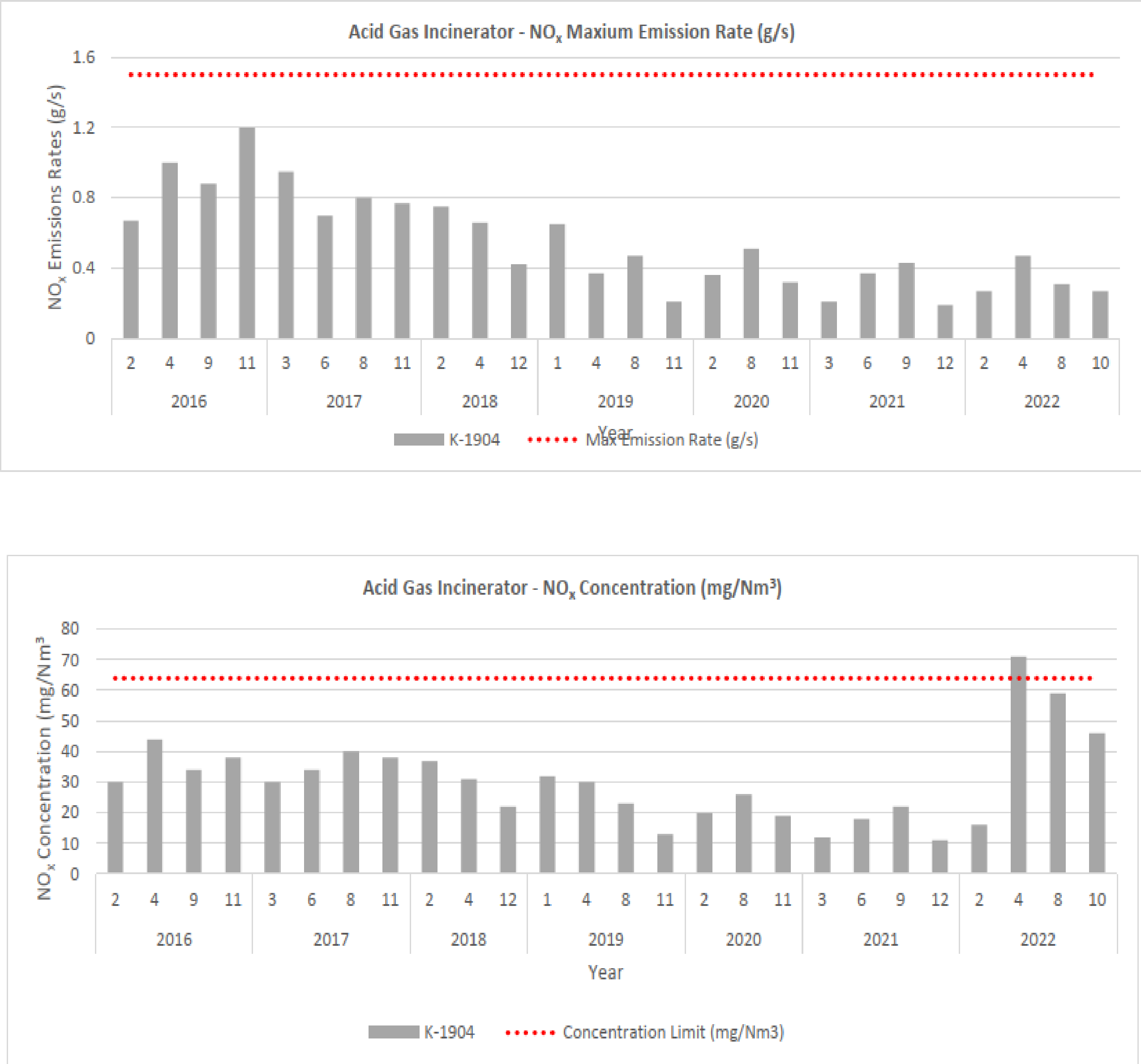
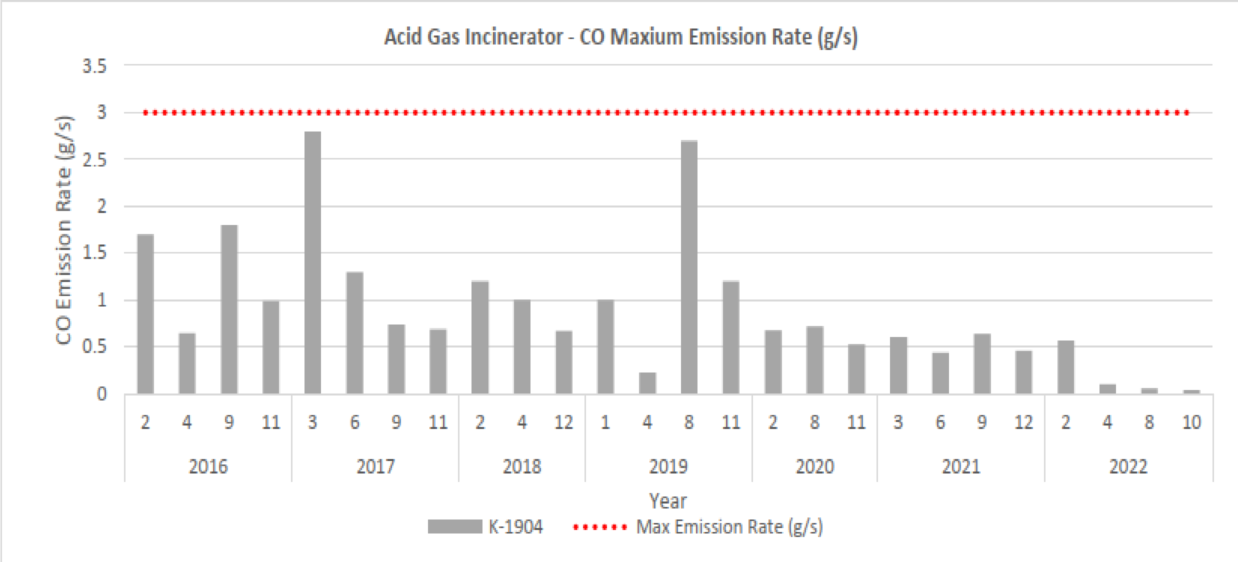


Figure 4-8 AGI NO_x emissions 2016-2022



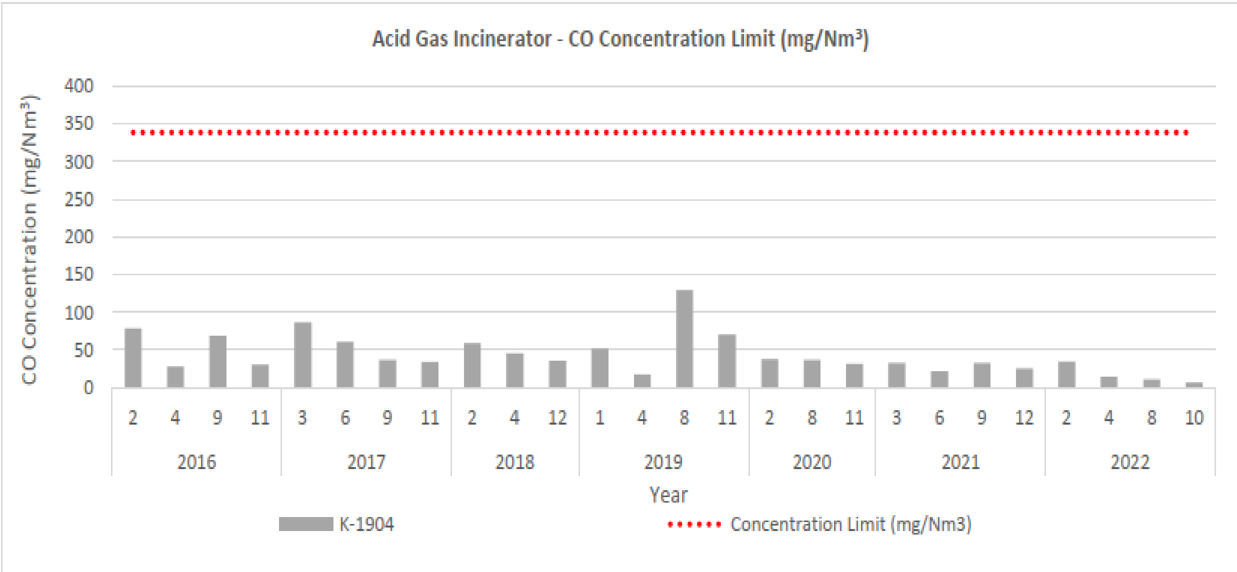
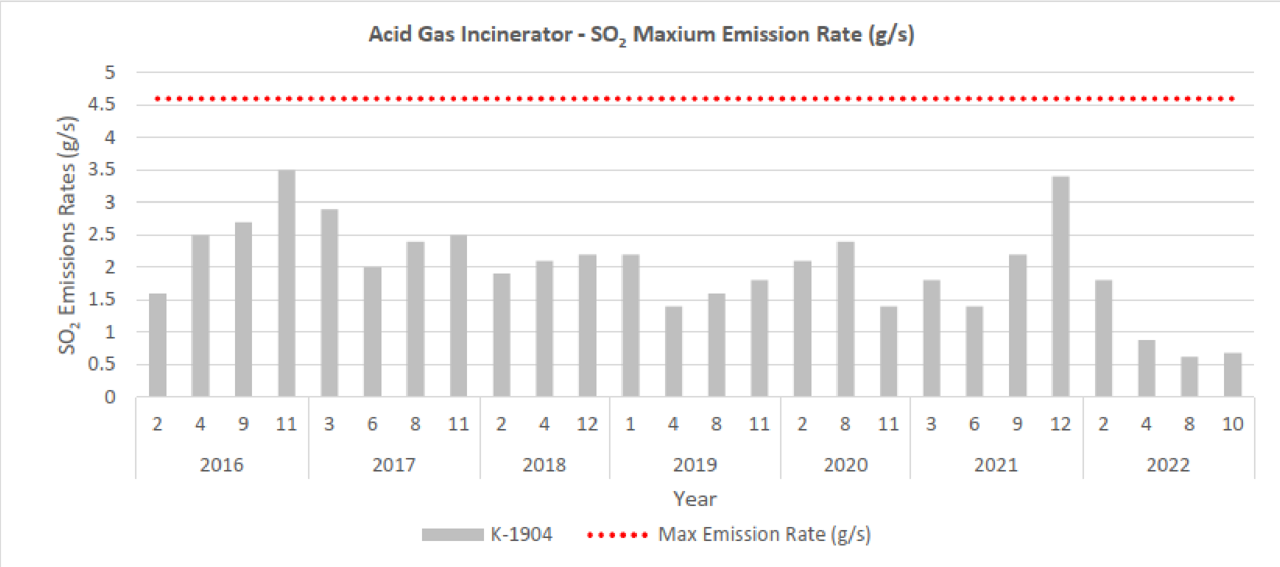


Figure 4-9 AGI CO emissions 2016-2022



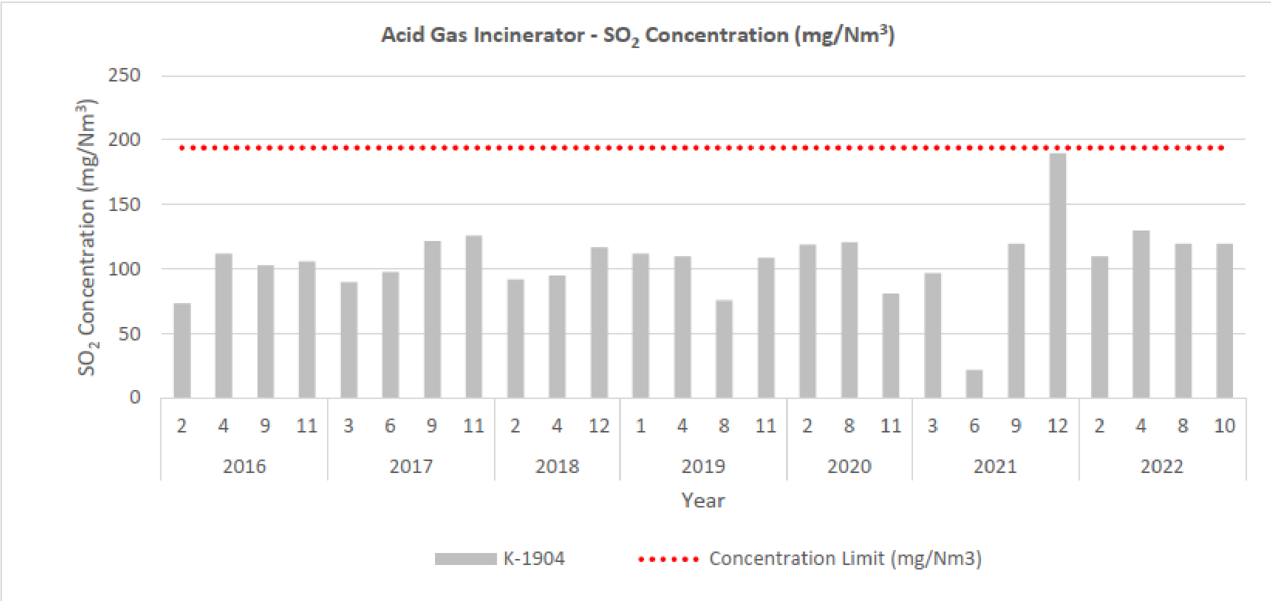
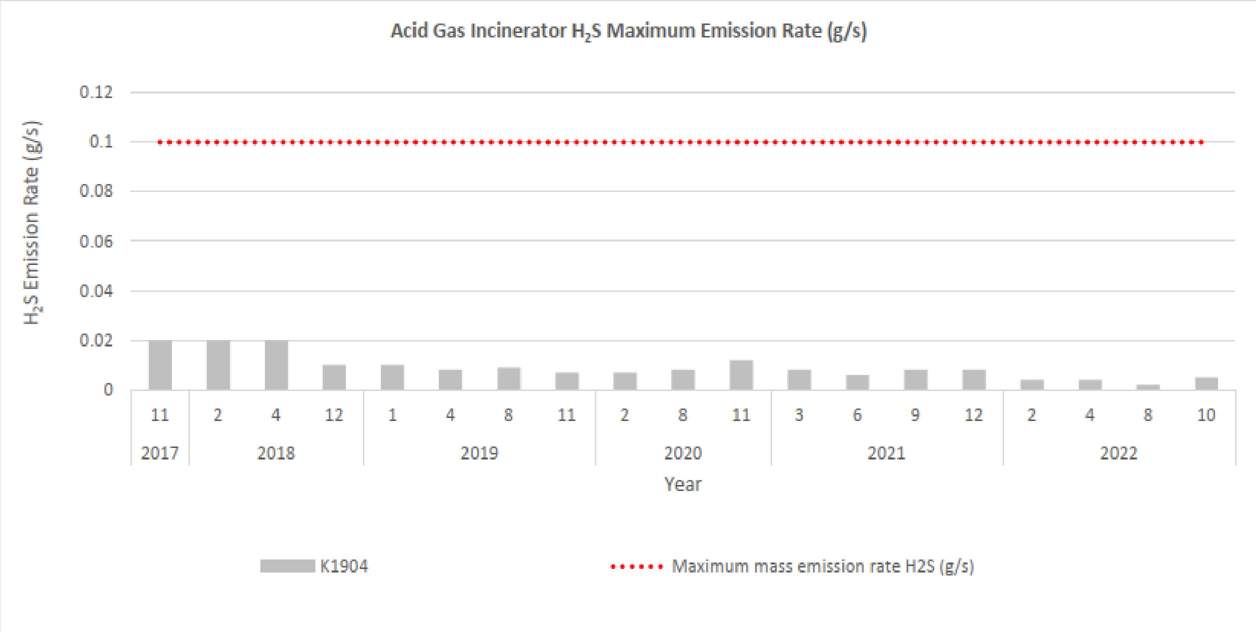


Figure 4-10 AGI SO_2 emissions 2016-2022



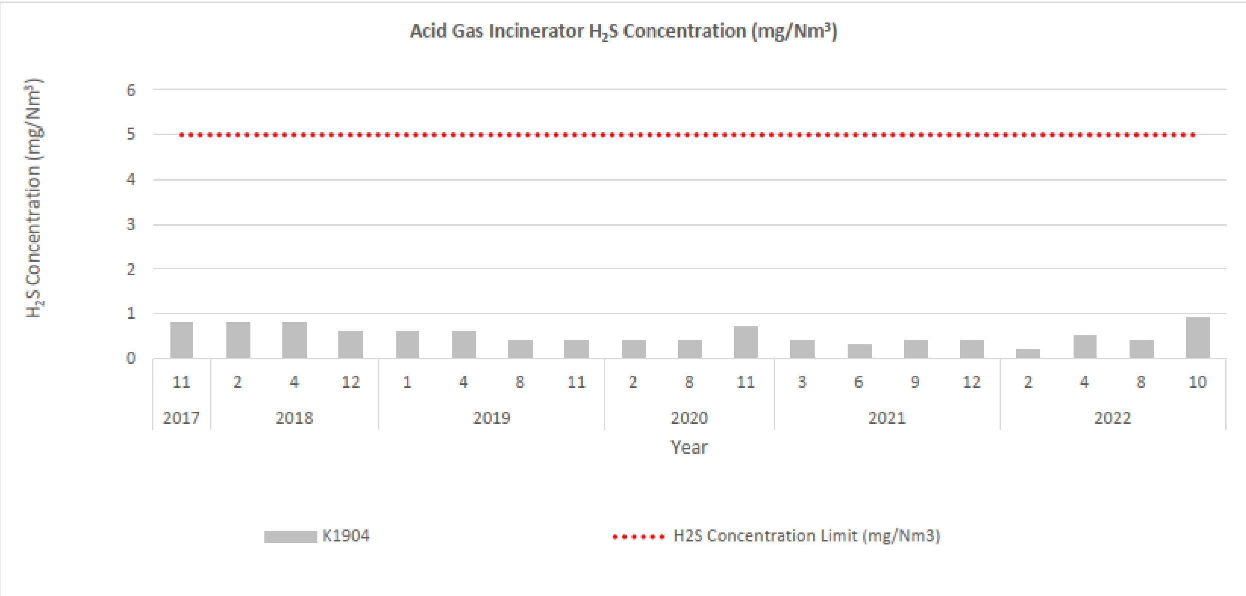


Figure 4-11 AGI H_2S emissions Q4 2017-2022

Process Boiler

Comparison of mass emissions rates and concentrations for the process boiler shows the following observations:

- Compliant NO_x mass emissions rates and concentrations for 2022 and overall, for the 2016-2022 period (Figure 4-12).
- Compliant CO mass emissions rates and concentrations for 2022 and overall, for the 2016-2022 period with the exception of an isolated spike recorded in November 2019 (Figure 4-13).
- Compliant SO_2 mass emissions rates and concentrations for 2022 and overall, for the 2016-2022 period (Figure 4-14).

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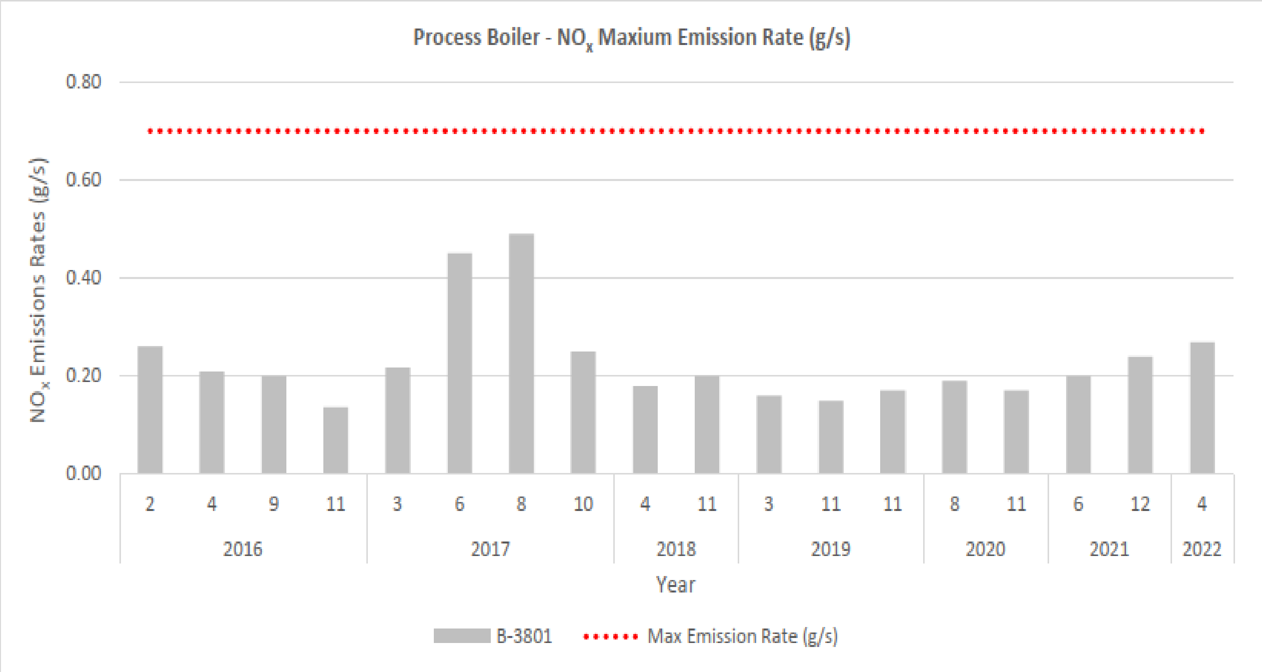


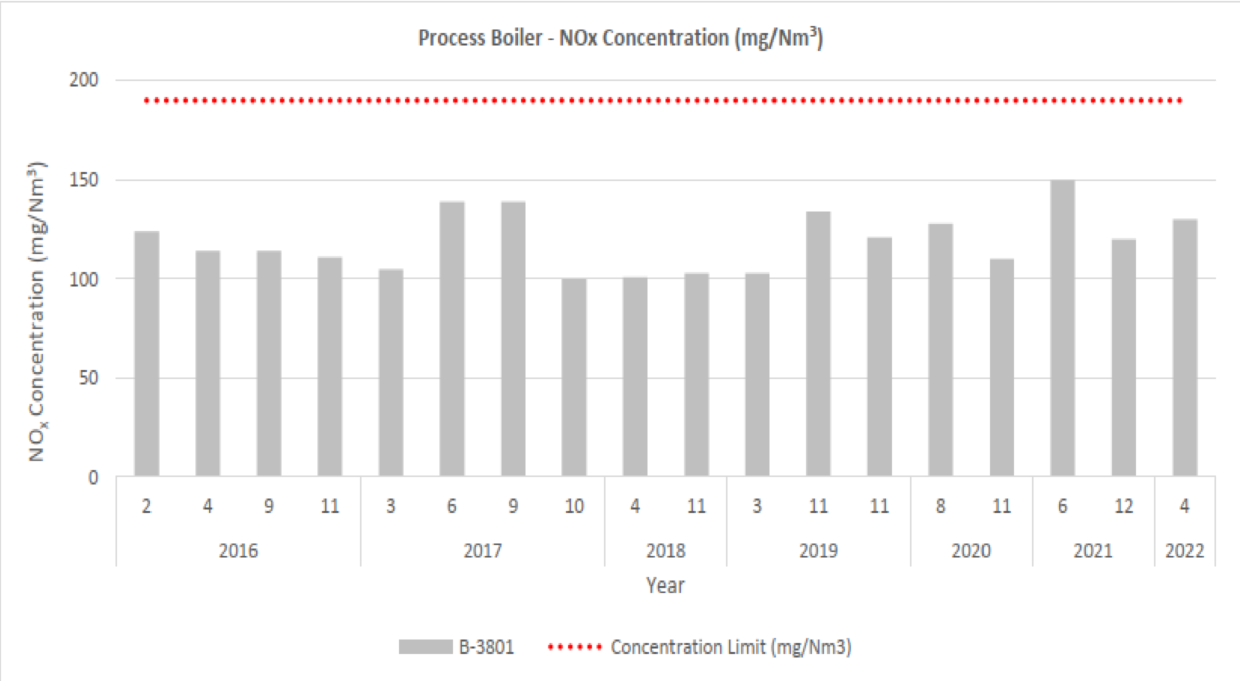
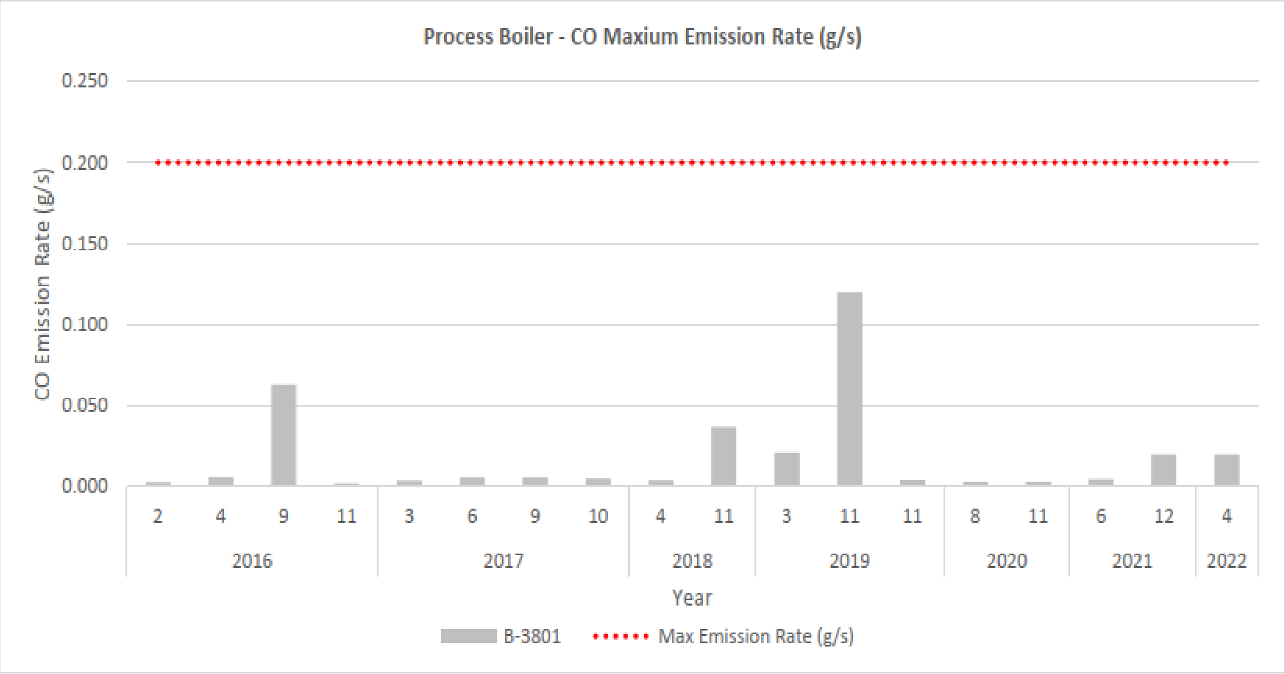


Figure 4-12 Process boiler NO_x emissions 2016-2022



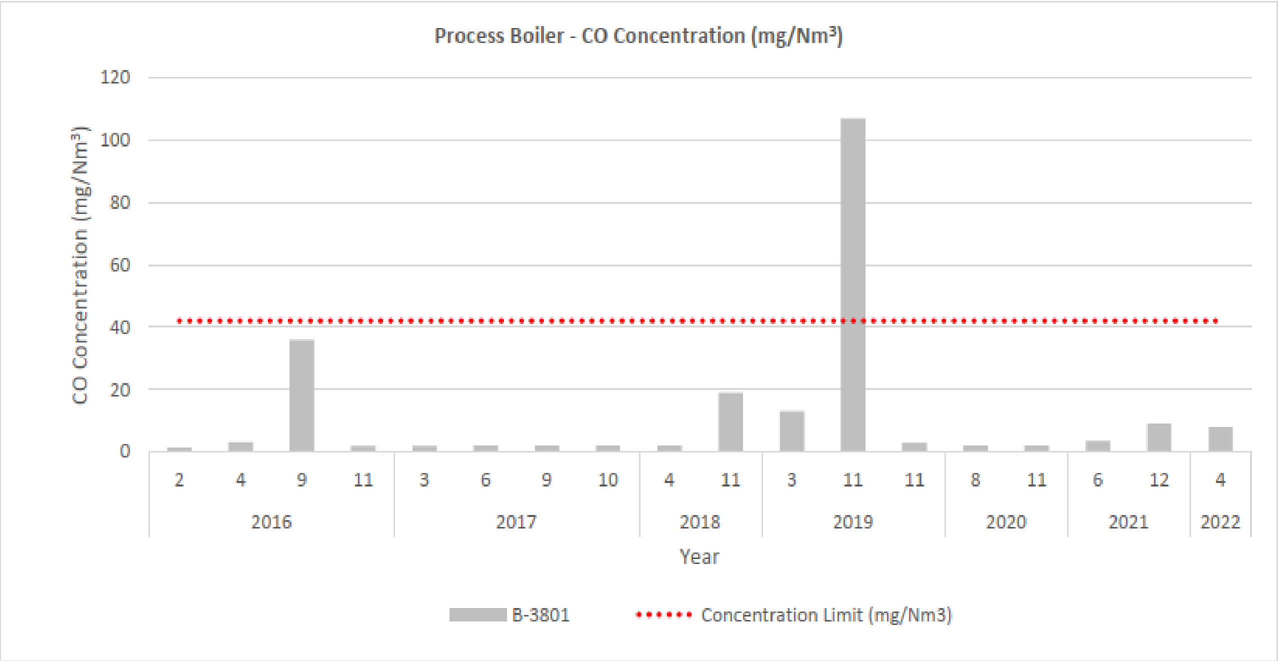
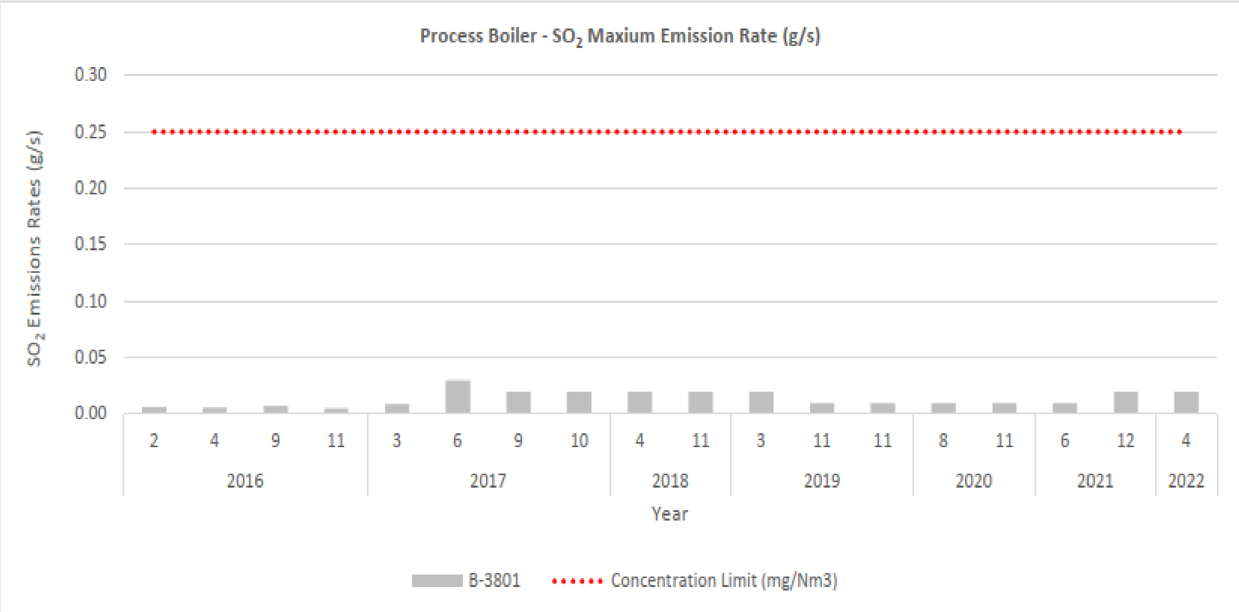


Figure 4-13 Process boiler CO emissions 2016-2022



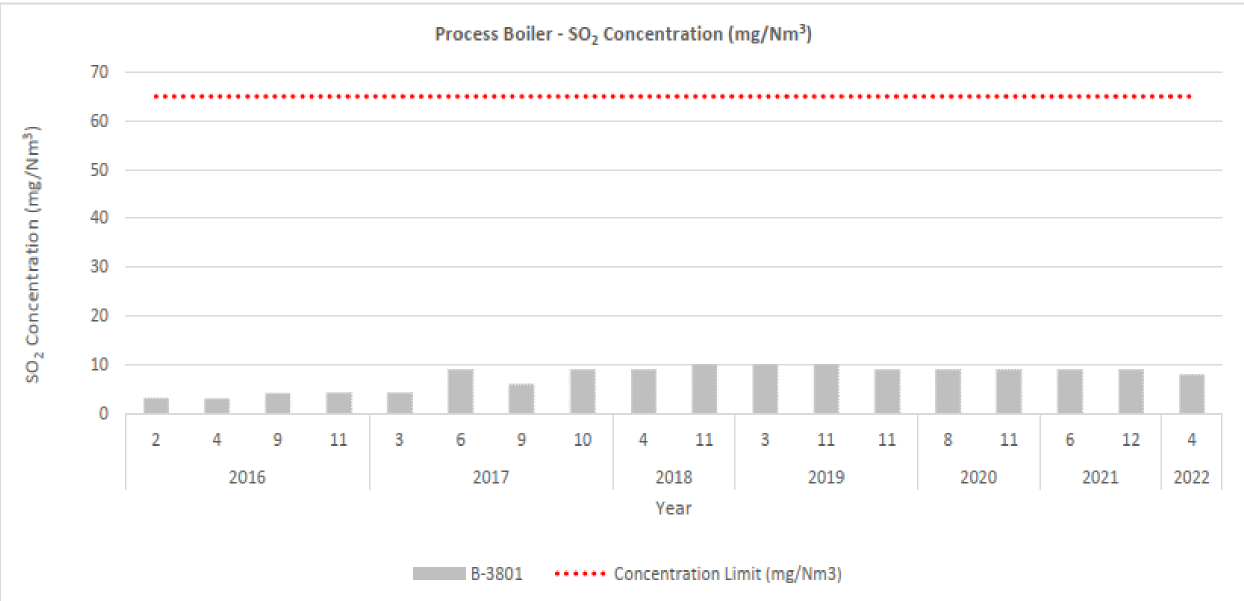


Figure 4-14 Process boiler SO_2 emissions 2016-2022

4.1.4 Data Management and Quality Control

All samples collected by the stack emissions monitoring specialist (Ektimo) complied with the NSW Approved Methods for the Sampling and Analysis of Air Pollutants. Ektimo is accredited by NATA for the sampling and analysis of air pollutants from industrial sources. Unless otherwise stated test methods used are accredited with NATA.

Emissions were calculated using Santos Plant Operating process data, a system which complies with data management standards and requirements to ensure quality and reliability of data.

4.1.5 Discussion and Interpretation of Results

Monitoring of stack emissions sources at the DLNG facility indicated that 2022 results were compliant with the Licence and generally within range of recent historical data (2015-2022).

The overall consistency with long-term data indicates the processes generating stack emissions are relatively stable and well understood. When considered in conjunction with the results of the ambient air monitoring program (Section 4.3), which showed low levels of stack emission pollutants attributable to DLNG beyond the facility boundary, the stack emissions are considered to present little environmental impact or risk.

4.2 Hydrocarbon Flaring and Venting

Hydrocarbon flaring and venting is an unavoidable activity and is required to operate the DNLG facility in a safe manner. Santos seeks to reduce the volume of hydrocarbons flared where practicable and implements flare targets for the DLNG facility. Methane is a much more potent GHG than Carbon Dioxide (CO_2,) although methane has a shorter average residence time in the atmosphere. Hence, flaring of hydrocarbons to convert methane to CO_2 is the preferred disposal method.

The nitrogen stream from the DLNG facility contains a commercially viable amount of helium, and the nitrogen stream removed from the liquefaction process is sent to an off-site helium extraction plant. Venting of nitrogen from the nitrogen rejection unit (NRU) occurs during routine operations where the helium extraction plant is unable to receive the nitrogen gas stream (e.g., during maintenance, when the DLNG stream exceeds the helium plant's capacity, etc.).

As part of a historic planned shutdown the acid gas cold vent pipework was removed and replaced with the hot vent pipework, which results in the acid gas stream being comingled with the compressor exhaust emissions to increase plume buoyance and mixing. Small quantities of acid gas are hot vented on occasions when the AGI is unavailable (e.g., AGI or plant trip)

4.2.1 Monitoring Objectives

The objective of the flaring and venting monitoring program is to understand the amounts of emissions associated with these activities. This information is used to quantify the atmospheric emissions and inform reporting to the NT EPA. The information is analysed in conjunction with other monitoring programs, such as the ambient air monitoring program. The monitoring is also intended to ensure compliance with the conditions of the Licence.

4.2.2 Monitoring Methods

Measurements of volumes of gas sent to the flares, NRU and acid gas vent are calculated based on metering of gas flows within the DLNG facility.

4.2.3 Monitoring Results

Flaring

During the reporting period, the total flaring volume from routine and non-routine sources was 15,920 kNm^3 (Figure 4-15). The flaring volume was less than 2021, but higher than the 2019 and 2020. Over the seven-year period, excluding 2018, 2021 and 2022, the flaring volume has generally reduced. The following operational controls implemented has contributed to reductions in flaring in recent years:

- Three offline compressor turbines not flowing primary seal gas to flare
- Flaring during ship loading minimised
- Reduced ethylene and propane to flare due to the ethylene purifier being online and
- Reduction in off-specification natural gas liquids (NGL) to flare.

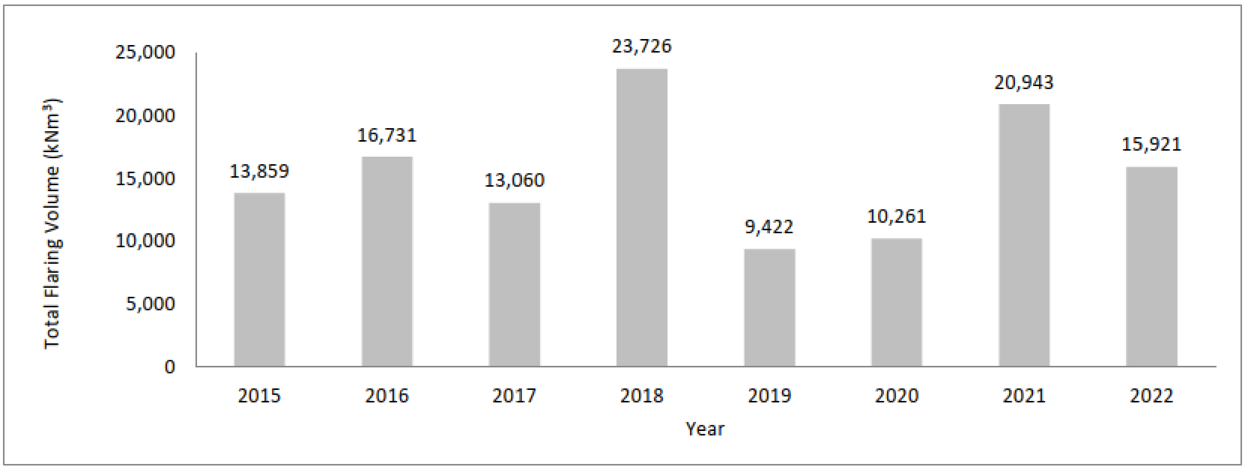


Figure 4-15 Annual flaring volumes (2016-2022)

Nitrogen Rejection Vent

During the reporting period, the total venting from the NRU was 444 kNm^3 (Figure 4-16). NRU venting was significantly greater than the historical range recorded since commissioning of the Helium Plant in 2011 due to the following reasons:

- Plant turndown impacts process water consumption for steam system/ turbine air chilling which has reduced and has also caused more frequent exceedances of specification on feeding reject nitrogen to BOC,
- Planned and unplanned plant outages which resulted in NRU cold venting on shutdown/start-up

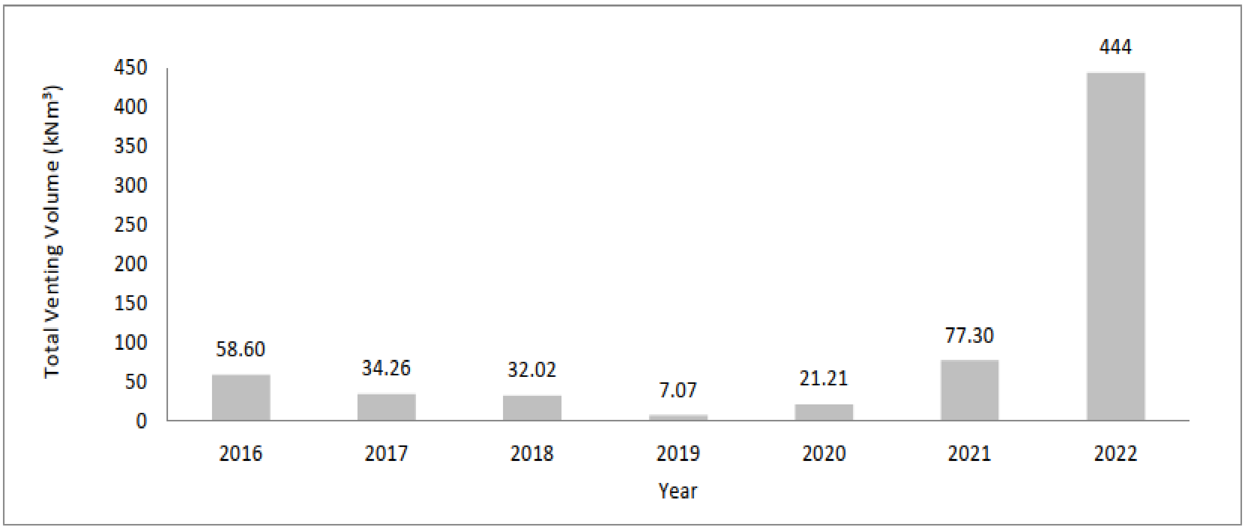


Figure 4-16 DLNG annual NRU venting volumes (2016-2022)

Acid Gas Vent

During the reporting period, the total acid gas venting volume for planned and unplanned downtime was 6,685 kNm^3 (Figure 4-17). Acid gas was vented due to the flow rate being below acid gas incinerator turndown ability (planned), for a total duration of 9.93 days in 2022. The duration of trips or unplanned maintenance in 2022 was 42.21 days, bringing the annual total venting duration to 52.14 days.

Santos was compliant with Condition 51 which states that the acid gas incinerator is not to be in repair and maintenance for more than 28 days at any one time and no more than 55 days per year.

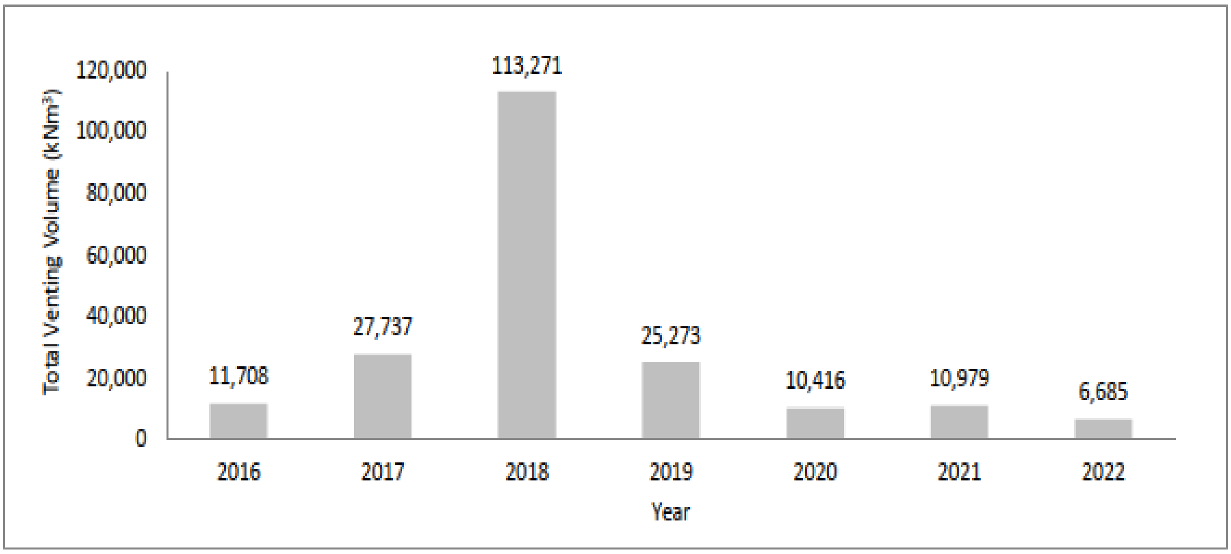


Figure 4-17 DLNG annual acid gas venting volumes (2016-2022)

Quarterly sampling of the AGV was initiated in Q4 2017 following a licence amendment that included this new monitoring condition in September 2017. Comparison of mass emissions rates and concentrations for the AGV shows the following observations:

- Compliant H_2S mass emissions rates and concentrations for 2022 and overall, for the Q4 2017-2022 period with the exception of a minor concentration exceedance in October 2018 (Figure 4-18); and
- Compliant benzene mass emissions rates for 2022.
- Elevated benzene concentrations for 2022, with exceedances observed in January, February, April, August, and October. Similarly, an exceedance was recorded in December 2021. During the 2021 and 2022 stack testing events, the waste gas stream was being treated by the acid gas incinerator and not being discharged via the acid gas vent and is not considered a non-compliance with the licence. Overall, the 2017-2022 period has been compliant except for exceedances in April 2019 and elevated levels at the Licence limit in November 2019 (Figure 4-19). During each of these historical stack testing occasions the waste gas stream was being treated via the acid gas incinerator and was not discharged via the acid gas vent.

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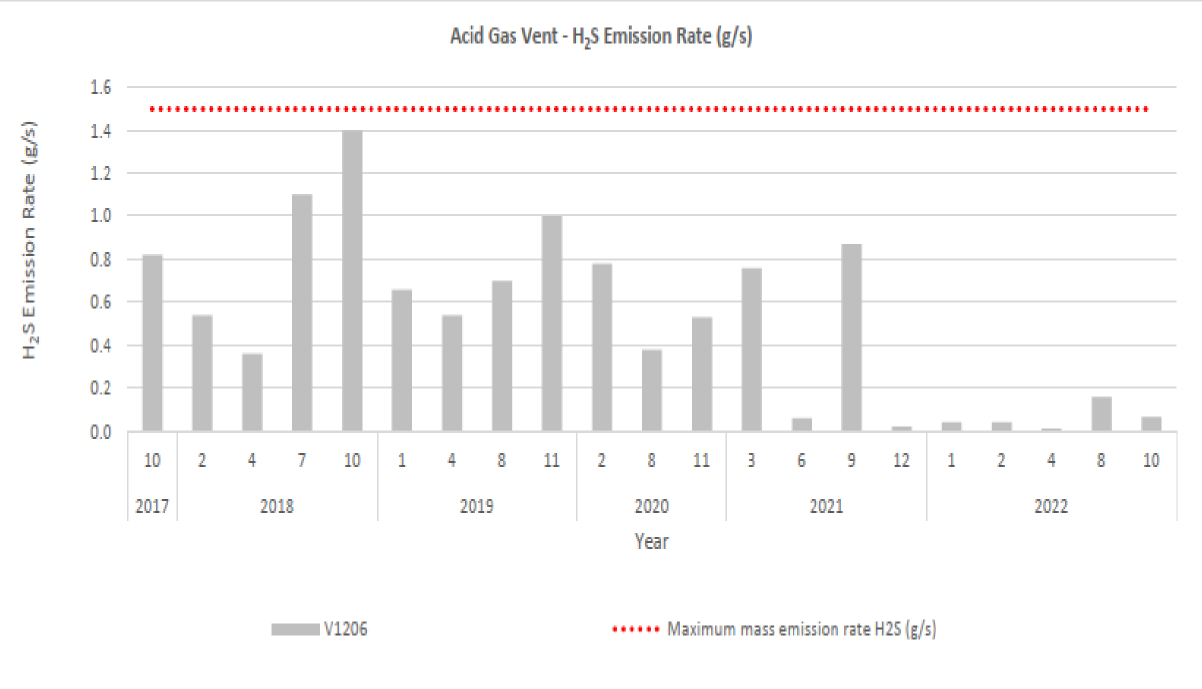


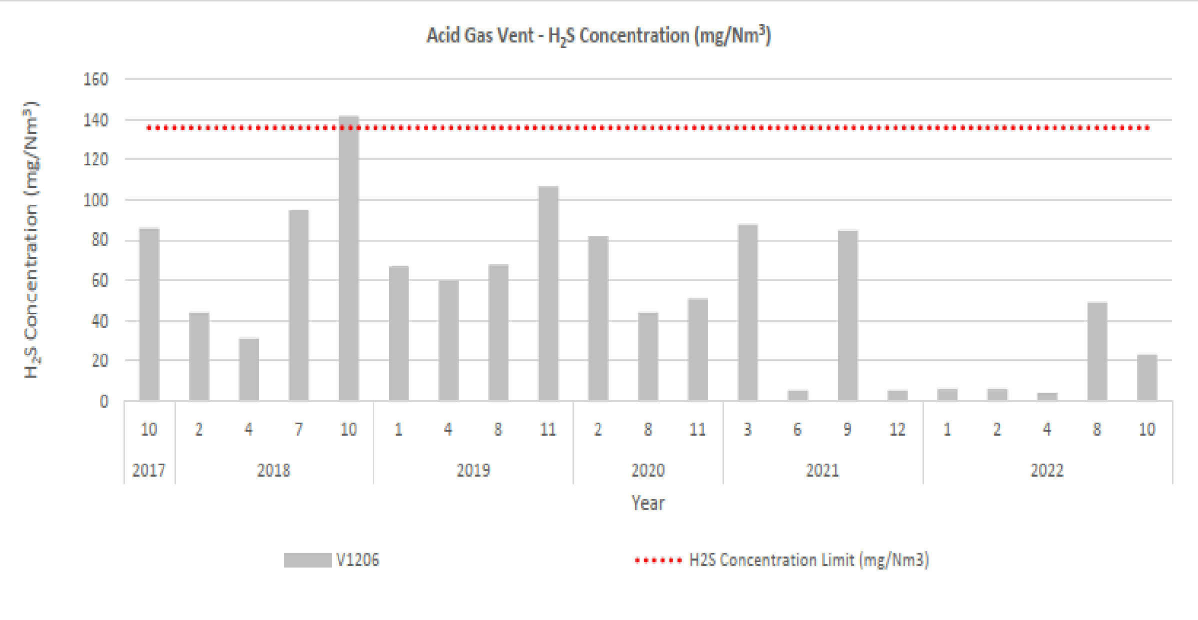
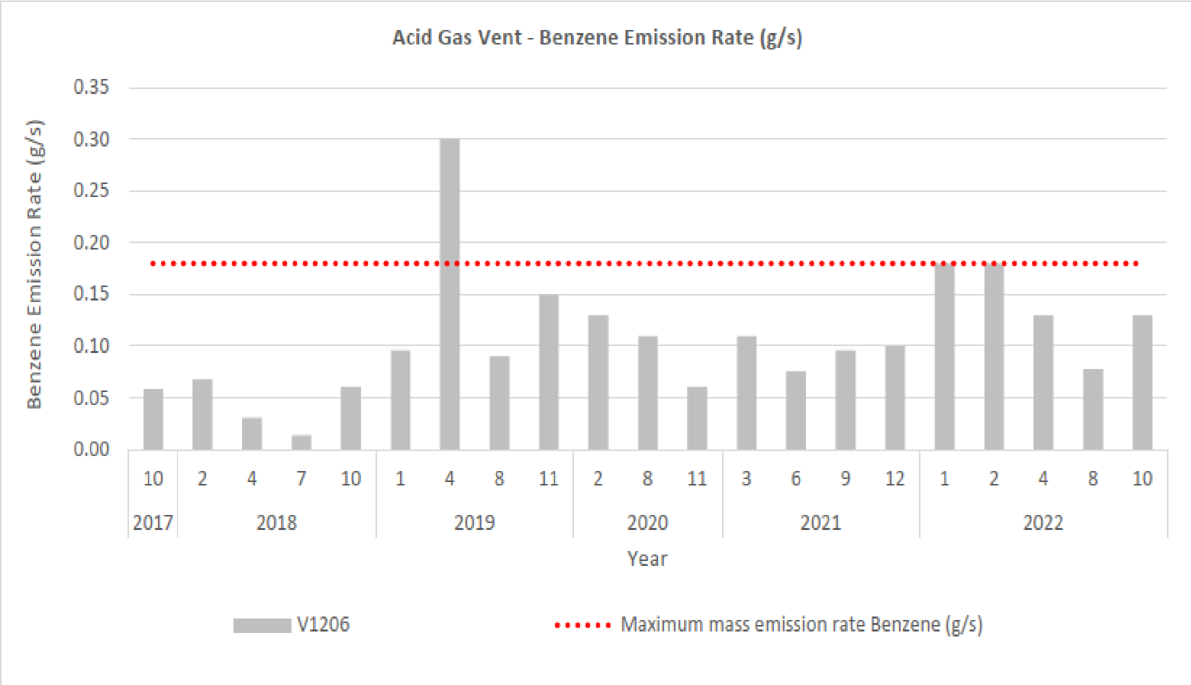


Figure 4-18 AGV H_2S emissions Q4 2017-2022



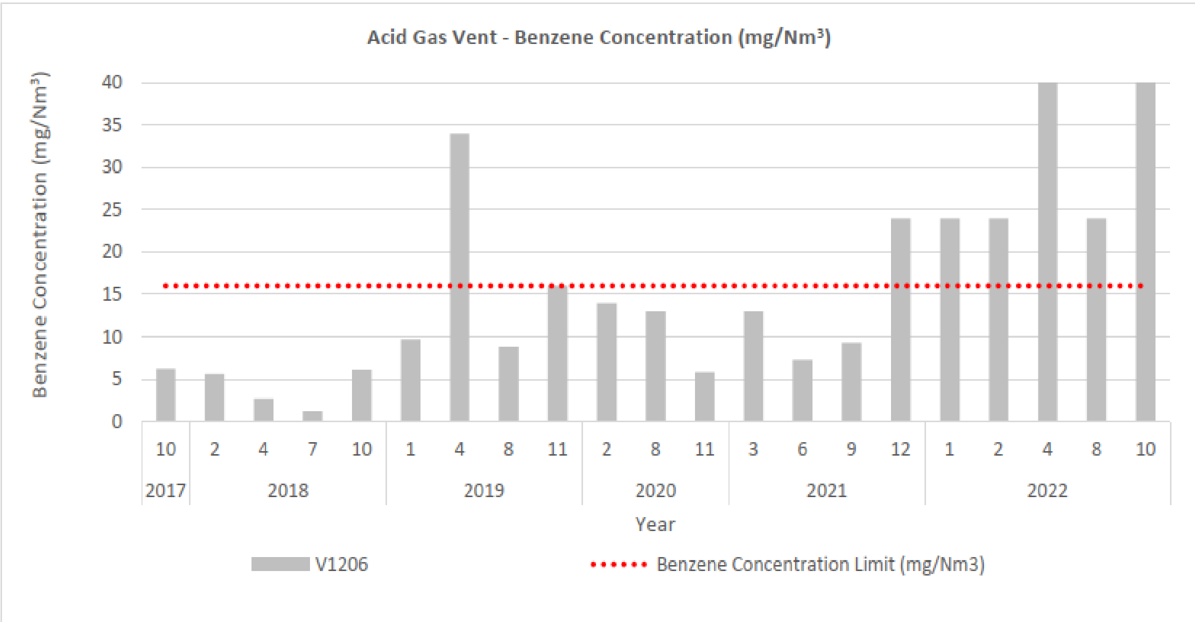


Figure 4-19 AGV benzene emissions Q4 2017-2022

4.2.4 Data Management and Quality Control

Hydrocarbon flaring and venting volumes were calculated using Santos plant operating process data system. This system is routinely monitoring as part of the operation of the DLNG facility and is considered reliable.

4.2.5 Discussion and Interpretation of Results

The 2022 Acid gas venting emissions were lower than the preceding periods. The NRU was significantly greater than the range for the previous five years, and flaring volumes had decreased compared to 2021. Over the five year period from 2017-2022, there is an overall decreasing trend for NRU and flaring, with exception of isolated peaks in 2018, 2021 and 2022, indicating a reduced risk to the environment.

Stack testing of the AGV indicated that the mass emissions rates and concentrations of acid gas were compliant with the Licence limits except for Benzene in Q1, Q2, Q3 and Q4 2022. However, the gas was being treated by the AGI at the time of sampling and is therefore not considered a Licence non-compliance.

Hot venting of acid gas occurred during 2022 due to planned shutdowns in July, August, November, and December to conduct maintenance to the facility or AGI. The total number of days for hot venting did not exceed the Licence limits. In addition, acid gas was also hot vented during planned events such as process trips of the AGI and flow rate being below AGI turndown ability. These events were reported to the NT EPA and the duration of these events was made as short as practicable.

Overall, the flaring and venting volumes in 2022 presents a negligible environmental risk or impact as supported by ambient air monitoring data of the Darwin airshed. Refer to Section 4.3 for more information on ambient air quality monitoring results.

4.3 Ambient Air Monitoring

As outlined in the summary of the 2022 stack emissions monitoring program results (Section 4.1), the DLNG facility has air emissions points permitted by the Licence. While the stack emissions monitoring program provides information on the amounts of atmospheric releases from these authorised discharge points, it does not provide information on their potential impacts in the airshed around the DLNG facility. To address this, Santos has developed, and implements, an ambient air quality monitoring program.

Ecotech Pty Ltd was commissioned by Santos to design, establish and implement an ambient air monitoring program for the DLNG facility over an 18-month period starting March 2016. This included the establishment of three monitoring sites managed by Santos. Once this data was collected, the scope of the ambient air monitoring was reduced in September 2017 to focus on analytes of interest, notably benzene and H_2S for the hot vent trial permitted by Appendix C of the Licence.

The ambient air monitoring program was scaled back to focus on data available from the three NT EPA managed stations only from March 2020 onwards. This was due the suspension of the hot venting trial in November 2019, coupled with a history of compliance with the relevant air quality standards demonstrating low environmental risk. The operation of the Santos monitoring stations was subsequently decommissioned in 2020.

Katestone was commissioned by Santos to collate, review, and interpret the ambient air monitoring data from NT EPA managed stations (Katestone, 2023). The results of this are summarised in this section.

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4.3.1 Monitoring Objective

The ambient air quality monitoring program aims to obtain robust data that accurately monitors the Darwin City and DLNG air sheds to determine the impact, if any, from DLNG air emissions. The data from the ambient air monitoring program is considered in conjunction with the stack emissions monitoring program and the operational activities at the DLNG facility.

The ambient air monitoring program was also intended to provide information for the DLNG acid gas Hot Vent Trial that is permitted by Appendix C of the Licence. The trial has since been cancelled 2019 and the Santos ambient air stations were decommissioned in early 2020.

4.3.2 NT EPA Network

NT EPA maintain their own network of three stations with the program evolving over the years. These are Stokes Hill near Darwin city, Winnellie along the Stuart Highway, and Palmerston. These monitoring sites are shown in Figure 4-20 and detailed in Table 4-1.

All three sites currently monitor particulate matter (PM_{10} and $PM_{2.5}$), CO, oxides of nitrogen (NO_X, NO and NO_2), SO_2 and meteorological parameters. This dataset is available on the public NT Air Quality Network website and is included within the ambient air quality discussion.

In general, the primary air pollutant in Darwin and Palmerston is particulate matter in smoke from distant and local vegetation burning during the dry season. Other air pollutants CO, NO_2 and SO_2 all occur at very low levels compared to large cities in other parts of Australia, while O_3 occurs at moderate levels, typically due to natural processes.

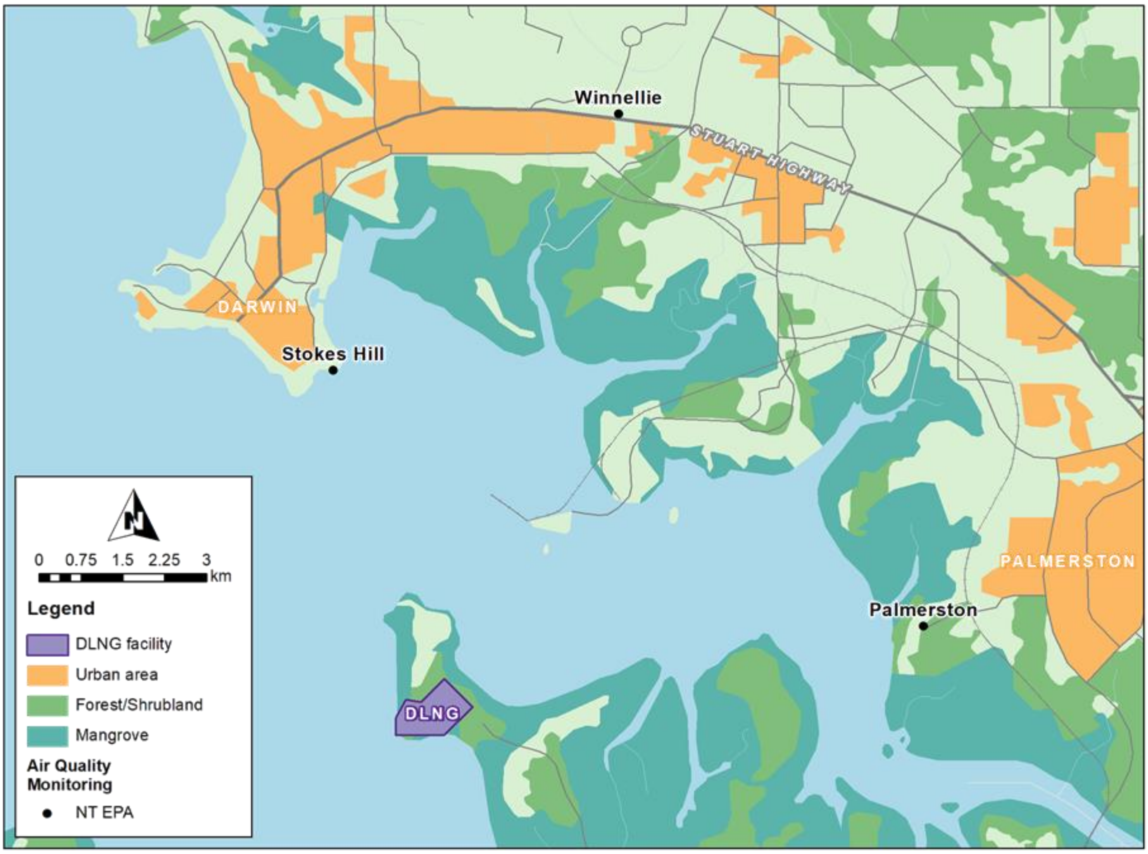

Figure 4-20 Ambient air quality monitoring station locations

Table 4-1 NT EPA ambient air monitoring network

Site description		Palmerston	Stokes Hill	Winnellie
Geographical coordinates	Latitude	130.94848	130.8506	130.89326
	Longitude	-12.50776	-12.46702	-12.42443
Classification		Residential	Industrial	Generally Representative Upper Bound
Meteorology				
Wind speed		✓	✓	✓
Wind direction		✓	✓	✓
Pollutants				
NO, NO_2, NO_x		✓	✓	✓
SO_2		✓	✓	✓
O_3		✓	✓	✓
CO		✓	✓	✓
PM_{10}, $PM_{2.5}$		✓	✓	✓

4.3.3 Data Capture

The ambient air quality monitoring network data were downloaded via the public NT Air Quality Network website by Katestone as hourly averages for all air pollutants and meteorological parameters. This data is automatically collected and may not have undergone preliminary quality checks or data ratification. The lack of data ratification is obvious in the concentration data for some pollutants, and it is not possible for Katestone to carry out this data ratification as it requires specific calibration data that is not published. Hence, while Katestone has sought to remove anomalous values from the dataset, the underlying data quality remains very poor in some cases.

Data at each monitoring site was compared with relevant air quality standards.

4.3.4 Meteorological Conditions

Meteorological conditions play an important role in the dispersion of air pollutants from their point of emission. The NT EPA ambient air monitoring network measures wind speed and wind direction at the three monitoring sites and indicate the following (Figure 4-21):

- The predominant winds in the region are from the east-southeast and west-northwest, based on Palmerston and Winnellie; northerly and southerly winds are uncommon at both sites
- Wind direction at these sites generally shifts from predominantly easterly in the Dry season (May to October) to predominantly westerly in the Wet season (November to April)
- The Stokes Hill data show a very different pattern, one which is similar to 2021 but very different to previous years, which perhaps suggests instrument error.

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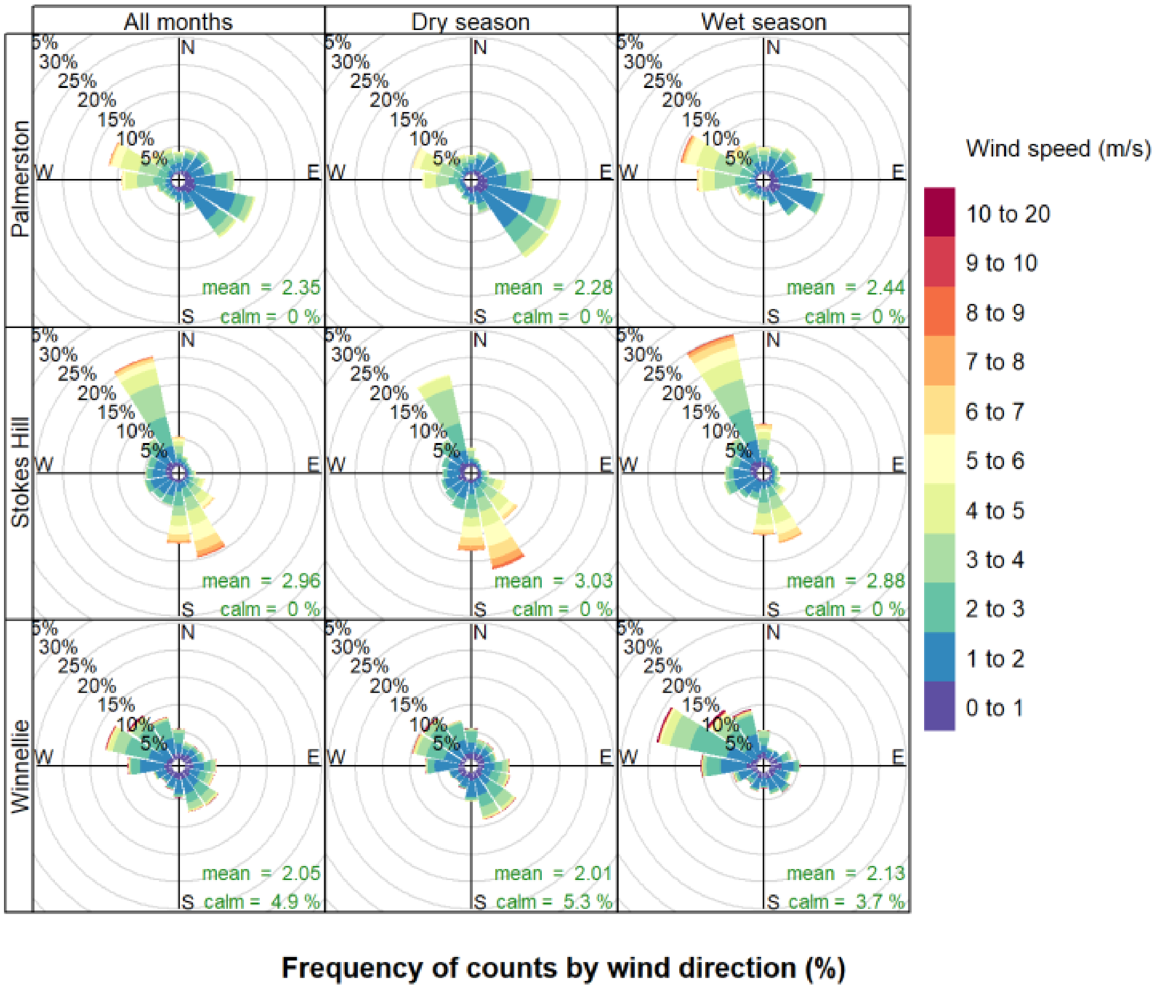

Figure 4-21 2022 wind rose for the NT EPA monitoring sites

4.3.5 Nitrogen Dioxide (NO_2)

A summary of NO_2 concentrations measured by the NT EPA monitoring network is presented in timeseries are shown in Figure 4-22. The results show that:

- 1-hour average concentrations of NO_2 were below the Air NEPM standard of 0.08 ppm
- Annual average concentrations of NO_2 were well below the Air NEPM standard of 0.015 ppm
- Concentrations of NO_2 complied with the relevant Air NEPM standards at all monitoring sites, reaching at most 54% of the standards.

A spike in concentrations in late July in Figure 4-22 looks potentially anomalous, closer investigation shows a spike over a few hours on 23 July 2022, including for two other pollutants ($PM_{2.5}$ and PM_{10}), with concentrations being elevated partially throughout this day and the following day (24 July 2022, primarily $PM_{2.5}$ and PM_{10}). This could potentially represent instrument error, although all the instruments failing at the same time seems unlikely, unless due to an electrical issue or potentially a problem with the datalogger. Regardless, no similar spike in concentrations has been observed since this period.

Figure 4-22 1-hour average concentrations of NO_2 measured by the NT EPA monitoring network 2022

4.3.6 SO_2

Summaries of SO_2 concentrations measured by the NT EPA monitoring network are presented in in Figure 4-22 and Figure 4-23. The results show that:

- 1-hour average concentrations of SO_2 were well below the Air NEPM standard of 0.10 ppm
- 24-hour average concentrations of SO_2 were well below the Air NEPM standard of 0.02 ppm
- Concentrations of SO_2 complied with the relevant Air NEPM standards at all monitoring sites, reaching at most 36% of the standards.

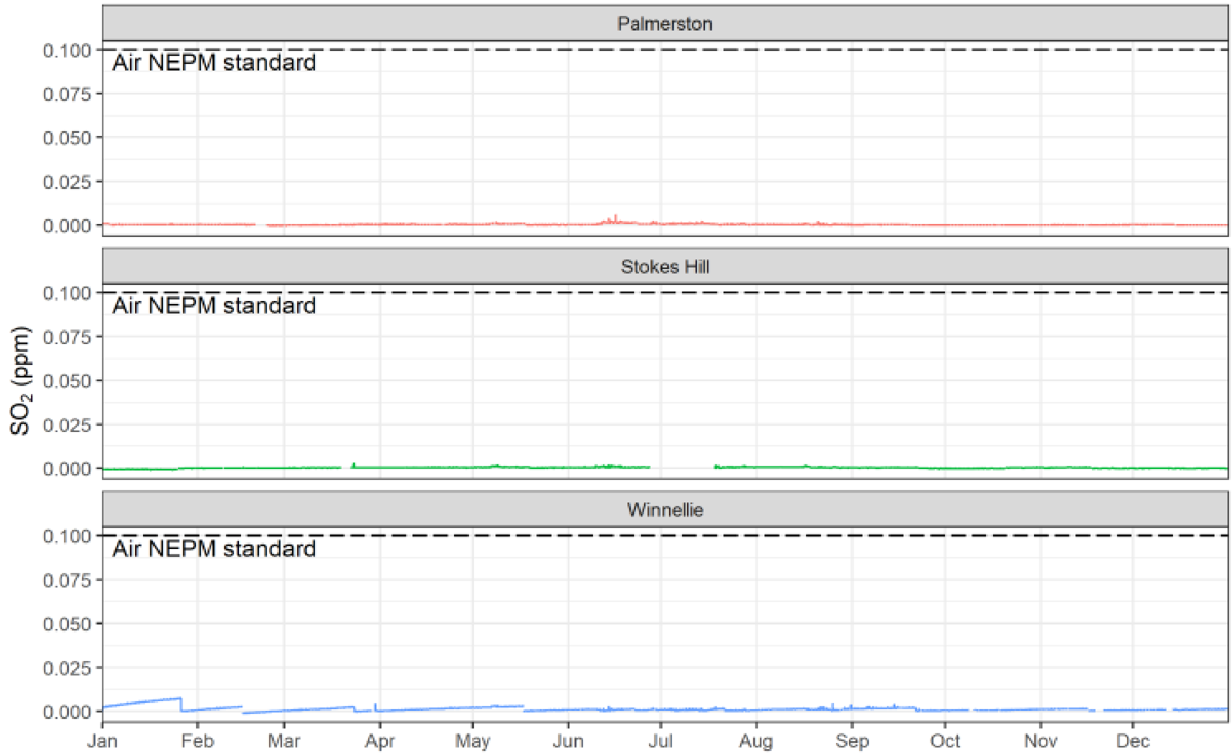

Figure 4-23 Timeseries of 1-hour average SO_2 concentrations (ppm) measured by the NT EPA monitoring network (January 2022 to December 2022)

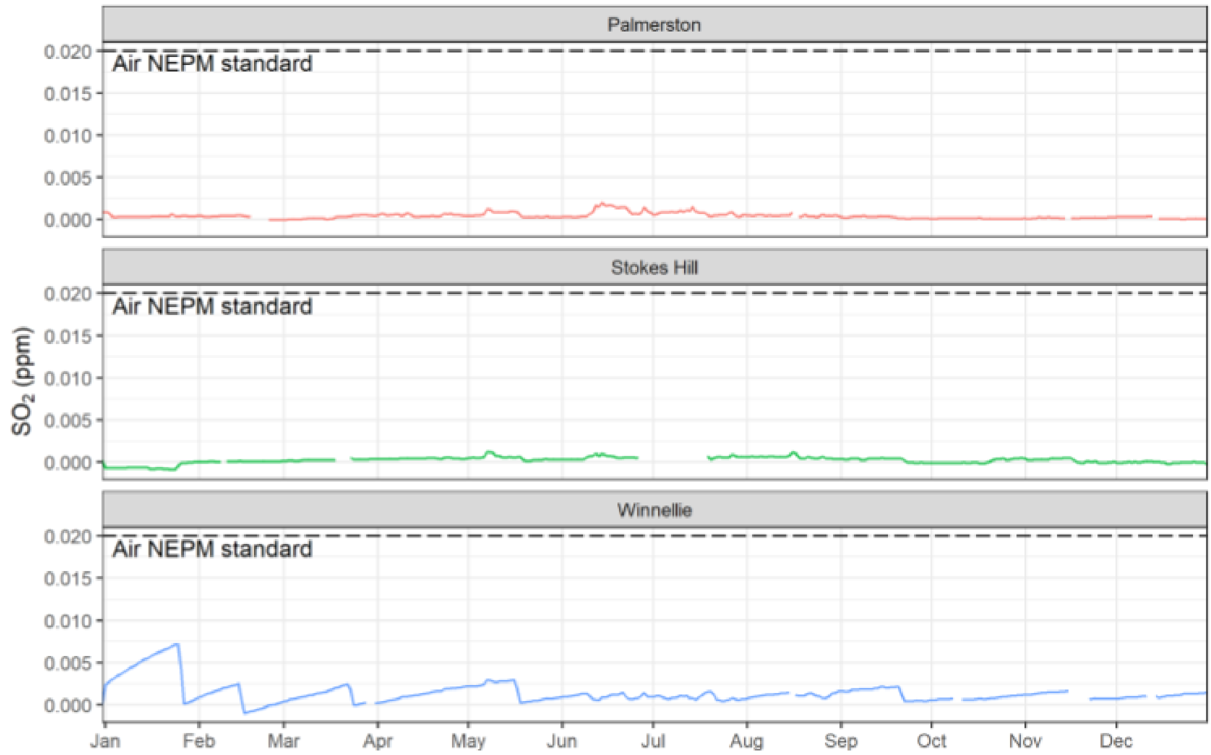

Figure 4-24 Timeseries of 24-hour average SO_2 concentrations (ppm) measured by the NT EPA monitoring network (January 2022 to December 2022)

4.3.7 CO

A summary of CO concentrations measured by the NT EPA monitoring network is presented in the timeseries are shown in Figure 4-25. The results show that 8-hour rolling average concentrations of CO were well below the Air NEPM standard of 9.0 ppm.

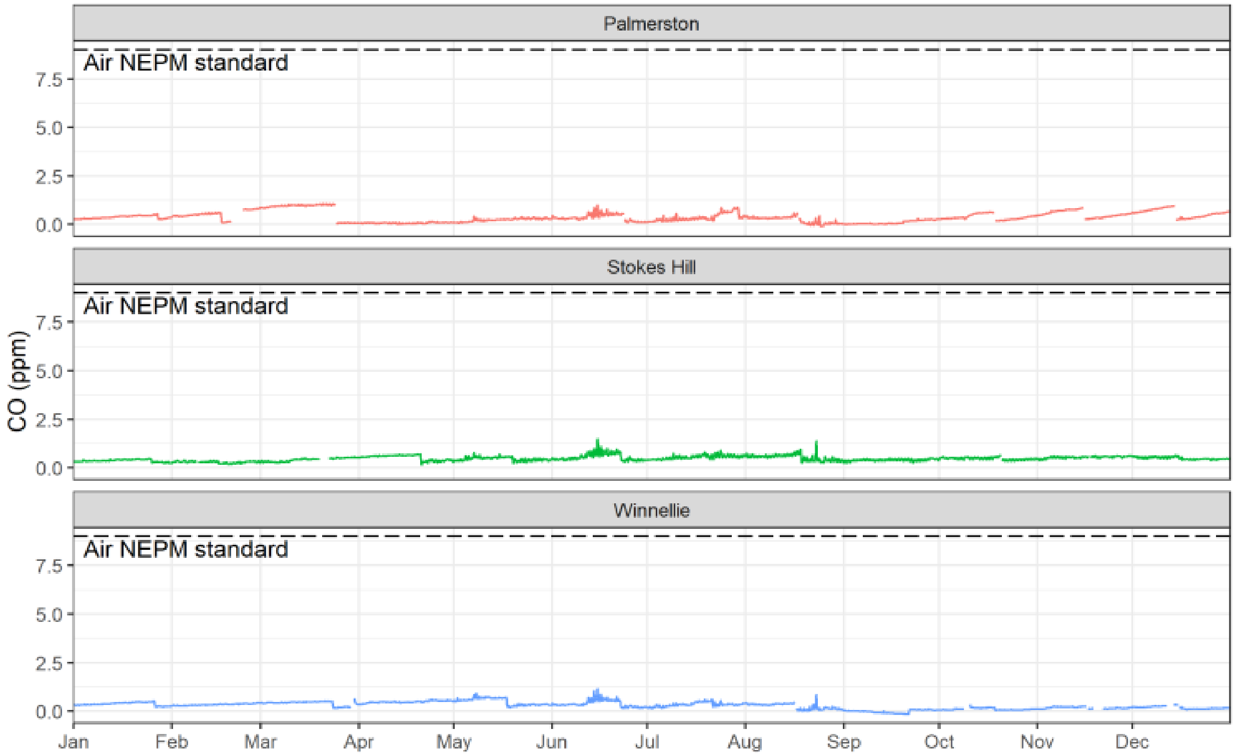

Figure 4-25 Timeseries of 8-hour rolling average CO concentrations (ppm) measured by the NT EPA monitoring network (January 2022 to December 2022)

4.3.8 PM_{10}

A summary of PM_{10} concentrations measured by the NT EPA monitoring network is presented in the timeseries are shown in Figure 4-26. The results show that:

- Annual average concentrations of PM_{10} complied with the Air NEPM standard of 25 µg/m3
- 24-hour average concentrations of PM_{10} exceeded the Air NEPM standard of 50 µg/m3, on a total of eight occasions across the three sites.

Table 4-2 describes the exceedances and shows that all sites recorded relatively high concentrations on thee listed days, which in some cases is likely indicative of a widespread dust event. Consistent with this is the fact that the exceedances occurred during the Dry season (May to October), when natural dust events are common.

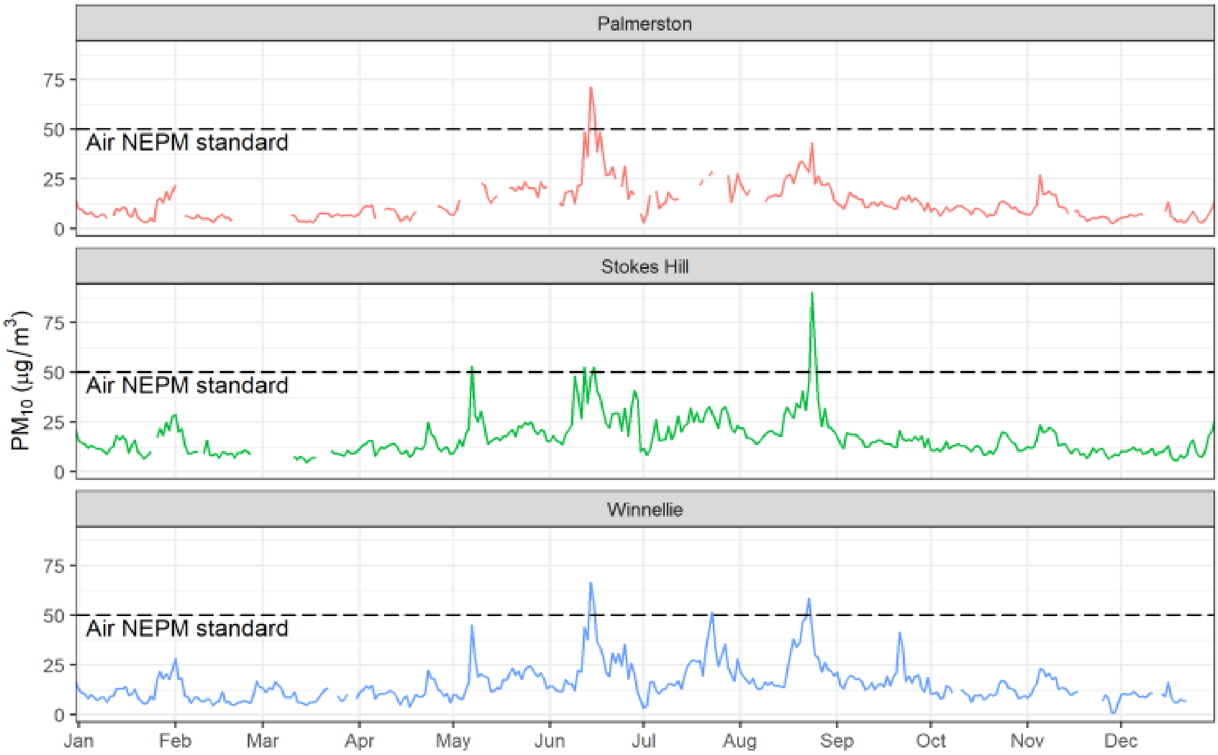

Figure 4-26 Timeseries of 24-hour average PM_{10} concentrations (µg/m³) measured by the NT EPA monitoring network (January 2022 to December 2022)

Table 4-2 24-hour average PM_{10} concentrations (µg/m³) measured by the NT EPA monitoring network on exceedance days (January 2022 to December 2022)

Date	24-hour average PM_{10} concentration (µg/m3)		
	Palmerston	Stokes Hill	Winnellie
7 May 2022	-	**53.0**	45.0
12 June	48.5	**52.5**	43.9
14 June	**71.3**	47.0	**66.4**
15 June	**61.5**	**52.6**	**55.7**
23 July	28.8	29.4	**51.6**
23 August	28.3	45.0	**58.5**
24 August	43.3	**90.1**	42.7
25 August	22.4	**62.3**	29.8

4.3.9 $PM_{2.5}$

A summary of $PM_{2.5}$ concentrations measured by the NT EPA monitoring network is presented in the timeseries are shown in Figure 4-27. The results show that:

- Annual average concentrations of $PM_{2.5}$ at Stokes Hill complied with the Air NEPM standard of 8 µg/m3; concentrations at Palmerston and Winnellie did not comply
- 24-hour average concentrations of $PM_{2.5}$ exceeded the Air NEPM standard of 25 µg/m³ on a total of 21 occasions across the three sites.

Table 4-3 shows that all of the exceedances occurred during the Dry season (May to October), when natural dust events are common, and such events are likely to be the cause of most of the exceedances.

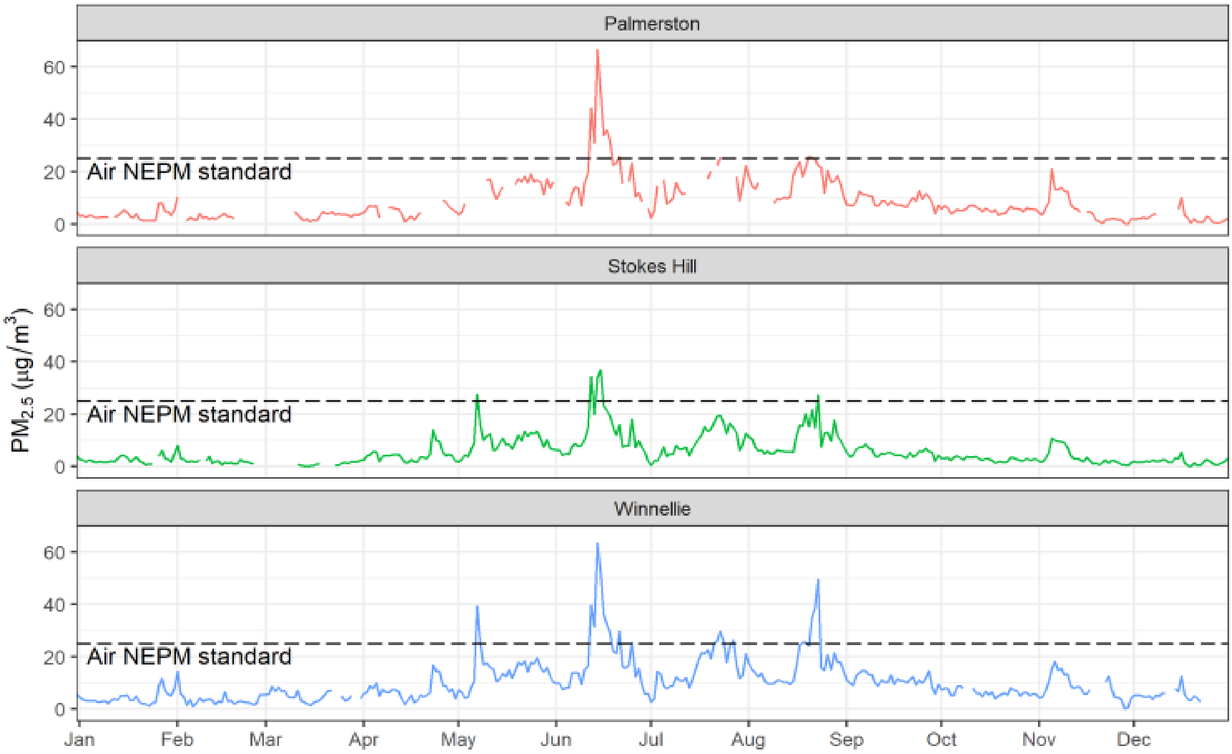

Figure 4-27 Timeseries of 24-hour average $PM_{2.5}$ concentrations (µg/m3) measured by the NT EPA monitoring network (January 2022 to December 2022)

Table 4-3 24-hour average $PM_{2.5}$ concentrations (μg/m3) measured by the NT EPA monitoring network on exceedance days (January 2022 to December 2022)

Date	24-hour average $PM_{2.5}$ concentration (μg/m^3)		
	Palmerston	Stokes Hill	Winnellie
7 May 2022	NA	**27.5**	**39.3**
12 June 2022	**44.2**	**34.3**	**39.6**
13 June 2022	**30.9**	19.9	**31.4**
14 June 2022	**66.6**	**33.9**	**63.3**
15 June 2022	**50.6**	**36.7**	**52.4**
16 June 2022	33.8	23.3	**36.0**
17 June 2022	**35.8**	21.4	**32.3**
18 June 2022	**31.8**	19.4	**29.1**
21 June 2022	**25.7**	16.0	**29.8**
25 June 2022	23.4	18.1	**25.5**
22 July 2022	22.3	19.3	**26.2**
23 July 2022	**25.5**	19.5	**29.7**
24 July 2022	NA	16.9	**26.1**
27 July 2022	NA	14.8	**26.2**
18 August 2022	18.2	15.5	**25.6**
19 August 2022	21.7	20.1	**25.5**
20 August 2022	**25.7**	15.3	24.1
21 August 2022	**25.3**	21.8	**35.1**
22 August 2022	24.8	14.8	**38.6**
23 August 2022	22.4	**27.2**	**49.5**

4.3.10 Hot Venting Periods

Table 4-4 provides details of the hot venting conducted during 2022 and corresponding ambient air quality events.

Table 4-4 Hot Venting Periods and Ambient Air quality events (January 2022 to December 2022

Start Date/time	End Date/Time	Duration (Days)	Volume discharged (kNm^3)	Type	Ambient Air Quality Events
09/03/22 15:04	13/03/22 04:31	3.56	1516	Unplanned	No exceedances
25/03/22 16:07	26/03/22 00:41	0.36	85	Unplanned	No exceedances
27/03/22 11:39	27/03/22 13:59	0.10	42	Unplanned	No exceedances
18/04/22 04:35	18/04/22 07:42	0.13	35	Unplanned	No exceedances
18/04/22 15:43	18/04/22 22:19	0.27	63	Unplanned	No exceedances
19/04/22 03:52	19/04/22 05:22	0.06	17	Unplanned	No exceedances
19/04/22 15:37	19/04/22 20:13	0.19	40	Unplanned	No exceedances
14/05/22 04:58	23/05/22 00:22	8.81	248	-	No exceedances
25/05/22 02:53	25/05/22 11:13	0.35	17	Unplanned	No exceedances
15/06/22 15:39	15/06/22 20:03	0.18	39	Unplanned	Exceedance of 24-hr average PM_{10} and $PM_{2.5}$ at all sites
21/06/22 15:45	21/06/22 19:28	0.15	27	Unplanned	Exceedance of 24-hour average $PM_{2.5}$ at Palmerston and Winnellie
22/06/22 10:07	25/06/22 11:11	3.04	268	Unplanned	Exceedance of 24-hour average $PM_{2.5}$ at Winnellie (25 June)
29/06/22 07:37	29/06/22 08:55	0.05	18	Unplanned	No exceedances

Start Date/time	End Date/Time	Duration (Days)	Volume discharged (kNm^3)	Type	Ambient Air Quality Events
10/07/22 08:30	10/07/22 13:55	0.23	34	Unplanned	No exceedances
13/07/22 05:45	13/07/22 07:30	0.07	21	Unplanned	No exceedances
14/07/22 03:30	14/07/22 07:00	0.15	40	Unplanned	No exceedances
15/07/22 06:45	15/07/22 08:20	0.07	17	Unplanned	No exceedances
18/07/22 05:00	18/07/22 08:25	0.14	40	Unplanned	No exceedances
23/07/22 06:05	23/07/22 07:35	0.06	17	Planned*	Exceedance of 24-hour average $PM_{2.5}$ at Palmerston and Winnellie and PM_{10} at Winnellie
03/08/22 09:18	03/08/22 09:21	0.00	0	Planned*	No exceedances
05/08/22 08:12	05/08/22 13:48	0.23	43	Planned*	No exceedances
18/08/22 12:50	19/08/22 00:35	0.49	33	Planned*	Exceedance of 24-hour average $PM_{2.5}$ at Winnellie (18 and 19 August)
19/08/22 22:06	20/08/22 07:05	0.37	41	Planned*	Exceedance of 24-hour average $PM_{2.5}$ at Winnellie (19 August) and Palmerston (20 August)
27/08/22 15:35	27/08/22 16:45	0.05	10	Planned*	No exceedances
28/08/22 12:45	28/08/22 14:00	0.05	10	Planned*	No exceedances
19/11/22 18:40	21/11/22 01:00	1.26	34	Unplanned	No exceedances
21/11/22 00:00	24/11/22 00:40	3.03	354	Unplanned	No exceedances
25/11/22 17:25	28/11/22 00:00	2.27	2	Planned*	No exceedances
05/12/22 00:00	09/12/22 01:45	4.07	154	Planned*	No exceedances
09/12/22 10:45	09/12/22 14:25	0.15	49	Planned*	No exceedances
09/12/22 20:00	12/12/22 00:00	2.17	901	Planned*	No exceedances
12/12/22 00:00	14/01/23 14:30	33.60	4149	Unplanned	No exceedances
15/01/23 15:15	15/01/23 17:40	0.1	15	Planned*	No exceedances
09/03/22 15:04	13/03/22 04:31	3.56	1516	Unplanned	No exceedances

While five periods of hot venting at the DLNG facility aligned with exceedances of the particulate matter standards (15 June, 21 June, 23 July, 18 August, and 20 August), hot venting is not associated with significant emissions of particulate matter. Furthermore, as is shown in Figure 4-28, Figure 4-29, Figure 4-30, Figure 4-31, Figure 4-32, Figure 4-33, Figure 4-34 and Figure 4-35, the monitors were not downwind of DLNG at these times. Specifically:

- Winnellie is to the north-northeast of DLNG and would be downwind under south-south-westerly winds; exceedances of the $PM_{2.5}$ and PM_{10} standards only occurred during easterly and south-easterly winds when the monitor would not have been downwind of the facility and would thus have been unaffected by its emissions.
- Stokes Hill is to the north-northwest of DLNG and would be downwind under south-south-easterly winds; winds from this direction contributed up to 50% of the total concentrations measured at Stokes Hill on 15 June, however, the contribution is not considered enough to have caused the exceedances occurring on 15 June (and DLNG was not necessarily the source of the particulates measured).
- Palmerston is to the east-northeast of DLNG and would be downwind under westerly winds; exceedances of the $PM_{2.5}$ standard occurred during easterly winds when the monitor would have been upwind of the facility and unaffected by its emissions.

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It is, therefore, highly unlikely that any of the exceedances of the Air NEPM standards were caused by DLNG operations.

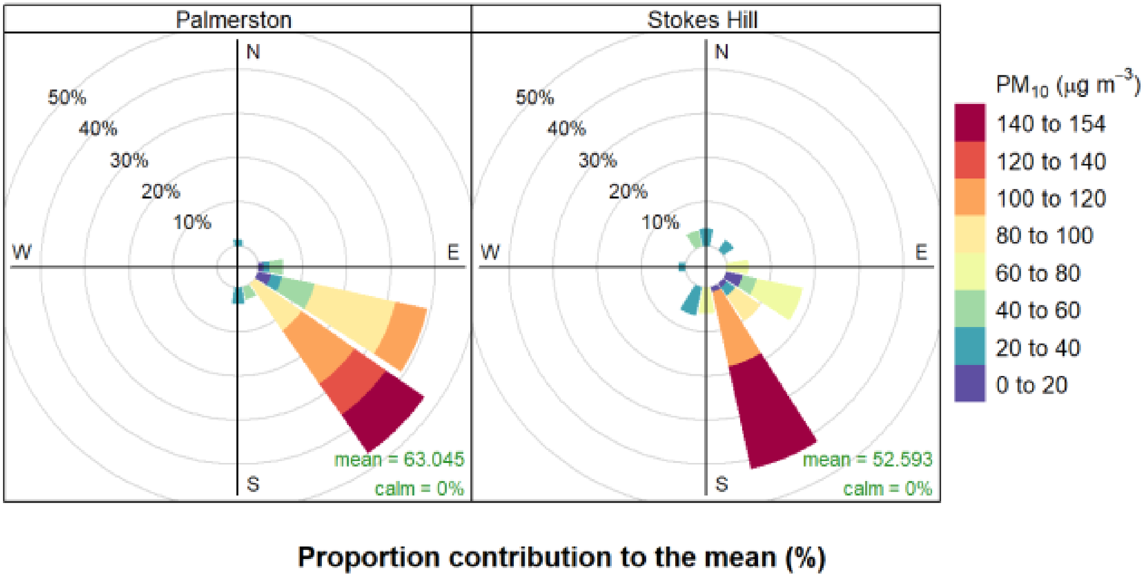

Figure 4-28 Distribution of 1-hour average PM_{10} concentrations measured at Palmerston and Stokes Hill on 15 June 2022 on days with 24-hour average concentrations above the Air NEPM standard and on which hot venting occurred

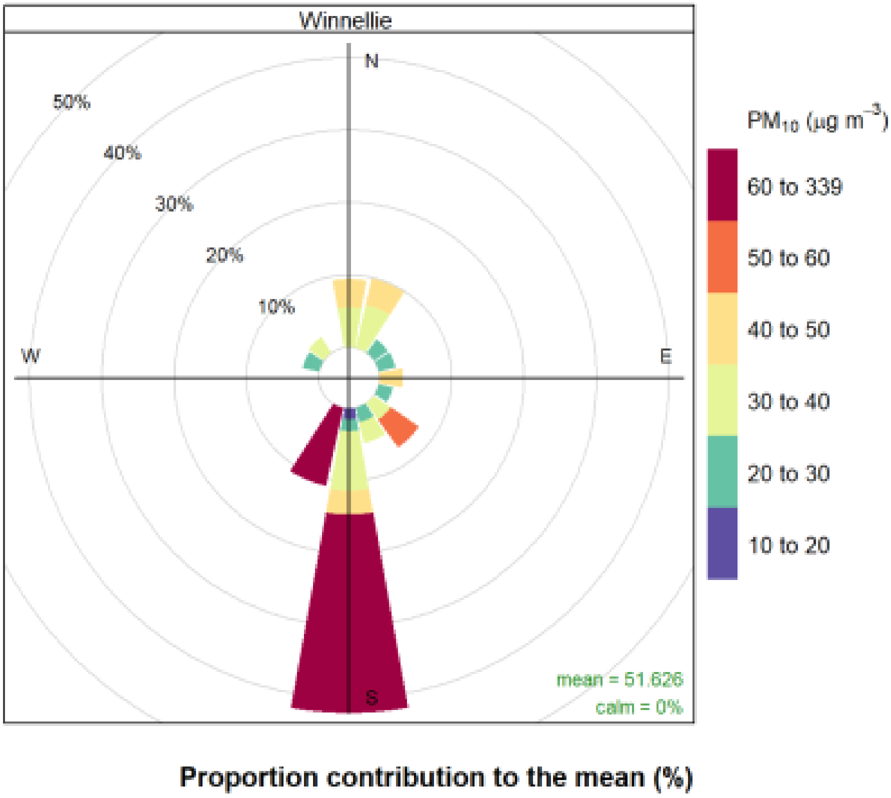

Figure 4-29 Distribution of 1-hour average PM10 concentrations measured on 23 July 2022 where 24-hour average concentrations were above the Air NEPM standard at Winnellie and on which hot venting occurred

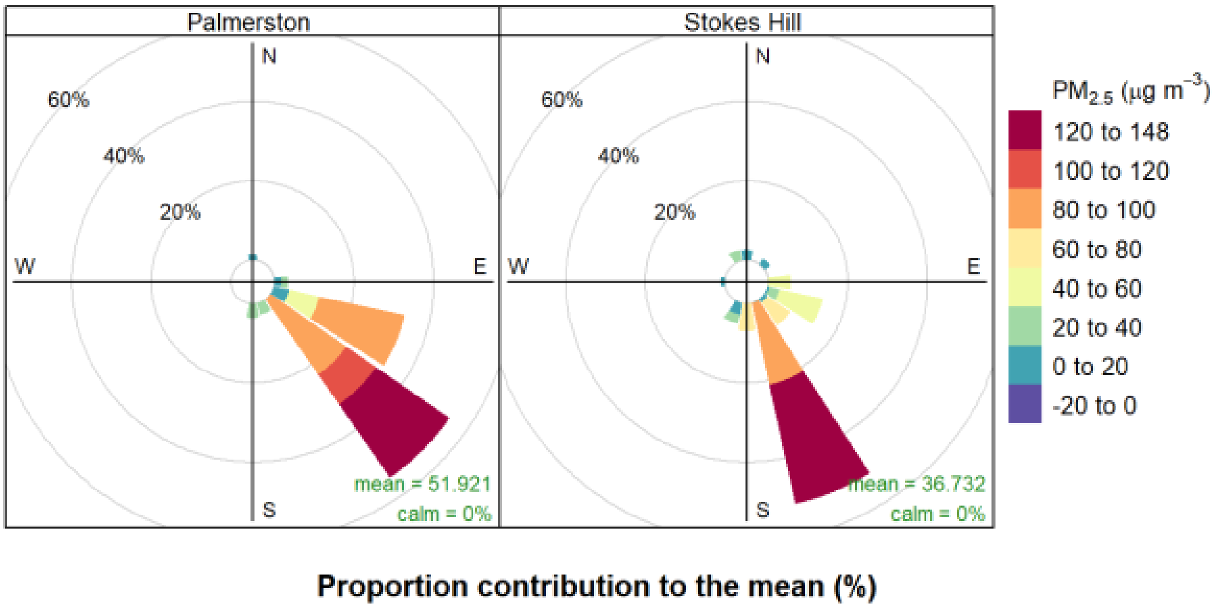

Figure 4-30 Distribution of 1-hour average PM2.5 concentrations measured on 15 June 2022 at Palmerston and Stokes Hill, on days with 24-hour average concentrations greater than Air NEPM standard and on which hot venting occurred

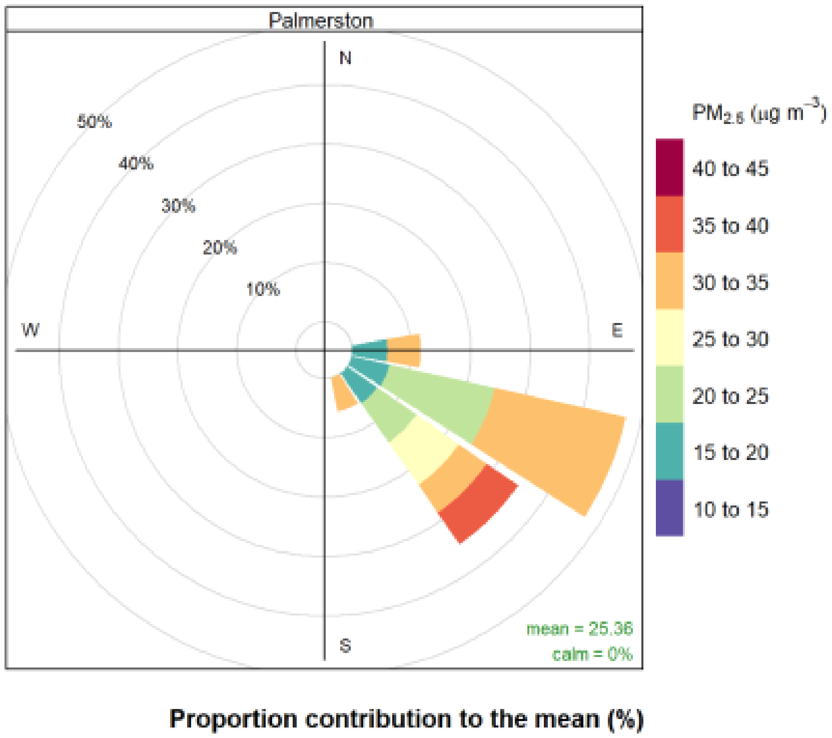

Figure 4-31 Distribution of 1-hour average PM2.5 concentrations measured on 21 June 2022 at Palmerston where 24-hour average concentrations were greater than the Air NEPM standard and on which hot venting occurred

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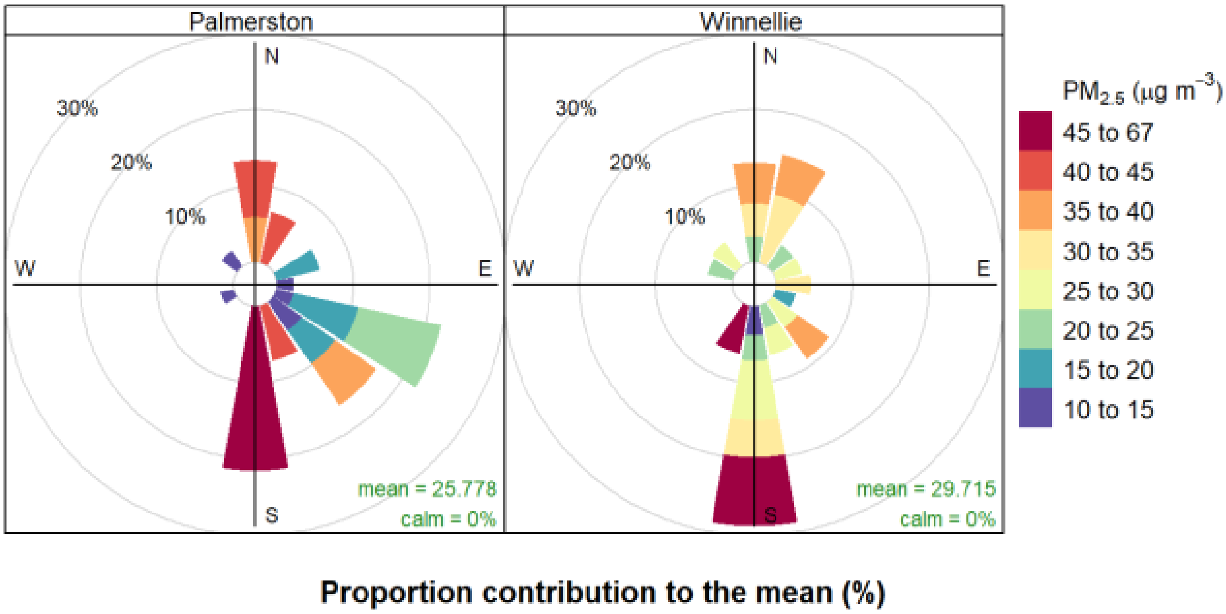

Figure 4-32 Distribution of 1-hour average PM2.5 concentrations measured on 23 July 2022 at Palmerston and Winnellie where 24-hour average concentrations were greater than the Air NEPM standard and on which hot venting occurred

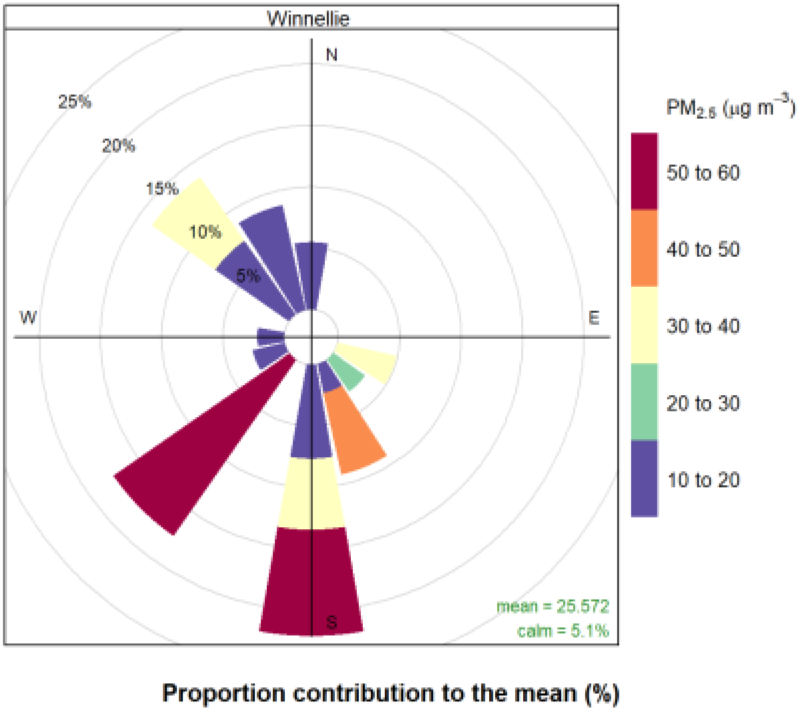

Figure 4-33 Distribution of 1-hour average PM2.5 concentrations measured on 18 August at Winnellie, where 24-hour average conditions were greater than the Air NEPM standard and on which hot venting occurred

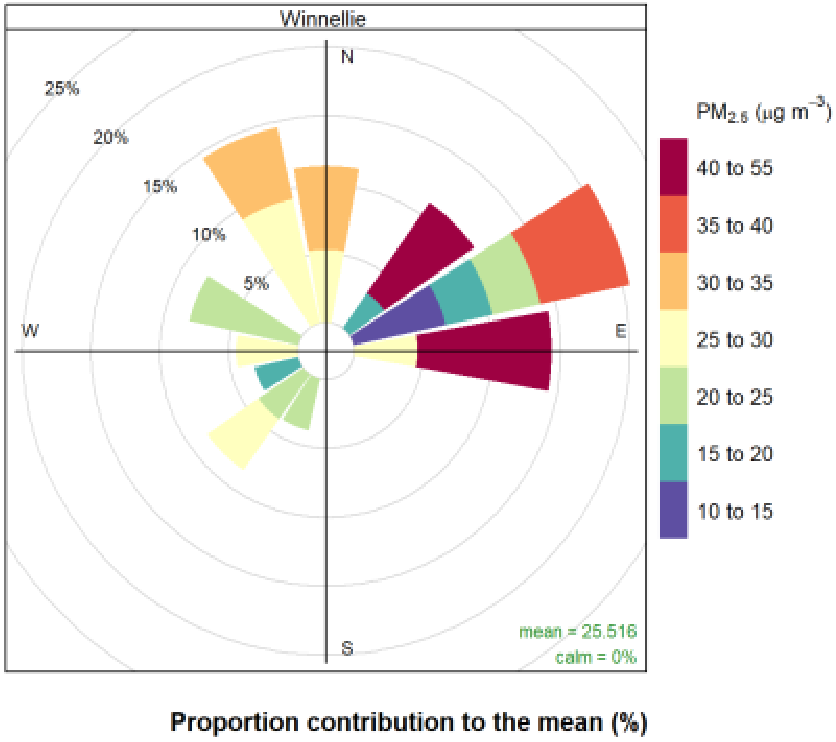

Figure 4-34 Distribution of 1-hour average PM2.5 concentrations measured on 19 August 2022 at Winnellie where 24-hour average concentrations were greater than the Air NEPM standard and on which hot venting occurred

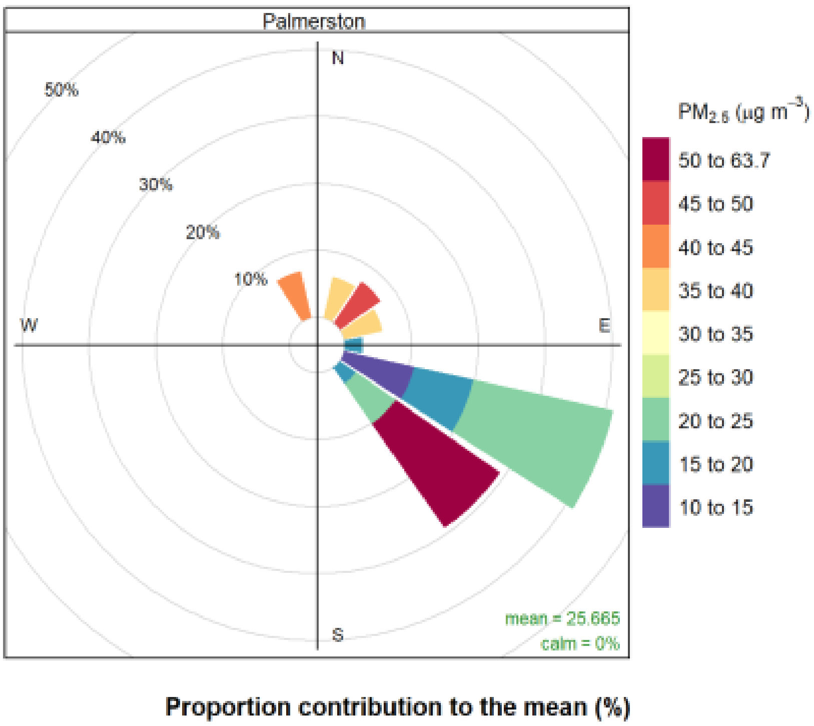

Figure 4-35 Distribution of 1-hour average PM2.5 concentrations measured on 20 August 2022 at Palmerston where 24-hour average concentrations were greater than the Air NEPM standard and on which hot venting occurred

4.3.11 Discussion and interpretation of results

Analysis of the NT EPA ambient air quality monitoring data from Palmerston, Stokes Hill, and Winnellie shows:

- The NT EPA monitoring network achieved a minimum of 86% valid data capture annually for all relevant pollutants.
- Concentrations of NO_2 complied with the relevant Air NEPM standards at all monitoring sites, reaching at most 54% of the standards.
- Concentrations of SO_2 complied with the relevant Air NEPM standards at all monitoring sites, reaching at most 36% of the standards.
- Concentrations of CO complied with the relevant Air NEPM standard at all monitoring sites, reaching at most 17% of the standard.
- Annual average concentrations of PM_{10} complied with the Air NEPM standard of 25 μg/m^3.
- 24-hour average concentrations of PM_{10} exceeded the Air NEPM standard of 50 μg/m^3 on eight occasions at all three sites.
- Annual average concentrations of $PM_{2.5}$ exceeded the Air NEPM standard of 8 μg/m^3at Palmerston and Winnellie but complied at Stokes Hill.
- 24-hour average concentrations of $PM_{2.5}$ exceeded the Air NEPM standard of 25 μg/m^3on 21 occasions at all three sites.
- No exceedances of the Air NEPM standards for PM_{10} and $PM_{2.5}$ were attributed to hot venting periods at DLNG; all exceedances that occurred during hot venting periods occurred at times when the monitors were not downwind of the facility.

5.0 Monitoring discharges to Land and Surrounding Environment

5.1 Groundwater Monitoring Program

Treated wastewater is discharged to the irrigation area at DLNG, which has the potential to permeate into the local groundwater. Santos has developed and implements a groundwater monitoring plan for the DLNG facility. This program is intended to monitor groundwater characteristics in the vicinity of the DLNG facility. The groundwater monitoring plan is a requirement of the Licence and was previously submitted to, and approved by, the NT EPA.

CDM Smith was commissioned by Santos to collect, review, and interpret groundwater quality data in accordance with the groundwater monitoring plan. The results of this analysis were provided in an annual groundwater monitoring report (CDM Smith, 2022f), the results of which are summarised in this section.

5.1.1 Monitoring Objectives

The objective of groundwater monitoring at the DLNG facility is to determine the presence and concentration of potential contaminants from the facility that may be present in the groundwater. Groundwater flows may lead to any contaminants being transported away from the DLNG facility, potentially resulting in downstream impacts to the environment.

Additionally, the groundwater monitoring plan is intended to ensure compliance with the groundwater-related monitoring requirements of the Licence (Conditions 66 to 68).

5.1.2 Monitoring Methods

Groundwater samples were taken by qualified personnel from a network of seven monitoring bores (Figure 5-1). Six monitoring bores are located within the Irrigation Area inside the boundary of the DLNG facility and a control bore is located to the east of the DLNG facility outside the operations footprint. The locations and sampling frequency of the monitoring bores is provided in Table 5-1; the bores are shown in Figure 5-1.

Each bore has geological characteristics that potentially influence the groundwater conditions observed, including proximity to coastal/tidal influences, water retention/flow capacity and strata chemistry. BH6 encountered significantly different strata from the other boreholes. A review of historical maps pre-dating the DLNG facility suggests that BH6 was the only borehole not located on the phyllite headland that underlies most of the infrastructure and was instead positioned over a small former bay/inlet where natural clay and laterite deposits predominated.

Two groundwater monitoring events were undertaken during the reporting period to capture wet and dry seasonality (April 2022 and August 2022). Groundwater analysis was completed for physical parameters, major ions, TPH and dissolved metals listed in the DLNG Groundwater Monitoring Plan. Groundwater standing water levels were also measured in field.

Samples were collected following stabilisation of the field parameters (water level, temperature, pH, conductivity and ORP) and stored in bottles and vials supplied by the laboratory. Duplicates, triplicates, and a field blank were collected at a rate of one per sample event (one per seven) for quality assurance purposes.

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Table 5-1 Groundwater monitoring bore locations

Bore	Location (Decimal Degrees)	Monitoring Frequency
BH1	12.52388 °S 130.8753 °E	Biannually
BH2	12.52099 °S 130.8635 °E	Biannually
BH3	12.52204 LS 130.8637 °E	Biannually
BH4	12.52316 °S 130.8628 °E	Biannually
BH5	12.52424 °S 130.8638 °E	Biannually
BH6	12.52455 °S 130.8641 °E	Biannually
BH7	12.52558 °S 130.8641 °E	Biannually

5.1.3 Assessment Framework

Under the DLNG Groundwater Monitoring Plan, no groundwater specific water quality objectives are nominated or are specified in the Licence. Therefore, to assess environmental risk a tiered assessment framework has been developed and includes the following three steps:

- Step 1 – Irrigation discharge quality assessment: comparison of the irrigation discharge against the EPL 217-03 Table 2 of Appendix B, the modelled ammonium nitrogen trigger value, and the irrigation discharge historical (2009-2019) 80th percentile.
- Step 2 – Groundwater quality trend assessment: evaluate change in groundwater from historical conditions by analysing trends within each bore. This level of assessment includes a comparison of the 2022 groundwater quality against the DHWQO, the modelled ammonium nitrogen trigger value and the groundwater historical (2015-2019) 80th percentile.
- Step 3 – Environmental risk assessment: analyse trends and correlations between each bore and the irrigation discharge. This level of assessment includes statistics and further assessment to confirm potential environmental risk from the irrigation discharge.

A highly conservative trigger value of 9.0 mg/L for ammonium nitrogen in groundwater applied at the groundwater network boundary was developed using a spreadsheet fate and transport model (CDM Smith, 2019). The model uses the Ogata Banks calculation and allows for the determination of the maximum concentration of ammonium nitrogen to meet the DHWQO if discharged to the harbour based on distance and time travelled and the subsequent dispersion and degradation of ammonium nitrogen.

The assessment framework is illustrated in Figure 5-2 and the investigation trigger values for compliance and the assessment of impacts to groundwater are represented in Table 5-2 and Table 5-3.

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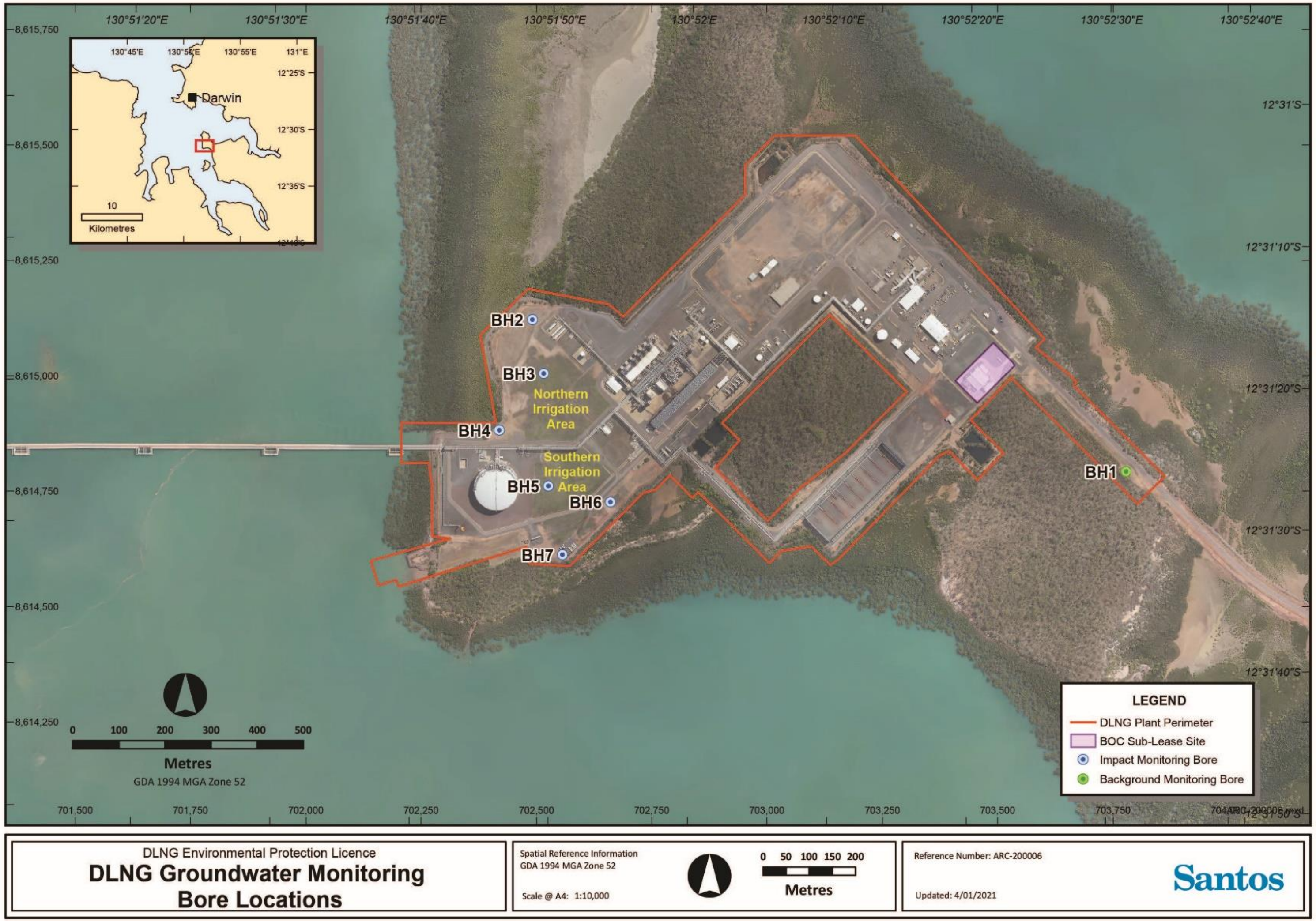

Figure 5-1 Groundwater monitoring program bore locations

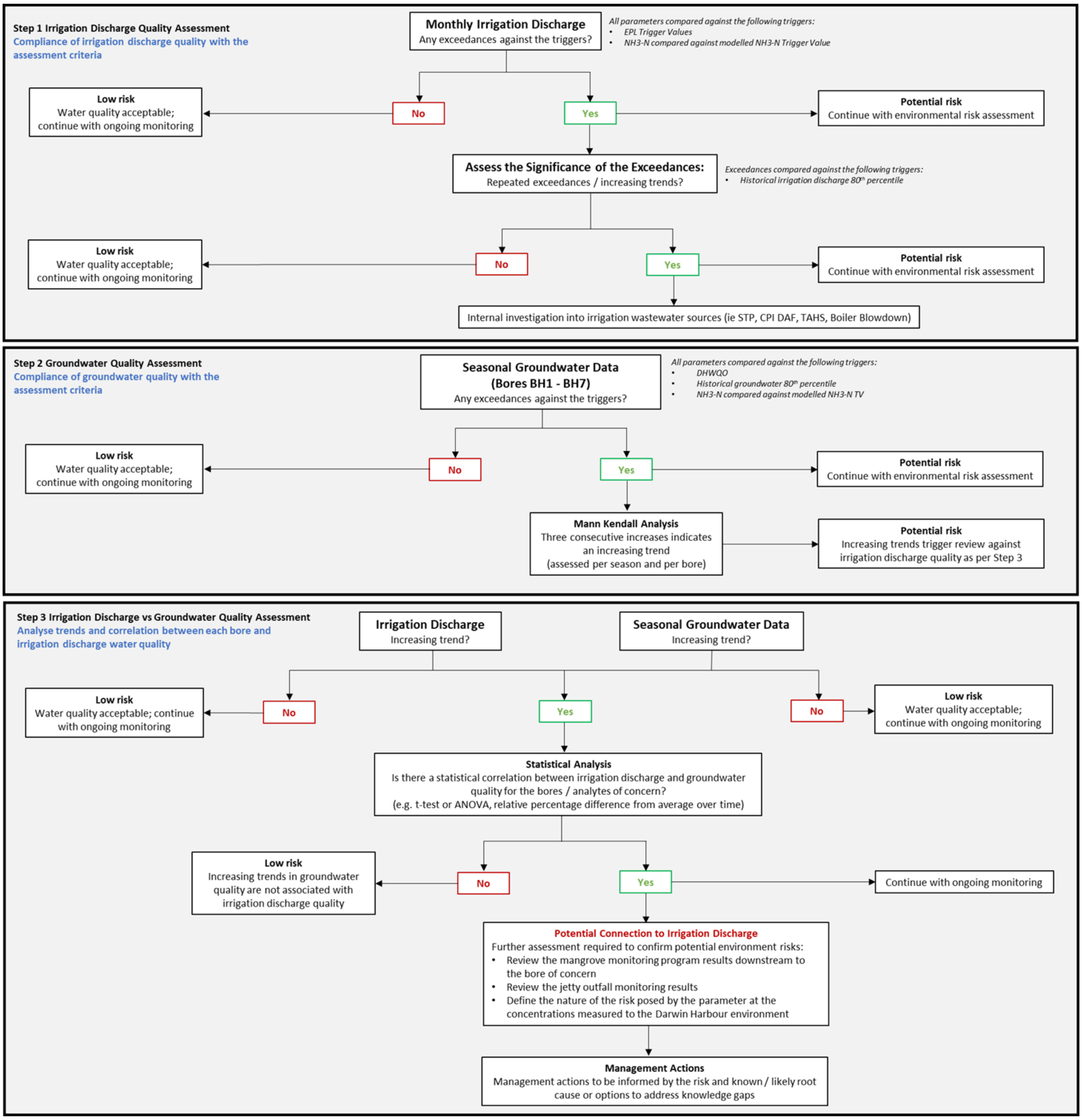

Figure 5-2 Assessment framework of impact to groundwater from irrigation discharge

Table 5-2 Assessment for irrigation discharge

Parameter	Units	EPL 217-03 Irrigation Discharge TV	Modelled TV	Historical 80th Percentile (2009-2019)
pH	pH units	7-8.5[1]	N/A	7.0-7.84
Total Dissolved Solids (TDS)	mg/L	<750[1]	N/A	<182.2
Total Suspended Solids (TSS)	mg/L	≤30[1]	N/A	<14.0
Total Nitrogen (TN)	mg/L	≤40[1]	N/A	<13.40
Total Phosphorus (TP)	mg/L	≤10[1]	N/A	<2.16
Ammonium nitrogen (NH_4-N)	mg/L	<0.02[1]	<9.0	<6.882
Nitrate (NO_3)	mg/L	<0.017[1]	N/A	<2.126
Nitrite (NO_2)	mg/L	<0.017[1]	N/A	<0.163
Dissolved reactive phosphorus (PO_4-P)	mg/L	<0.005[1]	N/A	<1.326
E. coli	MNP/100ml	≤75	N/A	<16.80
Enterococci	MNP/100ml	50	N/A	<41.00
Biological Oxygen Demand	mg/L	25	N/A	<26.00
Arsenic[3]	µg/L	<10[2]	N/A	<1.0
Cadmium[3]	µg/L	<3.2[2]	N/A	<0.1
Chromium[3]	µg/L	<10[2]	N/A	<1.0
Copper[3]	µg/L	<69[2]	N/A	<41.4
Iron[3]	µg/L	1,300[2]	N/A	<268.0
Lead[3]	µg/L	<10[2]	N/A	<1.0
Manganese[3]	µg/L	15,500[2]	N/A	<42.0
Mercury[3]	µg/L	<0.1[2]	N/A	<0.1
Nickel[3]	µg/L	<290[2]	N/A	<2.0
Zinc[3]	µg/L	<1,780[2]	N/A	<25.8
Silver[3]	µg/L	<1.4[2]	N/A	<1.0
BTEX	µg/L	<700[1]	N/A	<3.0
Total Petroleum Hydrocarbons (TPH)	mg/L	<6[1]	N/A	<1

Note 1: Derived from Northern Territory Government (NTG, 2010) Water Quality Objectives for the Darwin Harbour Region – Background Document as well as the Australian and New Zealand Environment Conservation Council (ANZECC/ARMCANZ, 2000) Australian and New Zealand Guidelines for Marine and Freshwater quality guideline document for metals.
Note 2: Interim Trigger Values from EPL 217-03 developed by using the 80th percentile value of the current groundwater reference well (BH1) dataset, which comprises of 16 data points including 11 consecutive data points collected as part of the development of the final site specific trigger values.
Note 3: Represents dissolved fraction.
Note 4: pH assessment based on 20th and 80th percentile

Table 5-3 Assessment for groundwater quality – Darwin harbour water quality objectives and groundwater historical 80th percentile trigger values

Parameters	Units	DHWQO [1]	Modelled Trigger Values	80th percentile 2015-2020 Wet and Dry Season[5]													
				BH1	BH1	BH2	BH2	BH3	BH3	BH4	BH4	BH5	BH5	BH6	BH6	BH7	BH7
pH (Field)	-	7-8.5	N/A	4.13[2] 4.51	4.22[2] 5.14	6.40[2] 6.54	6.30[2] 6.53	4.40[2] 5.76	4.62[2] 5.95	4.31[2] 5.19	4.09[2] 5.50	6.13[2] 6.63	5.71[2] 6.46	5.07[2] 5.31	5.35[2] 5.55	6.01[2] 6.14	6.09[2] 6.27
Dissolved Oxygen (Field)	%	80-100	N/A	63.81	60.85	50.68	33.32	55.96	31.50	50.15	38.38	79.02	60.42	45.10	24.10	52.27	27.37
Total Suspended Solids (TSS)	mg/L	<10	N/A	7,976.0	571.8	7,264	6,300.0	16,540.0	7,342.0	17,184.0	2,632.0	14,048.0	13,740.0	2,644.8	3,796.0	34,280.0	1,660.0
Total Nitrogen	mg/L	<0.27	N/A	2.040	1.020	26.800	30.240	1.140	4.320	2.020	0.620	2.860	2.860	0.780	1.100	5.960	5.840
Ammonia as N (NH_3-N)	mg/L	<0.02	<9	0.640	0.180	27.300	23.640	0.430	0.382	0.034	0.039	0.100	0.100	0.396	0.676	3.420	3.204
Nitrate as N (NO_3)[3]	mg/L	<0.02[3]	N/A	0.638	0.478	0.02	0.022	0.024	0.934	0.03	0.034	1.088	1.672	0.038	0.034	0.050	0.040
Reactive phosphorus (PO_4-P)	mg/L	<0.005	N/A	0.070	0.026	0.070	0.026	0.070	0.026	0.070	0.026	0.070	0.026	0.070	0.026	0.070	0.026
Total Phosphorus (TP)	mg/L	<0.02	N/A	1.348	0.30	0.962	1.674	4.108	2.396	2.038	0.464	0.48	0.972	0.092	0.176	0.81	0.134
E. coli	MNP/100ml	≤200	N/A	2	2	2	2	2	22	2	2	2	2	2	2	2	2
Enterococci	MNP/100ml	≤50	N/A	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Cadmium[4]	mg/L	<0.0055	N/A	0.0033	0.0006	0.0012	0.001	0.0001	0.0002	0.0001	0.0001	0.0002	0.0002	0.0011	0.0004	0.0002	0.0001
Chromium (III)[4]	mg/L	<0.0274	N/A	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Chromium (VI)[4]	mg/L	<0.0044	N/A	0.028	0.01	0.028	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.018	0.010	0.010
Copper[4]	mg/L	<0.0013	N/A	0.077	0.006	0.01	0.013	0.004	0.008	0.005	0.01	0.001	0.001	0.003	0.002	0.001	0.001
Lead[4]	mg/L	<0.0044	N/A	0.011	0.001	0.010	0.010	0.001	0.002	0.001	0.001	0.001	0.002	0.002	0.002	0.001	0.001
Mercury[4]	mg/L	<0.0004	N/A	0.0003	0.0001	0.0003	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Nickel[4]	mg/L	<0.07	N/A	0.289	0.054	0.017	0.027	0.010	0.009	0.003	0.002	0.018	0.035	0.014	0.007	0.01	0.004
Zinc[4]	mg/L	<0.015	N/A	1.684	0.573	0.050	0.426	0.043	0.129	0.069	0.056	0.021	0.131	0.030	0.435	0.016	0.164
Silver[4]	mg/L	<0.0014	N/A	0.010	0.001	0.010	0.010	0.001	0.001	0.001	0.001	0.001	0.046	0.001	0.006	0.001	0.005
Benzene	mg/L	<0.700	N/A	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Note 1: DHWQO Trigger Values for marine and estuarine systems - Mid estuary.
Note 2: 20th percentile applied only for pH.
Note 3: No DHWQO trigger value is determined for Nitrite (NO_3-N), however NO_x (nitrite + nitrate) in the groundwater is mainly composed of nitrate. The trigger value for NO_x was used for NO_3-N.
Note 4: Represents dissolved fraction.
Note 5: Grey shaded cells indicate the wet seasons data from 2015 to 2019. Yellow shaded cells indicate the dry season data from 2015 to 2019.

5.1.4 Monitoring Results and Discussion

The results of the 2022 groundwater monitoring program are discussed in the following sections with the 2016-2022 groundwater quality dataset provided in Attachment D.

Groundwater Level and Flow Direction

The standing water level (SWL) was measured in the field for each bore by recording the depth to groundwater from the top of the PVC casing. Groundwater elevation was then corrected to m AHD using survey data.

Groundwater levels were also monitored using two[1] data loggers:

- August 2021 to August 2022 – monitoring wells BH3 and BH5

Key findings from groundwater level data includes:

- The groundwater elevations are generally lower in 2022 than those measured for 2021. This is likely due to the significantly drier wet season experienced for 2021/22 (10% lower than the 2020/21 season). However, as with previous years; there is a distinct seasonal trend in response to the wet and dry season, with significantly higher groundwater levels during the wet season (Figure 5-3). During the wet season, a groundwater mound forms under the area of irrigation and groundwater flows radially away from these areas eventually discharging to Darwin Harbour. The mound then dissipates during the dry season. The rise and fall of groundwater levels appears to be predominantly influenced by rainfall driven recharge and not irrigation which occurs all year round. The rainfall induced mounding is likely due to the irrigation area having no substantial vegetation on it allowing direct infiltration into the ground during the wet season as opposed to the surrounding areas.
  This is further supported by the groundwater data loggers; the limited variation and delay in water level response suggests limited mixing and tidal effects of groundwater within the irrigation field. This is an important insight and confirms there is minimal tidal flushing effect and that the dominant feature remains seasonal recharge in the wet season and groundwater recession in the dry season. This suggests that wet season period presents a higher risk for flushing of contaminants to the Darwin Harbour noting that there are also increases in dilution potential.
- Hydrograph records for Bore BH3 indicate that the groundwater level may be responding to entry of surface water, particularly during the wet season, and as such may not fully represent groundwater quality. Investigations into groundwater levels and well integrity are ongoing.

[1] Initially three data loggers were set up, but data was unable to be downloaded from one, so it was removed.

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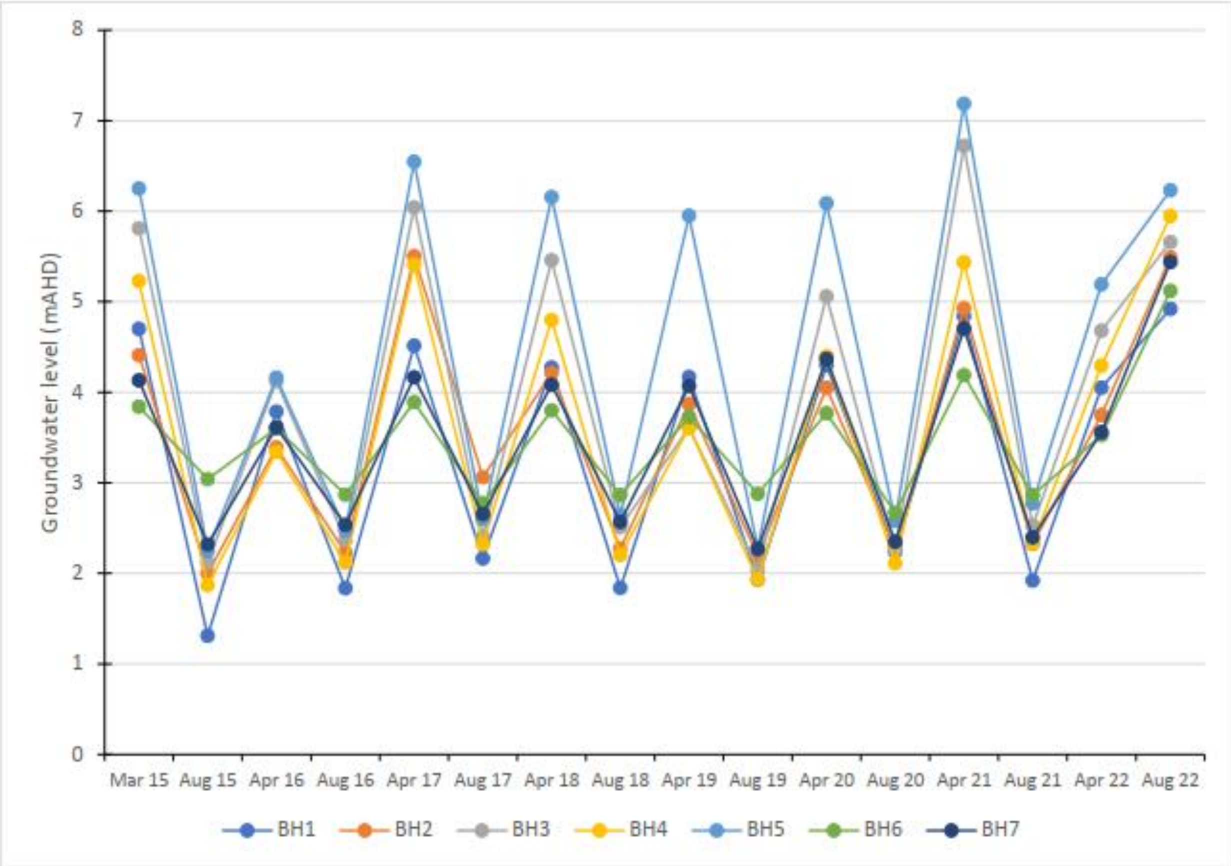

Figure 5-3 Groundwater elevations

Groundwater Quality Field Parameters

In addition to visual and olfactory observations, the following parameters were observed or measured for all bores: electrical conductivity, pH, redox potential, and dissolved oxygen. Key findings from groundwater field parameters include:

- The field parameters during the 2022 monitoring event are generally consistent with the previous records with the following main observations:
- **pH:** pH levels ranged from 3.69 (BH4) to 7.51 (BH7). This is a wider range then what has been observed in previous years. These results are likely to be related with Acid Sulphate Soils (ASS) impact (ERM, 2019) resulting in an overall increase in metal concentrations in these bores. The source of these changes remains unknown but are not considered to be related with the DLNG operations including the irrigation discharge.
- **Electrical Conductivity (EC):** A decreasing trend was observed for all wells during the wet and dry season. The variations in EC observed in the 2016-2022 groundwater dataset appear to be linked to the geochemistry, transmissivity, and relative location of each well to the perimeter of site and therefore saline influences. Wells located either within or near to the Irrigation Area demonstrate lower electrical conductivity levels.
- **Oxidation Reduction Potential (ORP)**: Oxidation reduction potential (ORP) ranges from -61.5 mV (BH7) to 390.2 mV (BH4) during the 2022 groundwater monitoring events. ORP at wells BH2 and BH7 tend to be predominantly negative and share the same trend over time, with the exception of BH7. All other wells tend to have a positive ORP.

- **Dissolved Oxygen (DO):** DO in groundwater ranges from 12.0 % (BH7) to 110.2 % (BH5) during the 2022 groundwater monitoring events, indicating varying aerobic conditions across the site. DO concentrations in all monitoring wells measured during the 2022 dry seasons show an upward trend from the dry season in 2010 and a downward trend overall when compared against the readings taken in August 2015. It should be noted that DO samples were unable to be recorded in the wet season in 2022.

Graphs illustrating the historical field water quality measurements for all in-situ parameters are provided in Figure 5-4.

Visual and olfactory observations were recorded during the purging and groundwater sampling program. Apart from BH2 and BH3, no odours or sheens were recorded. A sulphur odour commonly associated with estuarine and marine anoxic saturated zones was noted in the purged groundwater from BH2 and BH3. The waster in BH3 also appeared an orange/brown colour. These observations are consistent with previous monitoring events, noting that BH1 and BH7 have in the past also reported a sulphur smell, but were reported as odourless in 2022.

The results of field water quality measurements for the 2022 monitoring program were compared against the DHWQO TV (Table 5-4) and the groundwater historical 80th percentile (Table 5-5). When compared against the assessment framework, pH and dissolved oxygen conditions of groundwater exceeded the DHWQO TV and all parameters exceeded the groundwater historical 80th percentile at various bores.

Figure 5-4 Field groundwater parameter trends

Table 5-4 Field groundwater parameter

Monitoring Bore	Date	EC (µS/cm)	pH	Redox Potential (mV)	Temperature	DO (% Saturation)
DHWQO		**NA**	**7-8.5**	**NA**	**NA**	**80-100 %**
BH1	27/04/2022	20,100	5.16	88.6	35.7	-
	09/08/2022	35,700	4.24	307.3	32.63	63.9
BH2	26/04/2022	58,600	5.69	53.3	37.2	-
	09/08/2022	42,100	6.14	-50.4	30.4	76.4
BH3	26/04/2022	137	5.67	59.9	35.1	-
	09/08/2022	159	6.3	-49.1	32.1	52
BH4	26/04/2022	321	3.69	181	37.6	-
	09/08/2022	346	3.91	390	32.5	73.9
BH5	27/04/2022	1,600	5.73	50.1	32.4	-
	09/08/2022	1,260	5.73	213	31	110.2
BH6	27/04/2022	19,100	5.84	52.9	36.5	-
	09/08/2022	2,300	5.14	121	33.4	29.8
BH7	27/04/2022	1,000	7.51	-26.5	38	-
	09/08/2022	1,750	6.1	-61.5	33	12

Table 5-5 Water quality measurements wet and dry seasons 2015-2022 compared against groundwater historical 80th Percentiles

Wet Seasons 2015-2021										
Parameters	EC 80th percentile	EC	pH 20th percentile	pH Unit	pH 80th percentile	pH Unit	ORP 80th percentile	ORP	DO 80th percentile	Oxygen
	2015-2021	2022	2015-2021	2022	2015-2021	2022	2015-2021	2022	2015-2021	2022
Unit	(µS/cm)		pH Unit		pH Unit		mV		% Saturation	
BH1	14,000	20,100	4.272	5.16	5.11	5.16	264.7	88.6	N/A	N/A
BH2	70,000	58,600	6.342	5.69	6.53	5.69	-41.4	53.5	N/A	N/A
BH3	230	137	4.902	5.67	5.88	5.67	107	59.9	N/A	N/A
BH4	480	321	3.966	3.69	5.45	3.69	294.6	181	N/A	N/A
BH5	2,000	1,600	5.248	5.73	6.43	5.73	108.8	50.1	N/A	N/A
BH6	3,700	19,100	5.368	5.84	5.53	5.84	82.4	52.9	N/A	N/A
BH7	2,900	1,000	6.14	7.51	6.25	7.51	-64.4	-26.5	N/A	N/A
Dry Seasons 2015-2021										
Parameters	EC 80th percentile	EC	pH 20th percentile	pH Unit	pH 80th percentile	pH Unit	ORP 80th percentile	ORP	DO 80th percentile	Oxygen
	2015-2021	2022	2015-2021	2022	2015-2021	2022	2015-2021	2022	2015-2021	2022
Unit	(µS/cm)		pH Unit		pH Unit		mV		% Saturation	
BH1	35,700	88,080	3.92	4.24	4.34	4.24	138.8	307.3	62.8	63.9
BH2	42,100	73,060	6.3	6.14	6.5	6.14	0	-50.4	50.6	76.4
BH3	159	324.2	4.49	6.3	6	6.3	159	-49.1	54.1	52
BH4	346	494.4	3.98	3.91	4.9	3.91	333	390	39.9	73.9
BH5	1,260	1,992	5.55	5.73	6.55	5.73	164.2	213	77.2	110.2
BH6	2,300	10,468	5.01	5.14	5.26	5.14	164	121	43.1	29.8

BH7	1,750	10,612		5.912	6.1		6.15	6.1		9.3	-61.5		45.8	12

Groundwater Quality Laboratory Results

The analytical results for the 2022 biannual groundwater monitoring are presented below in line with the assessment framework outlined in Section 5.1.3.

Step 1: Irrigation Discharge Quality Assessment

Key findings from a review of the irrigation discharge water quality against the assessment framework include:

Irrigation discharge exceeded the assessment criteria for September 2021 to August 2022 (Licence trigger value for irrigation discharge, modelled trigger value and irrigation discharge historical 80th percentiles) for the following analytes and the results are summarised in Table 5-6 and Table 5-7:

- Electrical Conductivity exceeded the 80th percentile twice during the monitoring period but did not exceed the EPL limit.
- Total Suspended Solids exceeded the EPL licence limit three times and the 80th percentile five times during the monitoring period.
- Ammonia exceeded the EPL licence limit nine times but did not exceed the 80th percentile during the monitoring period.
- pH exceeded EPL Licence limit three times but did not exceed the 80th percentile during the monitoring period.
- Nitrate exceeded the EPL licence limit five times and the 80th percentile three times during the monitoring period.
- Reactive Phosphorous exceeded the EPL licence limit six times and the 80th percentile six times during the monitoring period.
- Phosphorous total did not exceed the EPL Licence limit or the 80th percentile during the monitoring period. BOD exceeded the EPL licence limit three times and the 80th percentile three times during the monitoring period.
- Copper exceeded the EPL Licence limit and the 80th percentile twice during the monitoring period.
- Enterococci did not exceed the EPL Licence limit or the 80th percentile in 2022.
- Nitrite exceeded the EPL licence limit four times and the 80th percentile once during the monitoring period.
- Turbidity did not exceed the EPL licence limit but did exceed the 80th percentile once during the monitoring period.
- Xylene did not exceed the EPL licence limit or the 80th percentile in 2022.

Irrigation discharge water quality is discussed in further detail in Section 3.1.3.

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Table 5-6 Step 1: Summary of irrigation discharge exceedances against the assessment criteria from September 2021 – August 2022

Date Sampled / Analyte	Electrical Conductivity	Total Suspended Solids	Ammonia as N	pH	Nitrate (as N)	Reactive Phosphorus as P	Phosphorus total (P2O5)	BOD	Copper	Enterococci	Nitrite (as N)	Turbidity	Xylene Total
Units	uS/cm	mg/L	mg/L	Units	mg/L	mg/L	mg/L	mg/L	mg/L	CFU/100mL	µg/L	NTU	µg/L
EPL 217-02		30	0.02	7 - 8.5	0.017	0.005	**10**	25	0.069	50	0.017		700
Modelled TV			**9**										
80th percentile	272.8	14	6.24	7.8	2.402	2.34	**1.742**	24.8	0.04	41		15.98	1.5
Dry Season													
1/09/2021	289	11	-	6.78	-	-	-	15	0.018	-	-	17.70	<1.5
22/09/2021	-	31	-	6.77	-	-	-	42	-	-	-	-	<1.5
6/10/2021	261	32	0.375	6.79	0.001	0.004	0.38	15	0.004	-	0.003	35.60	<1.5
27/10/2021	-	-	-	-	-	-	-	-	-	<10	-	-	<1.5
Wet Season													
10/11/2021	859	32	-	7.32	-	-	-	1.0	0.160	-	-	27.20	<1.5
1/12/2021	197	19	1.84	7.34	0.07	0.533	0.69	96.0	0.075	-	0.034	11.00	<1.5
5/01/2022	166	20	0.460	7.01	0.001	0.005	0.39	46	0.037	-	0.001	19.80	2.3
1/02/2022	175	13	1.790	7.18	0.007	0.006	0.70	8.9	0.018	<10	0.001	11.40	<1.5
8/03/2022	125	6	1.710	7.12	0.133	0.005	0.35	3.0	0.012	-	0.222	5.50	<1.5
6/04/2022	157	14	1.800	7.04	0.001	0.007	0.55	10.0	0.016	-	0.002	0.48	<1.5
4/05/2022	146	8	0.351	7.00	0.001	0.097	-	3.4	0.011	-	0.001	11.50	<1.5
1/06/2022	197	6	0.679	7.31	5.160	0.358	-	-	0.015	-	0.656	7.53	<1.5
12/07/2022	246	0	2.050	7.26	3.230	0.769	-	2.3	0.020	-	0.197	3.24	<1.5
3/08/2022	214	1	-	7.40	-	-	-	6.3	0.026	-	-	0.89	<1.5

Notes
Grey text denotes value less than LOR
Blue cells denote concentrations exceeds the EPL 217-02 TV
Red text denotes values exceeds the historical 80th percentile of groundwater based on data since 2015 to 2021

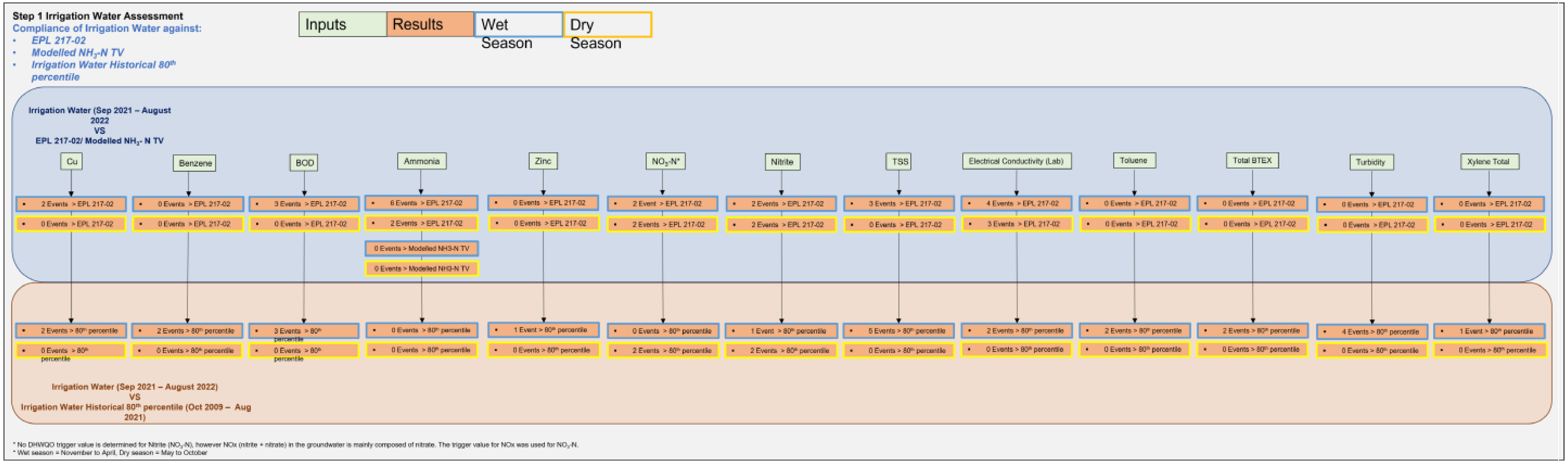

Table 5-7 Summary of Step 1 results: Irrigation discharge water quality compared against the assessment criteria

Step 2: Groundwater Quality Trend

All groundwater parameters for samples collected during the 2022 GMEs (the period of record) have been compared against the groundwater assessment criteria (i.e., the DHWQO, modelled ammonia TV and the seasonal historical 80th percentile of each monitoring well). A total of 40 parameters failed the assessment criteria over the period of record including 13 parameters which exceed the DHWQOs, one well (BH2) which exceeds the modelled ammonia TV and 38 parameters which exceed the historical 80th percentile (2015 – 2021) during the 2022 GMEs.

Table 5-9 summarises where exceedances have been recorded against the DHWQO, modelled ammonia TV and/or the historical 80th percentiles. Note, parameters which do not exceed a TV or 80th percentile have been excluded. An illustration of the Step 2 risk assessment process is provided in Figure 5-5; for ease of interpretation, only those parameters which exceed both the DHWQO, and modelled TV/80th percentile have been included in this figure.

Field parameters

Upon sampling of each monitoring well at the DLNG site, field parameters including electrical conductivity (EC), pH, oxidation reduction potential (ORP) and dissolved oxygen (DO) have been measured as a preliminary step to laboratory analysis. When compared against the groundwater assessment criteria the following can be concluded:

- pH (field) exceeds the DHWQOs in the majority of wells for both wet and dry seasons (with the exception of BH7 in the wet season).
- Dissolved oxygen exceeds the DHWQOs in BH4 and BH5 of the 2022 dry season only.
- Electrical Conductivity (Lab) (BH1 wet, BH6, wet), pH Lab (BH3 wet, BH4 dry, BH6 dry, BH7 dry), dissolved oxygen (BH2 wet, BH3 wet, BH4 wet, BH5 wet/dry, BH6 dry, BH7 dry), dissolved oxygen % saturation (BH1 dry, BH2 dry, BH3 dry, BH4 dry, BH5 dry), field redox (BH1 dry, BH2 wet, BH4 dry, BH5 dry) and redox potential (BH2 wet, BH7 wet) exceed the historical 80th percentile.

The variations in EC observed throughout the groundwater monitoring network appear to be linked to the geochemistry, transmissivity, and relative location of each well to the perimeter of site and therefore saline influences. Wells located either within or near to the Irrigation Area demonstrate lower electrical conductivity levels than those located within closer proximity to the harbour.

Microbiology

Elevated levels of Enterococci were detected within BH2, BH3 and BH5 during the 2022 GMEs and triggered exceedance of the historic 80th percentile as well as the DHWQO (≤200 E. coli / 100 mL and ≤50 Enterococci / 100 mL). Further exceedances of Enterococci were recorded within BH1 and BH7 during both the wet and dry seasons when compared to the 80th percentile.

The sample round conducted on 26th and 27th of April 2022 returned concentrations of Enterococci and E. coli measuring 594 and <10 MPN/100mL in BH2, 14,136 and <10 MPN/100mL in BH3 and 800 and <10 MPN/100mL in BH5 respectively.

Nutrients

The following nutrients failed the assessment criteria during the 2022 GMEs:

- Ammonia (BH1 wet/dry, BH2 wet/dry, BH3 wet/dry, BH4 dry, BH6 wet/dry, BH7 wet/dry), calcium (BH1 wet, BH5 wet, BH6 wet, BH7 wet), nitrate (BH1 wet/dry, BH3 dry, BH4 wet/dry, BH5 wet/dry), nitrate + nitrite (BH1 wet/dry, BH4 wet, BH5 wet/dry), total nitrogen (BH1 dry, BH2 wet/dry, BH3 wet/dry, BH5 wet/dry, BH6 wet/dry, BH7 wet/dry), total phosphorus (BH1 dry, BH2 wet, BH3 wet, BH5 wet/dry, BH6 dry, BH7 dry) when compared against the DHWQO.
- Ammonia (BH2 dry, BH3 wet/dry, BH4 dry, BH6 wet, BH7 wet), calcium (BH1 wet, BH6 wet), nitrate (BH4 wet/dry), nitrite (BH3 dry, BH4 dry), nitrate + nitrite (BH4 wet), magnesium (BH1 wet, BH3 wet, BH6 wet), total Kjeldahl nitrogen (BH2 dry), and total nitrogen (BH2 dry, BH7 wet) when compared against the historical 80th percentile.
- Ammonia (BH2 wet/dry) when compared against the modelled ammonia TV.

Note, the LOR for Total Nitrogen for BH1 has been raised as a result of matrix interference during the April 2022 GME, and therefore, cannot be assessed against the DHWQO.

Petroleum Hydrocarbons

TRH, Total Petroleum Hydrocarbons (TPH), Benzene, Toluene, Ethylene, Xylene and Naphthalene (BTEXN) register below the LOR during the 2022 GMEs which is consistent with historical data.

Metals

The following metals failed the assessment criteria during the 2022 GMEs:

- Copper (BH1 wet/dry, BH4 wet/dry, BH5 wet/dry, BH6 wet), chromium (III+VI) (BH5 dry), nickel (BH1 wet/dry, BH5 dry) and zinc (BH1 wet/dry, BH3 dry, BH4 wet/dry, BH5 wet/dry, BH6 wet/dry) when compared against the DHWQO.
- Aluminium (BH1 wet, BH4 wet/dry), arsenic (BH2 wet/dry, BH3 wet, BH6 wet), cadmium (BH1 wet, BH6 wet), copper (BH1 wet, BH4 dry, BH5 wet, BH6 wet), chromium (III+VI) (BH1 wet, BH5 dry), iron (BH2 wet/dry, BH3 wet/dry), lead (BH4 dry), manganese (BH2 dry, BH3 wet/dry, BH5 dry), nickel (BH1 wet, BH4 wet/dry, BH5 wet/dry,BH6 wet) and zinc (BH4 wet, BH6 wet) when compared against the historical 80th percentile.

Due to high levels of TDS in the BH1, BH2, BH5 and BH6 monitoring wells, the LOR of some heavy metals, namely, trivalent, and hexavalent chromium have been raised by the laboratory following the April 2021 GME and ultra-trace methods have been used for all other metals. No metal LORs have been raised as a result of matrix interference during the 2022 GMEs.

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Table 5-8 2022 Tier Assessment Summary for Groundwater Parameters with an Increasing [1] Trend

Season	Parameter (Mg/L)	Location	Min	Max	Mann Kendal Trend	General Trend [2]	DHWQO	80th Percentile
Wet Season	Aluminium	BH4	0.03	1.57	Increasing	Variable	-	-
	Arsenic	BH3	0.001	0.037	Increasing	4 Increasing	No Criteria	Above Criteria
	Calcium	BH6	85.72	48097.3	No Trend	4 Increasing	No Criteria	Above Criteria
	Dissolved Oxygen (field)	BH7	0.99	2.34	Increasing	4 Increasing	-	-
	Electrical Conductivity (field)	BH3	109.61	3767.3	No Trend	4 Increasing	No Criteria	Below Criteria
	Iron	BH3	0.08	7.81	No Trend	4 Increasing	No Criteria	Above Criteria
	Nickel	BH4	0.001	0.019	Increasing	4 Increasing	Below Criteria	Above Criteria
		BH5	0.01	0.254	Increasing	Variable	-	-
	pH (field)	BH1	4.17	5.25	No Trend	4 Increasing	No Criteria	Above Criteria
	Temperature (field)	BH2	30.8	37.2	No Trend	4 Increasing	No Criteria	Above Criteria
	Total Dissolved Solids (field	BH3	71.5	126.7	No Trend	4 Increasing	No Criteria	Above Criteria
	Zinc	BH4	0.005	0.22	No Trend	4 Increasing	Above Criteria	Above Criteria
		BH6	0.001	2.1	No Trend	4 Increasing	Above Criteria	Above Criteria
Dry Season	Alkalinity (Bicarbonate as $CaCO_3$)	BH3	11	54	Increasing	Variable	No Criteria	Above Criteria
	Alkalinity (total) as $CaCO_3$	BH3	11	54	Increasing	Variable	No Criteria	Above Criteria
	Aluminium	BH2	0.006	2.24	No Trend	4 Increasing	No Criteria	Above Criteria
		BH4	0.06	1.6	Increasing	Variable	No Criteria	Above Criteria
	Ammonia as N	BH4	0.01	0.09	No Trend	4 Increasing	Above Criteria	Above Criteria
	Arsenic	BH2	0.01	0.11	No Trend	4 Increasing	No Criteria	Above Criteria
		BH5	0.0007	0.007	No Trend	4 Increasing	No Criteria	Above Criteria
	Chromium (III+VI)	BH5	0.0003	0.041	No Trend	4 Increasing	Above Criteria	Above Criteria
	Copper	BH5	0.001	0.034	Increasing	Variable	Above Criteria	Above Criteria
	Dissolved Oxygen	BH5	7.1	9.2	No Trend	4 Increasing	No Criteria	Above Criteria
	Iron	BH2	0.1	105	No Trend	4 Increasing	No Criteria	Above Criteria
		BH6	3.4	14	No Trend	4 Increasing	No Criteria	Below Criteria
	Manganese	BH3	0.05	0.385	Increasing	4 Increasing	No Criteria	Above Criteria
		BH5	1.68	11.3	No Trend	4 Increasing	No Criteria	Above Criteria
		BH6	7.2	7.2	No Trend	4 Increasing	No Criteria	Below Criteria
	Nickel	BH4	0.002	0.015	Increasing	Variable	Below Criteria	Above Criteria
		BH5	0.001	0.169	Increasing	4 Increasing	Above Criteria	Above Criteria
	pH (field)	BH3	4.06	6.33	Increasing	Variable	No Criteria	Above Criteria

	pH (Lab)	BH3	4.23	6.59	Increasing	Variable	Below Range	Above Range
	Temperature (field)	BH1	29.8	32.63	No Trend	4 Increasing	No Criteria	Above Criteria
		BH2	28.9	31.9	Increasing	Variable	No Criteria	Below Criteria

Notes:

1. Decreasing and increasing trend for pH
2. Variable trend denotes not four consecutive increasing results

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Table 5-9 Step 2 – Summary of Groundwater Exceedances from the April and August 2022 GMEs

Sample ID	Sampled Date	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (total) as CaCO3	Aluminium (filtered)	Ammonia as N	Anions Total	Arsenic (filtered)	BOD	Cadmium (filtered)	Calcium (filtered)	Cations Total	Chloride	Chromium (III+VI) (filtered)	Copper (filtered)	Dissolved Oxygen	Dissolved Oxygen % Saturation (Field)	Enterococci	Electrical Conductivity (Lab)	Field Redox	Fluoride	Ionic Balance	Iron (filtered)	Kjeldahl Nitrogen Total	Lead (filtered)	Magnesium (filtered)	Manganese (filtered)	Nickel (filtered)	Nitrate (as N)	Nitrite (as N)	Nitrite + Nitrate as N	Nitrogen (Total)	pH (Lab)	pH (field)	Phosphorous	Potassium (filtered)	Redox Potential (field)	Sodium (filtered)	Sulfate SO4 – Turbidimetric	Total Dissolved Solids	Total Suspended Solids	Zinc (filtered)
Units		mg/L	mg/L	mg/L	mg/L	meq/L	mg/L	mg/L	mg/L	mg/L	meq/L	mg/L	mg/L	mg/L	mg/L	%Sat	CFU/100ml	uS/cm	mV	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	-	-	mg/L	mg/L	mV	mg/L	mg/L	mg/L	mg/L	mg/L
DHWQO					0.02					0.0055			0.0044	0.0013			50							0.0044			0.07	0.02	0.02	0.02	0.27	7-8.5		0.02						10	0.015
Modelled TV					9																																				
Wet Season																																									
BH1	27/04/22	8	8	0.52	0.07	204	0.001	<2	0.0007	211	174	6,600	0.002	0.032	5.6	-	30	20,100	88.6	0.1	7.9	0.75	<0.5#1	0.001	447	3.93	0.074	0.03	<0.01	0.03	<0.5#1	5.60	5.16	<0.5#1	57	88.6	2,890	868	12,500	131	0.358
80th Percentile		10	10	0.386	0.13	174	0.002	N/A	0.0006	170	223	4800	0.001	0.008	6.7	-	2	14000	264.7	0.5	9.74	1.1	0.68	0.001	400	5.57	0.06	0.44	0.01	0.36	1	5.7	5.11	0.41	60	264.7	3,000	733	21,629.4	735	0.386
BH2	26/04/22	569	569	<0.10#1	11.4	668	0.170	<2	<0.0010#1	760	633	21,600	<0.010#1	<0.010#1	7.3	-	594	58,600	53.3	0.4	2.64	63	12.8	<0.01#1	1,310	34.3	0.017	<0.01	<0.01	<0.01	12.8	6.78	5.69	0.12	357	53.3	11,000	2,260	43,100	370	<0.050#1
80th Percentile		645	645	3.316	19.8	765	0.12	N/A	0.001	844	871	25000	0.01	0.025	4.6	-	2	70,000	-41.4	0.6	4.962	45.7	21.3	0.01	1,890	95	0.025	0.03	0.02	0.05	21.3	7.19	6.53	1.5	477	-41.4	15,200	3,280	48,843	3,760	0.058
BH3	26/04/22	42	42	0.04	0.60	1.39	0.037	<2	<0.001	11	1.56	18	<0.001	<0.001	8.3	-	14,136	137	59.9	<0.1	-	7.81	2.3	<0.001	6	0.253	0.004	0.01	<0.01	0.01	2.3	6.57	5.67	0.54	5	59.9	9	2	287	746	<0.005
80th Percentile		28	28	0.282	0.38	1.57	0.006	N/A	0.0002	20	1.5	52	0.001	0.008	5.9	-	20	230	107	0.2	70.718	0.79	3.68	0.001	4	0.17	0.008	0.38	0.02	0.236	4	6.4	5.88	1.76	5	107	40	12	119.24	6,940	0.034
BH4	26/04/22	2	2	1.08	<0.01	2.98	0.001	<2	<0.001	5	2.72	85	<0.001	0.004	9	-	<10	321	181	0.2	-	0.25	<0.1	0.001	8	0.183	0.019	0.08	<0.01	0.08	<0.1	5.10	3.69	0.02	3	181	40	26	203	96	0.030
80th Percentile		20	20	0.81	0.021	2.94	0.008	N/A	0.0001	20	3.08	130	0.001	0.007	6.7	-	2	480	294.6	0.1	4.098	0.76	0.44	0.001	10	0.27	0.002	0.03	0.01	0.05	0.6	5.7	5.45	0.37	4	294.6	56	31	289.9	1,850	0.018
BH5	27/04/22	13	13	0.05	<0.01	15.7	<0.001	<2	0.0001	25	13.9	489	<0.001	0.005	6.4	-	880	1,600	50.1	0.2	6.16	<0.05	0.3	<0.001	24	6.08	0.066	0.4	<0.01	0.4	0.7	6.17	5.73	0.13	5	50.1	242	79	1,060	1,590	0.071
80th Percentile		99	99	0.14	0.08	16.8	0.002	N/A	0.0002	110	14.1	532	0.001	0.001	5.2	-	2	2,000	108.8	0.4	14.796	0.23	0.86	0.001	43	7.43	0.045	2.3	0.01	2.376	3.1	6.78	6.43	0.61	6	108.8	380	74	1,152.9	13,600	0.083
BH6	27/04/22	10	10	0.05	0.2	196	0.006	<2	0.0006	237	1283	6,290	<0.001	0.011	4.1	-	<10	19,100	52.9	<0.1	3.49	3.61	0.2	0.002	518	2.69	0.015	<0.01	<0.01	<0.01	0.2	5.78	5.84	<0.02#1	47	52.9	2,920	877	13,600	69	0.028
80th Percentile		33	33	0.074	0.074	10.7	0.002	N/A	0.0002	49	10.2	1200	0.001	0.002	5.4	-	2	3,700	82.4	0.5	3.45	14.9	0.76	0001	120	7.5	0.006	0.02	0.01	0.038	1.1	6.1	5.53	6.1	21	82.4	890	146	1,150.6	3,100	0.019
BH7	27/04/22	53	53	<0.01	1.12	10.3	<0.001	<2	<0.0001	13	9.80	220	<0.001	<0.001	3.4	-	10	1,000	-26.5	0.3	2.74	14.8	2.0	<0.001	22	20.7	0.004	<0.01	<0.01	<0.01	2.0	6.45	7.51	0.01	12	-26.5	126	148	636	161	<0.005
80th Percentile		87	87	0.018	0.018	14.6	0.001	N/A	0.0001	24	13	770	0.001	0.001	5.1	-	2	2,900	-64.4	0.3	6.162	65.9	3.31	0.001	66	58	0.004	0.04	0.02	0.042	0.042	6.58	6.25	6.58	22	-64.4	420	176	1,249.3	1,200	0.008
Dry Season																																									
BH1	09/08/22	<1	<1	0.92	0.17	374	<0.01#1	<2	0.0016	297	316	12,000	<0.01#1	0.028	9.4	63.9	10	35,700	307.3	0.4	8.3	1.06	0.6	<0.01#	812	6.58	0.12	0.19	<0.01	0.19	0.8	4.67	4.24	0.08	104	-	5,340	1,700	24,300	38	0.618
80th Percentile		17.8	17.8	1.69	0.582	655.6	0.31	2	0.003	907.6	688.6	29,120	0.01	0.08	9.76	62.8	10	88,080	138.8	0.48	7	1.16	2	0.01	2,300	16.1	0.29	0.54	0.01	0.406	2	5	4.34	0.88	416	-	18,540	3,074	46,668	6,784	1.62
BH2	09/08/22	316	316	<0.1#1	30.9	418	0.067	<2	<0.01#1	321	280	14,300	<0.01#1	<0.01#1	7.1	76.4	187	42,100	-50.4	0.8	4.66	86.4	35.8	<0.01#1	699	41.2	<0.01#1	<0.01#1	<0.01#1	<0.01#1	35.8	7.17	6.14	<0.05#1	176	-	6,950	377	27,700	684	<0.05#1
80th Percentile		680	680	0.1	26.6	652	0.04	2	0.001	883.6	695.4	23,960	0.01	0.01	8.76	50.6	8.4	73,060	0	0.82	10	4.48	26.7	0.01	1,804	38.88	0.016	0.018	0.018	0.018	27.6	7.46	6.5	0.707	502.4	-	14,780	2,204	47,120	7,756	0.05
BH3	09/08/22	54	54	<0.01	1.28	1.54	0.024	4	<0.0001	5	1.23	15	<0.001	<0.001	6.59	52	135	159	-49.1	0.2	5	11.7	<0.0001	<0.001	4	0.359	<0.001	0.03	3.9	<0.01	0.14	2	6.3	<50	0.03	-	10	123	2.2	96	0.018
80th Percentile		43.8	43.8	0.5	0.58	1.7	0.03	2	0.0001	12.4	1.76	72.6	0.001	0.002	8.16	54.1	2,606	324.2	159	0.18	2.15	7.98	2.03	0.001	5.44	0.174	0.006	0.036	0.01	0.042	1.26	6.2	6	3.48	6.4	-	36	9	210.35	15,120	0.028
BH4	09/08/22	<1	<1	1.6	0.03	2.88	<0.001	2	<0.0001	7	2.53	86	<0.001	0.009	3.55	73.9	<10	346	390	0.2	34	0.15	<0.0001	0.002	2	0.194	0.015	0.04	7	<0.01	0.01	22	3.91	<50	0.04	-	5	34	<0.01	204	0.031
80th Percentile		17.2	17.2	0.4	0.025	3.16	0.009	2	0.0001	11	3.16	109	0.001	0.005	7.66	39.9	10	494.4	333	0.1	2.17	1.16	1.08	0.001	10.8	0.276	0.004	0.028	0.01	0.034	1.62	5.36	4.9	4.55	4.56	-	63	40	273.35	8,964	0.113
BH5	09/08/22	9	9	0.01	0.02	11.8	<0.001	<2	0.0002	18	10.2	368	0.005	0.004	9.2	110.2	820	1,260	213	0.1	7.57	<0.05	0.6	<0.001	16	9.51	0.108	0.03	<0.01	0.03	0.6	6.12	5.73	0.17	2	-	182	62	784	774	0.111
80th Percentile		64.6	64.6	0.2	0.084	12.9	0.003	2	0.0003	55.2	11.68	523.6	0.001	0.005	7.74	77.2	8.2	1,992	164.2	0.18	5.75	0.05	0.94	0.001	26	8.31	0.085	1.45	0.01	1.38	2.54	7	6.55	0.35	4	-	287	72	1,162	5,228	0.137
BH6	09/08/22	15	15	0.01	0.32	21.7	0.001	<2	<0.0001	18	17.8	645	<0.001	<0.001	9	29.8	<10	2,300	121	<0.01	9.82	10.6	0.5	<0.001	39	5.63	0.007	0.02	<0.01	0.02	0.5	6.18	5.14	0.03	12	-	309	156	1,320	<5	0.032
80th Percentile		19.4	19.4	0.12	0.38	28.6	0.003	2	0.0001	129	33.64	3,290	0.001	0.004	7.24	43.1	10	10,468	164	0.44	14	12.87	0.54	0.002	346	6.13	0.012	0.046	0.01	0.05	0.7	5.9	5.26	0.08	44.4	-	2,300	216	4,775	913	0.036
BH7	09/08/22	68	68	<0.01	1.31	17.3	0.005	<2	<0.0001	18	16.3	434	<0.001	<0.001	8.4	12	<10	1,750	-61.5	0.4	3.23	29	2.3	<0.001	34	23.1	0.003	0.02	<0.01	0.02	2.3	6.56	6.1	0.05	19	-	226	180	937	170	<0.005
80th Percentile		67	67	0.005	3.31	51.76	0.006	2	0.0001	70.2	46.22	2,884	0.001	0.001	7.84	45.8	8.4	10,612	9.3	0.46	6.46	32.9	4.86	0.001	196.2	64.4	0.013	0.048	0.018	0.04	5.66	6.5	6.15	0.66	65.8	-	1,660	296	4,229	28,080	0.013

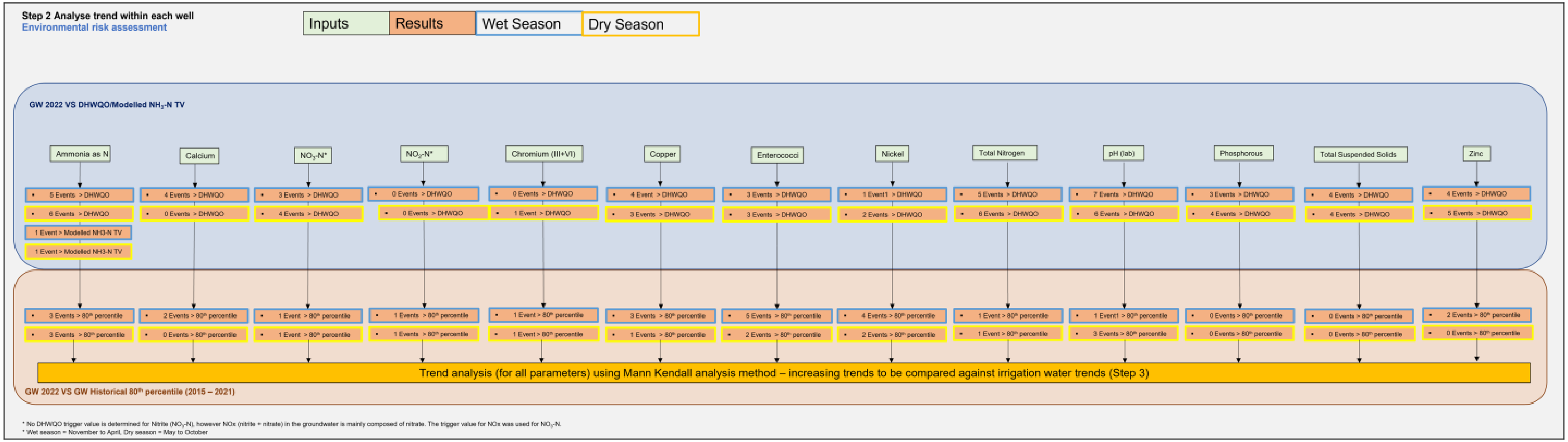

Figure 5-5 Summary of Step 2 Results: 2022 Groundwater Compared Against the DHWQO, Modelled NH3-N and Groundwater Historical 80th percentiles (2015-2020)

Step 3: Environmental Risk Assessment: Correlation Between Groundwater and Irrigation Discharge

A total of 24 parameters from the irrigation water and groundwater show an increasing trend identified by either a MK trend or as four consecutive GME increases (Table 5-10). However, the analysis found no increasing trend (as a MK trend) exists for parameters shared between the irrigation water and the groundwater. Therefore, and in accordance with the risk assessment framework, no further statistical assessment was undertaken.

No MK trend for E. coli or Enterococci has been identified within groundwater despite notable exceedances over both 2022 GMEs and an increasing MK trend within the irrigation water. A review of the MK analysis results indicate there is insufficient microbiology data for the MK analysis to calculate a trend, and as such, these bacteria cannot yet be assessed by the framework. Monitoring of microbiology in groundwater began in 2019 and further sample data is required for the seasonal datasets to be statistically robust.

Copper concentrations within BH1 during the dry season continue to show an increasing MK trend despite a decreasing trend of copper in irrigation water. It should be noted, BH1 is located outside of the irrigation area where influence from irrigation activities is considered unlikely.

Table 5-10 2022 Tier Assessment Summary for Irrigation and Groundwater Parameters with An Increasing Trend

Parameter (Mg/L)	Location	Season	Min	Max	Mann Kendal Trend	General Trend [1]	DHWQO	EPL-217-02	80th Percentile
Alkalinity (Bicarbonate as $CaCO_3$)	BH3	Dry Season	1	54	Increasing Trend	Variable	No Criteria	-	Above Criteria
Alkalinity (total as $CaCO_3$)	BH3	Dry Season	1	54	Increasing Trend	Variable	No Criteria	-	Above Criteria
Aluminium	BH4	Wet Season	0.03	1.57	Increasing Trend	Variable	-	-	-
	BH2	Dry Season	0.006	2.24	No Trend	4 Increasing	No Criteria	-	Above Criteria
	BH4	Dry Season	0.06	1.6	Increasing Trend	Variable	No Criteria	-	Above Criteria
Ammonia as N	BH4	Dry Season	0.01	0.09	No Trend	4 Increasing	Above Criteria	-	Above Criteria
Arsenic	BH2	Dry Season	0.01	0.11	No Trend	4 Increasing	No Criteria	-	Above Criteria
	BH3	Wet Season	0.001	0.037	Increasing Trend	4 Increasing	-	-	-
	BH5	Dry Season	0.0007	0.007	No Trend	4 Increasing	No Criteria	-	Above Criteria
BOD	Irrigation Water	-	1	280	Increasing Trend	Variable	-	Above Criteria	Above Criteria
Calcium	BH6	Wet Season	8	480	No Trend	4 Increasing	-	-	-
Chloride	Irrigation Water	-	12.89	64.38	Increasing Trend	Variable	-	No Criteria	Above Criteria
Chromium (III+VI)	BH5	Dry Season	0.0003	0.041	No Trend	4 Increasing	Above Criteria	-	Above Criteria
Copper	BH5	Dry Season	0.001	0.034	Increasing Trend	Variable	Above Criteria	-	Above Criteria
Dissolved Oxygen	BH5	Dry Season	7.1	9.2	No Trend	4 Increasing	No Criteria	-	Above Criteria
Dissolved Oxygen (field)	BH7	Wet Season	0.99	2.34	Increasing Trend	4 Increasing	-	-	Above Criteria
E. coli	Irrigation Water	-	0	24196	Increasing Trend	Variable	-	Above Criteria	Above Criteria
Electrical Conductivity (field)	BH3	Wet Season	109.6	376	No Trend	4 Increasing	-	-	-
Enterococci	Irrigation Water	-	1	2420	Increasing Trend	Variable	-	Above Criteria	Above Criteria
Iron	BH3	Wet Season	0.08	7.81	No Trend	4 Increasing	-	-	-
	BH2	Dry Season	0.1	105	No Trend	4 Increasing	No Criteria	-	Above Criteria
	BH6	Dry Season	3.4	14	No Trend	4 Increasing	No Criteria	-	Below Criteria
	Irrigation Water	-	0.025	3.6	Increasing Trend	Variable	-	Below Criteria	Above Criteria
Kjeldahl Nitrogen Total	Irrigation Water	-	0.67	79.3	Increasing Trend	4 Decreasing	-	No Criteria	Above Criteria
Manganese	BH3	Dry Season	0.05	0.385	Increasing Trend	4 Increasing	No Criteria	-	Above Criteria
	BH5	Dry Season	1.68	11.3	No Trend	4 Increasing	No Criteria	-	Above Criteria
	BH6	Dry Season	3.09	7.2	No Trend	4 Increasing	No Criteria	-	Below Criteria
Nickel	BH5	Wet Season	0.001	0.254	Increasing Trend	Variable	-	-	-
	BH4	Wet Season	0.001	0.019	Increasing Trend	4 Increasing	-	-	-
	BH4	Dry Season	0.002	0.015	Increasing Trend	Variable	Below Criteria	-	Above Criteria
	BH5	Dry Season	0.001	0.169	Increasing Trend	4 Increasing	Above Criteria	-	Above Criteria
pH (field)	BH3	Dry Season	4.06	6.33	Increasing Trend	Variable	No Criteria	-	Above Criteria
	BH1	Wet Season	4.17	5.25	No Trend	4 Increasing	-	-	-
pH (lab)	BH3	Dry Season	4.23	6.59	Increasing Trend	Variable	Below Criteria	-	Above Criteria
Phosphate	Irrigation Water	-	0.004	2.34	No Trend	4 Increasing	-	No Criteria	Above Criteria
Potassium	Irrigation Water	-	1.971	17.7	Increasing Trend	Variable	-	No Criteria	Above Criteria
Sodium	Irrigation Water	-	3.379	27.225	Increasing Trend	4 Increasing	-	No Criteria	Above Criteria
Temperature (field)	BH1	Dry Season	29.8	32.63	No Trend	4 Increasing	No Criteria	-	Above Criteria
	BH2	Dry Season	28.9	31.9	Increasing Trend	Variable	No Criteria	-	Below Criteria
	BH2	Wet Season	30.8	37.2	No Trend	4 Increasing	-	-	-
Toluene	Irrigation Water	-	0.5	2.5	Increasing Trend	Variable	-	No Criteria	Above Criteria
Total Dissolved Solids	Irrigation Water	-	3.31	878	Increasing Trend	Variable	-	-	-
Total Dissolved Solids (field)	BH3	Wet Season	71.5	126.7	No Trend	4 Increasing	-	No Criteria	Above Criteria
Total Suspended Solids	Irrigation Water	-	0	120	Increasing Trend	Variable	-	Above Criteria	Above Criteria
Zinc	BH4	Wet Season	0.005	0.22	No Trend	4 Increasing	-	-	-
	BH6	Wet Season	0.001	2.1	No Trend	4 Increasing	-	-	-

Data Management and Quality Control

Groundwater samples were collected by qualified professional environmental consultants who followed standard quality control procedures. The data validation procedure employed in the assessment of the field and laboratory quality control data showed the field and laboratory results to be representative of the conditions at the sample locations at the time of sampling. While there were some exceedances in quality assurance targets noted it is possible that this was the result of variability in groundwater from within the monitoring wells due to the use of a bailer for groundwater sampling and not the result of laboratory inaccuracy. Therefore, it is concluded that overall, the quality of the field and laboratory data produced is reliable for the purposes of this groundwater assessment.

Conclusions

Statistical assessment comparing the groundwater and irrigation water parameters using the Mann Kendal analysis (Step 3) identified no correlation between the groundwater and irrigation water quality, therefore overall, the data collected from the 2022 groundwater monitoring events demonstrate that current irrigation practices present a low environmental risk.

UNCONTROLLED IF PRINTED

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6.0 Certification

I Wade Johnstone, Production - Manager DLNG, have reviewed this report and I confirm that to the best of my knowledge and ability all the information provided in the report is true and accurate.

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7.0 List of Symbols and Acronyms

Ag	Silver
AGI	Acid Gas Incinerator
AGV	Acid Gas Vent
ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agricultural and Resource Management Council of Australia and New Zealand
As	Arsenic
ASS	Acid Sulphate Soils
BOD	Biological oxygen demand
BTEX	Benzene, ethyl-benzene, toluene, xylene
Cd	Cadmium
CH_4	Methane
Santos	Santos NA Darwin Pipeline Pty Ltd (Santos)
CO	Carbon monoxide
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CPI/DAFF	Corrugated plate interceptor/dissolved air filtration flotation
Cr	Chromium
Cu	Copper
ºC	Degrees Celsius
DHWQO	Darwin Harbour Water Quality Objectives
DLNG	Darwin liquefied natural gas facility
DO	Dissolved oxygen
DRP	Dissolved reactive phosphorous
EMP	Environmental management plan
EPA	Environmental Protection Authority
the Licence	Darwin LNG Environmental Protection Licence EPL217-02
Fe	Iron
FSANZ	Food Standards Australia New Zealand
g	Grams
GEL	Generally Expected Levels
GHG	Greenhouse gas
H_2S	Hydrogen Sulphide
Hg	Mercury
ISQG	Interim sediment quality guidelines
kg	Kilograms
kNm^3	Thousand normal cubic metres
L	Litres
LNG	Liquefied natural gas
LPG	Liquid petroleum gas
LOR	Limit of Reporting
m	Metre
m^3	Cubic metres
mg/L	Milligrams per litre
mL	Millilitres
mm	Millimetre
Mn	Manganese
Mol%	Mole % - a measure used to express gas compositions
MPN	Most probable number
MTPA	Million tonnes per annum
MZ	Mixing zone
N	Nitrogen
N_2O	Nitrous oxide
NATA	National Association of Testing Authorities
NEPM	National Environmental Protection Measure
NGL	Natural gas liquids
Ni	Nickel
NO_x	Nitrogen oxides
NRU	Nitrogen rejection unit
NSW	New South Wales
NT	Northern Territory of Australia
NTU	Nephelometric turbidity units
OEMP	Operations phase environmental management plan
ORP	Oxidation reduction potential
PAH	Polycyclic aromatic hydrocarbons
Pb	Lead
PIP	Performance Improvement Plan
$PM_{2.5}$	Particulate matter (with an aerodynamic diameter of less than 2.5 µm)
PM_{10}	Particulate matter (with an aerodynamic diameter of less than 10µm)
ppm	Parts per million
PWC	Power and Water Corporation
RO	Reverse osmosis
SO_x	Sulphur oxides
SP	Sediment Pond
STP	Sanitary treatment plant
t	Tonnes
TN	Total nitrogen
TP	Total phosphorus
TDS	Total dissolved solids
TPH	Total petroleum hydrocarbons
TRH	Total recoverable hydrocarbons
TSS	Total suspended solids
VOC	Volatile organic compounds
WMPC	NT Waste Management and Pollution Control Act
Zn	Zinc

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Attachment A - Irrigation, Jetty Outfall and Sediment Pond data

UNCONTROLLED IF PRINTED

IRRIGATION WATER (1SC-2919)

Anion / Cation 12 month dataset 2018-19

Date Sampled / Analyte	Sampling Reason (Compliance / Retest / Voluntary)	DO	Temp	Turbidity	pH	EC	TDS	TSS	TRH	E Coli	Enterococci	BOD	Chlorophyll a	TN	TP	NH3-N	NO3-N	NO2-N	PO4-P	TKN
		mg/L	℃	NTU		µS/cm	mg/L	mg/L	mg/L	MPN/100mL	MPN/100mL	mg/L	µg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L
EPL 217 Trigger Value		**N/A**	**N/A**	**N/A**	**7-8.5**	**N/A**	**N/A**	**30**	**6.00**	**75**	**50**	**25**	**2**	**40**	**10**	**20**	**17**	**17**	**5**	**N/A**
LOR			N/A		N/A				0.65	10	10	<1	1	0.01	0.005	1	1	1	1	10
Testing Frequency		Monthly	Monthly	Monthly	Monthly	Monthly	N/A	Monthly	Annual	Biannual	Biannual	Monthly	Biannual	Annual	Annual	Annual	Annual	Annual	Annual	N/A
2016																				
6/01/2016	C	0.17	37.4	11.80	7.24	187	130	17	<0.65	2	41	**26**	<1	4.19	0.25	**2,370**	<1	**54**	**213**	4.20
14/01/2016	R																			
3/02/2016	C	0.17	36.4	2.82	7.70	212	141	0	<0.65	1	5	4.9	<0.2	6.37	0.75	**3,530**	**741**	**207**	**548**	5.82
18/02/2016	R											**32**								
2/03/2016	C	0.12	39.8	9.40	7.34	196	133	8	<0.65	<1	27	**120**	1	5.62	0.78	**1,140**	2	3	**7**	5.61
2/03/2016	R											24								
9/03/2016	V											**160**								
4/04/2016	C	0.12	41.0	16.70	**6.73**	199	133	17	<0.65	1	5	**68**	<1	6.45	1.27	**167**	3	2	**81**	1.44
4/05/2016	C	0.16	33.9	37.30	7.20	237	160	7	1.20	<1	38	**140**	2	5.60	0.97	**798**	<1	3	**61**	5.64
1/06/2016	C	0.12	33.0	16.30	7.24	272	188	22	<0.65	<10	31	**100**	<1	9.68	1.92	**1,510**	4	<1	**580**	9.52
5/07/2016	C	0.08	38.1	14.40	**6.79**	224	158	21	<0.65	<1	**78**	**170**	<1	7.09	0.95	**133**	3	2	**8**	7.00
3/08/2016	C	0.14	38.3	12.70	**6.93**	214	154	21	<0.65	<10	<10	**190**	1	7.75	1.22	**184**	5	<1	**12**	8.12
7/09/2016	C	0.09	39.9	13.20	7.59	239	164	14	<0.65	3	**>2420**	**110**	<1	7.28	1.25	**101**	8	3	**19**	7.24
5/10/2016	C	0.12	38.8	23.00	7.27	290	203	14	<0.65	23	**219**	**29**	<1	11.10	2.45	**5,190**	<1	<1	**907**	11.60
2/11/2016	C	0.05	39.9	15.60	**6.81**	231	159	21	<0.65	<10	<10	**230**	<1	6.69	1.16	**1,320**	2	1	**55**	6.43
7/12/2016	C		25.0		7.25	274	186	16		**>2420**	**2,420**	21		8.19	1.47	**1,510**	<1	5	**533**	8.14
16/12/2016	C		3.1		7.57	320	215	18				**80**	<1							
19/12/2016	C	0.15	32.7	9.16			215	18	0.71	<10	10			17.40	0.70	**13,500**	<1	<1	**159**	17.20
2017																				
4/01/2017	C	0.10	35.4	11.20	**6.57**	306	208	16	<0.65	<10	<10	18.0	<1	13.60	0.93	**9,510**	<1	2	**202**	14.00
1/02/2017	C	0.18	33.8	10.30	7.18	259	179	9	<0.65	<10	<10	8.1	1	11.50	0.60	**7,170**	**61**	8	**134**	10.50
1/03/2017	C	0.07	40.1	8.61	7.71	198	137	7	<0.65	<10	<10	**33.0**	<1	12.70	0.65	**6,300**	2	7	**294**	12.10
5/04/2017	C	0.21	38.3	10.70	7.34	172	117	9	<0.65	**134**	<10	**30.0**	<1	8.47	0.89	**3,220**	<1	2	**379**	8.33
10/04/2017	R								<0.65	20	10									
3/05/2017	C	0.53	38.1	1.48	7.38	198	135	4	<0.65	31	<10	<1	<1	8.25	1.12	**5,930**	14	14	**784**	8.29
7/06/2017	C	0.19	36.8	2.81	7.66	207	141	0	<0.65	10	10	**27.0**	1	7.87	1.83	**5,550**	**2,080**	**566**	**1,640**	6.40
5/07/2017	C	0.19	38.1	13.20	7.15	210	143	9	<0.65	<10	<10	12.0	<1	9.01	0.89	**6,690**	6	2	**11**	9.05
2/08/2017	C	0.23	37.6	16.20	7.62	214	146	7	<0.65	12	13	1.7	<1	10.50	1.46	**7,750**	5	3	**952**	9.93
6/09/2017	C	0.22	39.0	12.70	**6.95**	203	138	9	<0.65	<1	<10	10.0	<1	7.21	1.42	**5,710**	**24**	8	**644**	7.18
4/10/2017	C	0.14	37.9	5.80	7.68	220	152	0	<0.65	20	10	2.8	1	8.11	0.79	**7,370**	**212**	**55**	**385**	7.73
1/11/2017	C	0.19	31.5	13.20	7.98	220	152	0				5.3								
6/12/2017	C	0.14	38.8	15.50	7.77	201	138	4				20.0								
2018																				
3/01/2018	C	0.17	39.3	12.60	7.19	114		6				11.0								
7/02/2018	C	0.14	37.0	9.13	**6.92**	148		9				**39.0**								
28/02/2018	R											24.0								
7/03/2018	C	0.17	38.4	10.60	**6.61**	193		4		<10	20	24.0	<1	6.60	1.16	**243**	<1	2	**586**	5.17
4/04/2018	C	0.15	39.8	11.10	7.63	152		3				12.0								
2/05/2018	C	0.12	40.1	7.80	7.73	160		**<1**				22.0								
6/06/2018	C	0.18	36.6	8.05	8.07	332		7				9.5								
6/06/2018	V																			
4/07/2018	C	0.17	31.9	18.30	7.57	201		3				8.0								
1/08/2018	C	0.13	31.0	62.80	7.76	236		26				17.0								
5/09/2018	C	0.15	38.5	17.40	7.67	228		14				**30.0**								
20/09/2018	R											21.0								
3/10/2018	C	0.14	37.6	9.49	7.59	267		11		**98**	10	14.0	<1							
15/10/2018	R									52	<10									
7/11/2018	C	0.15	41.0	4.08	7.97	210		12		<10	<10	4.0								
5/12/2018	C	0.5	39.6	16.00	**6.74**	181		22		31	<10	7.7								

Date Sampled / Analyte	Sampling Reason (Compliance / Retest / Voluntary)	Al	As	Cd	Cr Total	Cr VI	Cu	Pb	Fe	Mn	Hg	Ni	Zn	Ag	Benzene	Toluene	Ethyl Benzene	Xylene	BTEX
		µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EPL 217 Trigger Value		**N/A**	**10**	**3.2**	**10**	**N/A**	**69**	**10**	**1,300**	**15,500**	**0.0001**	**290**	**1780**	**1.4**	**N/A**	**N/A**	**N/A**	**N/A**	**700**
LOR		5	1	0.1	1	0.004	1	1	5	1	0.0001	1	5	1	0.5	0.5	0.5	1.5	3
Testing Frequency		N/A	Annual	Monthly	Annual	N/A	Monthly	Annual	Annual	Annual	Monthly	Annual	Monthly	Annual	Monthly	Monthly	Monthly	Monthly	Monthly
2016																			
6/01/2016	C	<5	<1	<0.1	<1	<0.005	22	<1	62	38	<0.0001	2	33	<1	0.70	1.40	<0.5	2.70	5.00
14/01/2016	R														<0.5	<0.5	<0.5	<1.5	<3
3/02/2016	C	<5	<1	<0.1	<1	<0.005	21	<1	44	22	<0.0001	2	19	<1	<0.5	<0.5	<0.5	<1.5	<3
18/02/2016	R																		
2/03/2016	C	<5	<1	<0.1	<1	<0.005	19	<1	25	39	<0.0001	<1	22	<1	<0.5	<0.5	<0.5	<1.5	<3
2/03/2016	R																		
9/03/2016	V																		
4/04/2016	C	<5	<1	<0.1	<1	<0.005	6	<1	56	41	<0.0001	<1	17	<1	<0.5	<0.5	<0.5	<1.5	<3
4/05/2016	C	<5	<1	<0.1	<1	<0.005	18	<1	130	50	<0.0001	2	24	<1	<0.5	<0.5	<0.5	<1.5	<3
1/06/2016	C	<5	<1	<0.1	<1	<0.005	11	<1	180	54	<0.0001	2	22	<1	<0.5	<0.5	<0.5	<1.5	<3
5/07/2016	C	<5	<1	<0.1	<1	<0.005	9	<1	230	42	<0.0001	<1	12	<1	<0.5	<0.5	<0.5	<1.5	<3
3/08/2016	C	<5	<1	<0.1	<1	<0.005	9	<1	190	43	<0.0001	<1	15	<1	<0.5	<0.5	<0.5	<1.5	<3
7/09/2016	C	<5	<1	<0.1	<1	<0.005	5	<1	1,100	39	<0.0001	<1	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
5/10/2016	C	<5	<1	<0.1	<1	<0.004	16	<1	560	44	<0.0001	1	16	<1	<0.5	<0.5	<0.5	<1.5	<3
2/11/2016	C	<5	<1	<0.1	<1	<0.004	8	<1	390	44	<0.0001	1	15	<1	<0.5	<0.5	<0.5	<1.5	<3
7/12/2016	C	<5	<1	<0.1	<1	<0.004	13	<1	600	47	<0.0001	1	6	<1					
16/12/2016	C																		
19/12/2016	C	<5	<1	<0.1	<1	<0.004	10	<1	450	78	<0.0001	3	<5	<1	<0.5	0.70	<0.5	1.90	3.00
2017																			
4/01/2017	C	<5	<1	<0.1	<1	<0.004	15	<1	180	75	<0.00005	2	10	<1	<0.5	<0.5	<0.5	<1.6	<3.1
1/02/2017	C	<5	<1	<0.1	<1	<0.004	18	<1	250	42	<0.0001	2	14	<1	0.70	0.60	<0.5	<1.8	<3.6
1/03/2017	C	<5	<1	<0.1	<1	<0.004	8	<1	110	78	<0.0001	1	8	<1	<0.5	<0.5	<0.5	<1.5	<3
5/04/2017	C	<5	<1	<0.1	<1	<0.004	9	<1	290	34	<0.0001	<1	10	<1	<0.5	<0.5	<0.5	<1.6	<3.1
10/04/2017	R																		
3/05/2017	C	<5	<1	<0.1	<1	<0.004	10	<1	140	30	<0.0001	<1	13	<1	<0.5	<0.5	<0.5	<1.5	<3
7/06/2017	C	<5	<1	<0.1	<1	<0.004	15	<1	30	22	<0.0001	<1	17	<1	<0.5	<0.5	<0.5	<1.5	<3
5/07/2017	C	<5	<1	<0.1	<1	<0.004	5	<1	200	20	<0.0001	<1	<5	<1	<0.5	<0.5	<0.5	2.50	3.00
2/08/2017	C	<5	<1	<0.1	<1	<0.004	8	<1	260	27	<0.0001	<1	10	<1	<0.5	0.70	<0.5	<1.5	<3.2
6/09/2017	C	<5	<1	<0.1	<1	<0.004	7	<1	150	21	<0.0001	3	10	<1	<0.5	<0.5	<0.5	<1.5	<3
4/10/2017	C	<5	<1	<0.1	<1	<0.004	7	<1	290	5	<0.0001	<1	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
1/11/2017	C						5				<0.0001		<5		<0.5	<0.5	<0.5	<1.5	<3
6/12/2017	C						6				<0.0001		<5		<0.5	<0.5	<0.5	<1.5	<3
2018																			
3/01/2018	C			<0.1			8				<0.0001		8		<0.5	<0.5	<0.5	<1.5	<3
7/02/2018	C			<0.1			52				<0.0001		34		<0.5	<0.5	<0.5	1.7	<3
28/02/2018	R																		
7/03/2018	C	<5	<1	<0.1	<1	<0.004	11	<1	240	2	<0.0001	2	11	<1	<0.5	<0.5	<0.5	<1.5	<3
4/04/2018	C			<0.1			14				<0.0001		12		<0.5	<0.5	<0.5	<1.5	<3
2/05/2018	C			<0.1			16				<0.0001		16		<0.5	<0.5	<0.5	<1.5	<3
6/06/2018	C			<0.1			2				<0.0001		25		<0.5	<0.5	<0.5	<1.5	<3
6/06/2018	V			<0.1			24				<0.0001		9						
4/07/2018	C			<0.1			6				<0.0001		10		<0.5	<0.5	<0.5	<1.5	<3
1/08/2018	C			<0.1			3				<0.0001		9		0.6	<0.5	<0.5	<1.5	<3
5/09/2018	C			<0.1			3				<0.0001		8		<0.5	<0.5	<0.5	1.6	<3
20/09/2018	R																		
3/10/2018	C			<0.1			9				<0.0001		13		<0.5	<0.5	<0.5	1.6	<3
15/10/2018	R																		
7/11/2018	C			<0.1			13				<0.0001		19		<0.5	<0.5	<0.5	1.6	<3
5/12/2018	C			<0.1			9				<0.0001		17		<0.5	<0.5	<0.5	1.6	<3

Date Sampled / Analyte	Sampling Reason (Compliance / Retest / Voluntary)	DO	Temp	Turbidity	pH	EC	TDS	TSS	TRH	E Coli	Enterococci	BOD	Chlorophyll a	TN	TP	NH3-N	NO3-N	NO2-N	PO4-P	TKN	Al	As	Cd	Cr Total	Cr VI	Cu	Pb	Fe	Mn	Hg	Ni	Zn	Ag	Benzene	Toluene	Ethyl Benzene	Xylene	BTEX
		mg/L	℃	NTU		µS/cm	mg/L	mg/L	mg/L	MPN/100mL	MPN/100mL	mg/L	µg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
2019																																						
2/01/2019	C	0.15	39.4	15.90	7.57	193		6		<10	<10	18.0											<0.1			14				<0.0001		6		<0.5	<0.5	<0.5	3.1	4
6/02/2019	C	0.23	37.2	9.91	7.52	185		2		108	<10	21.0											<0.1			17				<0.0001		17		<0.5	<0.5	<0.5	1.9	<3
20/02/2019	R									6,488	331																											
27/02/2019	R									197	41																											
4/03/2019	R									<10	<10																											
6/03/2019	C	0.50	40.4	6.41	7.87	189		0	<0.65	<10	<10	1.6	<1	6.15	1.33	5,890	22	2	1,150	6.11	<5	<1	<0.1	<1	<0.004	17	<1	88	18	<0.0001	<1	9	<1	<0.5	<0.5	<0.5	<1.5	<3
3/04/2019	R	0.10	40.0	15.30	7.15	176		14		275	<10	18.0											<0.1			9				<0.0001		<5		<0.5	0.5	<0.5	<1.5	<3
8/04/2019	R									<10	<10																											
1/05/2019	C	0.10	39.8	4.99	7.30	220		12		31	<10	2.1											<0.1			14				<0.0001		7		<0.5	<0.5	<0.5	<1.5	<3
5/06/2019	C	0.13	27.7	5.41	7.88	249		6		<10	<10	1.2											<0.1			18				<0.0001		16		<1	<1	<1	<3	<6
3/07/2019	C	0.09	37.2	12.40	7.96	298		6		313	20	32.0		14.80	3.08	12,600	<1	3	2,460	14.80			<0.1			24				<0.0001		28		<0.5	0.6	<0.5	<1.5	<3
17/07/2019	V									<100	<100	7.9																										
7/08/2019	C	0.15	34.8	14.60	7.63	292		10		10	<10	6.3		13.20	3.63	8,000	1,520	60	3,230	11.70			<0.1			16				<0.0001		10		<0.5	<0.5	<0.5	1.8	<3
4/09/2019	C	0.06	37.8	5.76	7.28	298		8		<10	<10	2.9		9.63	2.79	4,220	3,820	190	2,340	5.65			<0.1			21				<0.0001		18		<0.5	<0.5	<0.5	<1.5	<3
2/10/2019	C	0.17	38.5	6.09	7.50	343		11		<10	<10	10.0	<1	14.50	2.41	12,900	3	3	1,960	14.00			<0.1			11				<0.0001		<5		<0.5	<0.5	<0.5	<1.5	<3
6/11/2019	C	2.42	36.8	2.93	7.28	329		5	<0.65	<10	<10	<1		20.80	2.81	9,800	980	77	2,390	10.10		<1	0.2	<1		400	<1	150	31	<0.0001	2	210	<1	<0.5	<0.5	<0.5	<1.5	<3
18/11/2019	R																					<1	<0.1			82	<1	100	21	<0.0001	<1	50	<1					
4/12/2019	C	0.67	38.6	7.54	7.01	238		11		<10	<10	<1		13.40	1.31	2,810	676	186	1,130	4.79		<1	<0.1	<1		190	<1	150	37	<0.0001	1	120	<1	<0.5	<0.5	<0.5	<1.5	<3
11/12/2019	V			25.40		170		28						7.50	1.10	910	<5	<5	31	7.50		<1	<0.1	<1	<0.004	40	<1	480	58	<0.0001	1	42	<1					
11/12/2019	V													6.41	1.01	981	<1	2	6	5.92																		
17/12/2019	V	0.14	38.2	8.75	7.09	164		12						4.10	2.10	480	<5	<5	1,400	4.10		<1	<0.1	<1	<0.004	10	<1	270	33	<0.0001	<1	10	<1					
17/12/2019	V													3.87	2.21	51	<1	<1	1,340	3.61																		
2020																																						
8/01/2020	C	0.06	36.1	1.98	7.40	216		2		<10	<10	1.4		5.47	1.34	453	3,120	151	994	3.09		<1	<0.1	<1	<0.001	5	<1	120	20	<0.00005	<1	19	<1	<1	<1	<1	<1	<4
15/01/2020	V													3.46	0.52	65	2	<1	4			<1	<0.1	<1	<0.004	2	<1	320	29	<0.0001	<1	<5	<1					
22/01/2020	V													3.64	0.71	205	<1	1	9			<1	<0.1	<1		2	<1	230	32	<0.0001	<1	10	<1					
29/01/2020	V																					<1	<0.1	<1		2	<1	190	24	<0.0001	<1	10	<1					
5/02/2020	C	0.15	35.4	15.1	7.23	210		22				23.0		0.50	2.25	99	<1	1	610				<0.1			6				<0.0001		6		<0.5	<0.5	<0.5	<1.5	<3
4/03/2020	C	0.09	37.9	16.4	7.35	206		17	<0.65	10	<10	15.0	<1	5.58	1.80	235	2	1	931			<1	<0.1	<1	<0.004	11	<1	200	40	<0.0001	<1	16	<1	<0.5	<0.5	<0.5	<1.5	<3
1/04/2020	C	0.15	35.0	2.73	7.62	258		0				2.5		5.95	2.77	3,330	<1	<1	2,500				<0.1			5				<0.0001		<5		<0.5	<0.5	<0.5	<1.5	<3
6/05/2020	C	0.11	36.0	2.12	7.29	255		1				1.5		8.76	0.74	2,410	4,580	123	731				<0.1			13				<0.0001		30		<0.5	<0.5	<0.5	<1.5	<3
10/06/2020	C	0.10	32.0	1.92	7.37	338		0				3.1		13.10	1.44	2,730	6,890	1,670	1,330				<0.1			18				<0.0001		34		<0.5	<0.5	<0.5	<1.5	<3
8/07/2020	C	0.12	32.5	5.06	7.45	311		3				6.9		8.77	1.25	2,200	2,870	191	100				<0.1			12				<0.0001		10		<0.5	<0.5	<0.5	<1.5	<3
5/08/2020	C	0.14	35.3	6.92	7.40	213		5				3.9		4.51	1.48	309	1,280	38	992				<0.1			16				<0.0001		10		<0.5	<0.5	<0.5	<1.5	<3
9/09/2020	C	0.13	37.4	6.96	7.18	288		4				41		4.87	1.35	1,060	<1	<1	455				<0.1			7				<0.0001		<5		0.5	1.2	<0.5	<1.5	<3
22/09/2020	V			15.1	6.45	282		22				44																										
7/10/2020	C	0.05	37.3	21.1	7.12	257		73		<10	10	41	1	6.93	1.06	975	2	2	201				<0.1			5				<0.0001		<5		<0.5	0.6	<0.5	1.6	<3
19/10/2020	V				7.18	401		82				61																										
28/10/2020	V	0.11	36.5	21.0	7.06	275		61				66																										
4/11/2020	C	0.13	37.5	15.60	6.97	251		48				60		5.72	0.635	1,910	<1	6	245				<0.1			7				<0.0001		<5		<0.5	<0.5	<0.5	3.5	3
11/11/2020	V	0.14	39.7	11.00	7.17	258		28				46																										
17/11/2020	V									<10	213	120																										
25/11/2020	V	0.14	35.7	15.90	7.19	254		25				85																										
2/12/2020	C	0.13	37.0	11.20	7.04	233		35		<10	20	100		3.76	3.91	1,760	24	<1	232				<0.1			98				<0.0001		25		<0.5	<0.5	<0.5	<1.5	<3
3/12/2020	V							23																														
9/12/2020	V	0.12	37.8	13.80	7.07	228		28		10	20	97																										
16/12/2020	V	0.13	36.1	12.10	7.04	241		28		<10	10	54											<0.1			9				<0.0001		7						
2021																																						
6/01/2021	C	0.14	38.0	14.4	7.03	222		28		<10	<10	190		5.66	0.445	496	2	<1	13			<0.5	<0.05	<0.5		6	<0.2	200	40	<0.0001	<0.5	2	<1	<1	1	<1	<1	<2
20/01/2021	V				6.90	194		17				92																										
27/01/2021	V				6.80	173		22				120																										
3/02/2021	C	0.15	32.2	15.6	6.90	210		35				180		4.07	0.67	578	2	<1	83				<0.1			10				<0.0001		<5		<0.5	<0.5	<0.5	<1.5	<3
10/02/2021	V				6.84			27				130																										
17/02/2021	V				6.91			24				110																										
23/02/2021	V				7.00			16				160																										
3/03/2021	C	0.13	38.7	13.2	6.83			26	<0.65	10	<10	85	<1	3.62	0.41	466	2	<1	70			<1	<0.1	<1		7	<1	400	43	<0.0001	<1	8	<1	<0.5	<0.5	<0.5	<1.5	<3
10/03/2021	V				6.93			22				89																										
15/03/2021	V				6.93			24				110																										
24/03/2021	V				6.83			87				120																										
31/03/2021	V				7.22			6				140																										
7/04/2021	C		27.1	12.3	6.76	205		13				190		1.15	0.56	641	2	<1	86				<0.1			19				<0.0001		20		<2.5	<2.5	<2.5	<7.5	<15
14/04/2021	V				6.27			11				12																										
21/04/2021	V				6.62			13		<10	<10	230																										
28/04/2021	V				6.87			15				100																										
5/05/2021	C	0.13	33.0	18.10	6.85	315		14				280		7.82	0.74	1,250	4	<1	180				<0.1			25				<0.0001		6		<0.5	<0.5	<0.5	<1.5	<3
19/05/2021	V				6.83			12				210																										
2/06/2021	C	0.14	33.0	24.40	6.84	276		18				30		8.04	1.64	2,730	2	2	137				<0.1			16				<0.0001		<5		<0.5	<0.5	<0.5	<1	<3
16/06/2021	V		24.7		7.09			8																														
7/07/2021	C	0.10	35.9	12.70	6.83	159		27				100		4.61	0.36	226	<1	2	8				<0.1			6				<0.0001		<5		<0.5	<0.5	<0.5	<1	<3
19/07/2021	V		24.4		6.90			28																														
4/08/2021	C	0.12	30.4	19.40	6.99	387		17				190		9.56	1.56	121	2	<1	287				<0.1			13				<0.0001		5		<0.5	<0.5	<0.5	<1	<3
16/08/2021	V		27.1		6.78			16				66																										
1/09/2021	C	0.14	32.4	17.70	6.77	289		11				15											<0.1			18				<0.0001		<5		<0.5	<0.5	<0.5	<1	<3
22/09/2021	V		24.4		7.03			31				42																										
6/10/2021	C	0.07	34.4	35.60	6.79	261		32				15		11.30	0.38	375	<1	3	4				0.1			4						8		1	2	<0.5	<1.5	4
27/10/2021	C									<10	<10																											
10/11/2021	C	0.15	23.8	27.20	7.32	859		32				<1	<1										0.1			160				<0.0001		120		<0.5	<0.5	<0.5	<1.5	<3
1/12/2021	C	0.12	26.7	11.00	7.34	197		19				96.0		6.49	0.69	1,840	70	34	533				<0.1			75				<0.0001		23		<0.5	<0.5	<0.5	<1.5	<3
13/12/2021	R																						<0.1			20				<0.0001		5						
2022																																						
5/01/2022		0.14	37.7	19.80	7.01	166		20				46.0		5.52	0.39	460	1	1	5				<0.1			37				<0.0001		6		0.6	0.8	<0.5	2.3	4
1/02/2022		0.14	33.1	11.40	7.18	175		13		10	<10	8.9	<1	4.61	0.70	1,790	7	1	6			<1	<0.1	<1		18	<1	510	32	<0.0001	<1	20	<1	<0.5	<0.5	<0.5	<1.5	<3
8/03/2022		0.17	27.4	5.50	7.12	125		6				3.0		4.49	0.35	1,710	133	222	5				0.1			12				<0.0001		10		<0.5	<0.5	<0.5	<1.5	<3
6/04/2022		0.15	37.8	0.48	7.04	157		14				10.0		4.70	0.55	1,800	1	2	7				<0.1			16				<0.0001		<5		<0.5	<0.5	<0.5	<1.5	<3
4/05/2022		0.20	36.8	11.50	7.00	146		8				3.4		2.19	0.55	351	<1	<1	97				<0.1			11				<0.0001		7		<0.5	<0.5	<0.5	<1.5	<3
1/06/2022		0.07	34.5	7.53	7.31	197		6						7.87	0.71	679	5,160	656	358				<0.1			15				<0.0001		13		<0.5	<0.5	<0.5	<1.5	<3
12/07/2022		0.17	27.4	3.24	7.26	246		0				2.3		6.22	0.81	2,050	3,230	197	769				<0.1			20				<0.0001		11		<0.5	<0.5	<0.5	<1.5	<3
3/08/2022		0.54	35.1	0.89	7.40	214		1				6.3											<0.1			26				<0.0001		16		<0.5	<0.5	<0.5	<1.5	<3
7/09/2022		0.70	37.1	0.31	7.40	241		3				6.1											<0.1			45				<0.0001		15		<0.5	<0.5	<0.5	<1.5	<3
5/10/2022		0.22	35.5	5.01	7.63	205		6															<0.1			27				<0.0001		11		<0.5	<0.5	<0.5	<1.5	<3
2/11/2022		2.26	34.3	2.10	7.25	344		5															<0.1			68				<0.0001		51		<0.5	<0.5	<0.5	<1.5	<3

JETTY OUTFALL (1SC-2920)

Date Sampled / Analyte	Sampling Reason (Compliance / Retest / Voluntary)	DO	Temp	Turbidity	pH	EC	TDS	TSS	TRH	E Coli	Enterococci	BOD	Chlorophyll a	TN	TP	NH3-N	NO3-N	NO2-N	PO4-P	TKN	Al	As	Cd	Cr Total	Cr VI	Cu	Pb	Fe	Mn	Hg	Ni	Zn	Ag	Benzene	Toluene	Ethyl Benzene	Xylene	BTEX
		mg/L	℃	NTU		µS/cm	mg/L	mg/L	mg/L	MPN/100mL	MPN/100mL	mg/L	µg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EPL 217 Trigger Value		N/A	N/A	20	7-8.5	N/A	N/A	30	6	75	50	25	N/A	40	10	337	764	27	51	N/A	N/A	N/A	5.5	4.4	N/A	3	4.4	N/A	N/A	0.4	70	15	1.4	N/A	N/A	N/A	N/A	700
LOR			N/A		N/A				0.65	10	10	<1	1	0.01	0.005	1	1	1	1	10	5	1	0.1	1	0.004	1	1	5	1	0.0001	1	5	1	0.5	0.5	0.5	1.5	3
Testing Frequency		Monthly	Monthly	Monthly	Monthly	Monthly	N/A	Monthly	Biannual	Biannual	Biannual	Biannual	N/A	Quarterly	Biannually	Quarterly	Quarterly	Quarterly	Biannually	N/A	N/A	Biannually	Quarterly	Biannually	N/A	Quarterly	Biannually	Biannually	Biannually	Biannually	Quarterly	Quarterly	Biannually	Biannually	Biannually	Biannually	Biannually	Biannually
2016																																						
4/01/2016	C	0.03	31.0	2.23	7.68				<0.65	<10	<10	1.1	6	1.26	0.11	51	524	6	35		<5	<1	<0.1	<1	<0.004	<1	<1	140	2	<0.0001	1	<5	<1	<0.5	<0.5	<0.5	<1.5	
6/01/2016	C	0.05	33.5	3.08	8.06	824	574	0	<0.65	<1	<1	6.3	<1	1.34	0.14	118	315	32	64	1.03	<5	<1	<0.1	<1	<0.005	2	<1	240	8	<0.0001	2	<5	<1	<0.5	<0.5	0.6	3.8	5
14/01/2016	R																																	<0.5	<0.5	<0.5	2.7	3
3/02/2016	C	0.29	33.4	2.08	7.99	900	600	0	<0.65	<1	<1	2.9	<0.2	1.48	0.12	184	60	36	42	1.49	<5	<1	<0.1	<1	<0.005	<1	<1	170	21	<0.0001	2	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
2/03/2016	C	3.21	35.0	0.77	8.15	857	576	0	<0.65	<1	629	<5	<0.2	1.37	0.10	162	366	14	38	1.12	<5	<1	<0.1	<1	<0.005	<1	<1	230	12	<0.0001	2	6	<1	<0.5	<0.5	<0.5	2.2	<3
4/04/2016	C	0.08	35.6	2.38	8.05	907	611	0	<0.65	<1	<1	3.3	<1	1.79	0.18	73	383	8	22	1.49	<5	<1	<0.1	<1	<0.005	<1	<1	260	3	<0.0001	1	<5	<1	<0.5	<0.5	<0.5	2.1	<3
4/05/2016	C	3.93	33.8	0.58	8.05	729	497	0	<0.65	<1	<1	2.3	<1	1.76	0.14	165	343	3	20	1.49	<5	<1	<0.1	<1	<0.005	10	<1	270	6	<0.0001	1	9	<1	<0.5	<0.5	<0.5	<1.5	<3
1/06/2016	C	0.16	23.0	1.12	8.09	760	524	0	<0.65	<1		2.4	<1	1.68	0.11	254	320	3	26	1.38	<5	<1	<0.1	<1	<0.005	<1	<1	220	2	<0.0001	1	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
5/07/2016	C	0.17	30.6	1.76	8.02	775	550	0	<0.65	<1	<1	4.1	<1	1.90	0.12	369	295	5	42	1.50	<5	<1	<0.1	<1	<0.005	<1	<1	180	20	<0.0001	2	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
3/08/2016	C	2.83	30.5	0.66	8.00	689	502	0	<0.65	<1	<1	3.2	<1	1.70	0.10	260	435	13	71	1.33	<5	<1	<0.1	<1	<0.005	<1	<1	180	29	<0.0001	1	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
7/09/2016	C	0.03	32.9	2.50	7.76	703	494	0	<0.65	<1	<1	2.0	<1	1.22	0.08	113	484	10	31	1.07	<5	<1	<0.1	<1	<0.005	<1	<1	390	8	<0.0001	2	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
5/10/2016	C	6.45	33.8	0.32	8.00	702	491	0	<0.65	<1	<1	2.4	<1	1.86	0.11	348	453	5	69	1.43	<5	<1	<0.1	<1	<0.004	<1	<1	400	12	<0.0001	2	5	<1	<0.5	<0.5	<0.5	<1.5	<3
2/11/2016	C	6.52	33.2	0.26	7.50	795	457	0	<0.65	<10	<10	3.7	<1	1.36	0.09	61	326	27	45	0.97	<5	<1	<0.1	<1	<0.004	<1	<1	350	8	<0.0001	2	<5	<1	<0.5	<0.5	<0.5	2	2
7/12/2016	C	1.01	34.8	2.12	7.89	815	550	0	<0.65	<1	40	2.5	<1	1.30	0.07	40	474	8	27	0.09	<5	<1	<0.1	<1	<0.004	<1	<1	190	2	<0.0001	1	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
2017																																						
4/01/2017	C	0.03	31.0	2.23	7.68	826	561	1	<0.65	<10	<10	1.1	6	1.26	0.11	51	524	6	35	1.20	<5	<1	<0.1	<1	<0.004	<1	<1	140	2	<0.00005	1	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
1/02/2017	C	6.34	33.5	0.26	7.32	99	68	1	<0.65	<10	<10	1.4	<1	1.40	0.11	101	667	10	46	0.77	<5	<1	<0.1	<1	<0.004	1	<1	300	3	<0.0001	1	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
1/03/2017	C	3.34	33.2	0.63	8.10	780	538	1	<0.65	<10	<10	<1	<1	0.81	0.07	113	156	10	52	0.61	<5	<1	<0.1	<1	<0.004	<1	<1	270	7	<0.0001	<1	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
5/04/2017	C	6.77	33.6	0.49	8.00	730	496	0	<0.65	<10	<10	6.5	<1	1.79	0.05	335	442	10	23	1.15	<5	<1	<0.1	<1	<0.004	<1	<1	230	8	<0.0001	1	<5	<1	<0.5	<0.5	<0.5	8.80	<10.3
3/05/2017	C	0.15	32.7	2.74	8.20	702	477	1	<0.65	<10	<10	<1	<1	2.44	0.09	148	437	14	21	2.27	<5	<1	<0.1	1	<0.004	2	<1	490	4	<0.0001	2	7	<1	<0.5	<0.5	<0.5	<1.5	<3
7/06/2017	C	6.96	30.2	0.23	8.04	590	401	0	<0.65	<10	<10	4.6	<1	1.56	0.08	250	482	6	52	1.29	<5	<1	<0.1	<1	<0.004	1	<1	420	4	<0.0001	<1	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
5/07/2017	C	0.25	31.9	1.88	7.82	685	466	0	<0.65	<10	<10	3.5	<1	1.34	0.06	156	327	4	17	1.12	<5	<1	<0.1	<1	<0.004	2	<1	860	8	<0.0001	<1	7	<1	<0.5	<0.5	<0.5	<1.5	<3
2/08/2017	C	0.16	30.6	3.76	8.04	704	478	0	<0.65	<1	<1	3.9	<1	1.73	0.07	316	312	7	11	1.74	<5	<1	<0.1	<1	<0.004	1	<1	470	6	<0.0001	<1	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
6/09/2017	C	1.52	32.20	5.43	7.71	715	486	0		<1	<10	10.0	<1	1.74	0.08	500	440	10	20	1.48	<5	<1	<0.1	<1	<0.004	7	<1	150	21	<0.0001	3	10	<1					
12/09/2017	R								<0.65																									<0.5	<0.5	<0.5	<1.5	<3
4/10/2017	C	0.16	33.7	2.98	7.90	697	481	0	<0.65	<10	<10	26.0	1	2.10	0.14	562	494	12	47	1.72	<5	<1	<0.1	<1	<0.004	<1	<1	110	10	<0.0001	<1	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
1/11/2017	C	0.13	33.8	3.09	7.99	728	502	0		<1	<1	9.9											<0.1			1				<0.0001		<5		<0.5	<0.5	<0.5	2.00	<3
6/12/2017	C	0.19	33.5	2.31	7.83	708	489	0		<1		17.0											<0.1			<1				<0.0001		<5		<0.5	<0.5	<0.5	<1.5	<3
2018																																						
3/01/2018	C	1.63	33.7	1.29	8.10	673		0				20		2.14	0.045	370	325	43	8	1.84			<0.1			<1				<0.0001		7		<0.5	<0.5	<0.5	2.10	<3
7/02/2018	C	1.24	32.1	2.42	6.63	627		0				5.1		2.63	0.080	648	150	56	7	2.30			<0.1			<1				<0.0001		13		<0.5	<0.5	<0.5	1.80	<3
7/03/2018	C	1.94	32.6	1.42	7.33	717		0		<10	<10	6.1		3.07	0.060	839	189	75	27	2.22		<1	<0.1	<1	<0.004	<1	<1	300	16	<0.0001	1	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
4/04/2018	C	3.29	33.1	1.69	7.58	421		0				<1		2.82	0.120	497	19	4	17	2.19			<0.1			<1				<0.0001		<5		<0.5	<0.5	<0.5	2.10	<3
2/05/2018	C	0.15	32.2	2.07	7.80	306		0				9.9		2.38	0.100	279	12	177	14	2.76			<0.1			<1				<0.0001		5		<0.5	<0.5	<0.5	<1.5	<3
6/06/2018	C	6.50	30.4	0.53	7.93	570		0				<1		5.82	0.080	134	3,270	421	71	1.23			<0.1			13				<0.0001		6		<0.5	<0.5	<0.5	<1.5	<3
6/06/2018	R																						<0.1			2				<0.0001		28						
18/06/2018	R																									<1												
4/07/2018	C	5.22	30.1	0.88	7.94	464		0				<1		3.14	0.065	1,150	430	16	20	2.12			<0.1			<1				<0.0001		7		<0.5	<0.5	<0.5	<1.5	<3
1/08/2018	C	6.75	30.5	2.45	8.15	780		0				22		3.35	0.055	843	223	91	15	2.53			<0.1			<1				<0.0001		<5		<0.5	<0.5	<0.5	<1.5	<3
5/09/2018	C	2.13	32.7	1.31	7.97	741		0				5.2		1.79	0.045	363	345	49	19	1.44			<0.1			<1				<0.0001		<5		<0.5	<0.5	<0.5	<1.5	<3
20/09/2018	R											21.0																										
3/10/2018	C	0.05	33.5	3.10	7.95	913		0		<10	<10	12.0		2.79	0.075	244	11	171	18	2.22			<0.1			<1				<0.0001		<5		<0.5	<0.5	<0.5	2.10	<3
7/11/2018	C	5.45	35.7	0.74	8.18	757		0				4.4		2.32	0.115	705	66	3	52	2.21			<0.1			<1				<0.0001		<5		<0.5	<0.5	<0.5	2.20	<3
5/12/2018	C	6.06	35.0	0.53	7.83	837		0				<1		2.73	0.100	668	58	1	93	1.92			<0.1			1				<0.0001		<5		<0.5	<0.5	<0.5	3.20	4
2019																																						
2/01/2019	C	3.81	33.6	0.58	7.45	764		0				2.2		1.49	0.030	295	40	10	9	1.44			<0.1			<1				<0.0001		<5		<0.5	<0.5	<0.5	<1.5	<3
6/02/2019	C	4.94	32.4	0.92	7.97	758		0				5.6		2.51	0.050	884	114	7	19	2.39			<0.1			<1				<0.0001		<5		<0.5	<0.5	<0.5	2.4	<3
6/03/2019	C	4.27	34.1	0.67	8.02	771		0	<0.65	<10	<10	1.4		1.26	0.020	389	72	4	7	1.07	<5	<1	<0.1	2	<0.004	1	<1	160	3	<0.0001	1	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
3/04/2019	C	2.5	34.4	1.34	7.96	739		0				12.0		2.57	0.045	479	219	18	18	2.07			<0.1			1				<0.0001		<5		<0.5	<0.5	<0.5	<1.5	<3
1/05/2019	C	6.33	33.9	0.55	7.91	708		0				<1		3.52	0.090	869	230	9	74	2.78			<0.1			<1				<0.0001		<5		<0.5	<0.5	<0.5	<1.5	<3
5/06/2019	C	6.92	30.0	0.29	8.04	715		0				<1		1.09	0.060	150	292	1	11	0.62			<0.1			<1				<0.0001		<5		<1	<1	<1	<3	<6
26/06/2019	V													1.51	0.040	345	187	3	4	1.22																		
3/07/2019	C	0.03	30.4	2.33	8.13	690		0				11.0		2.06	0.050	217	98	80	9	2.00			<0.1			<1				<0.0001		<5		<0.5	<0.5	<0.5	<1.5	<3
10/07/2019	V													1.50	0.025	179	210	4	10	1.11																		
17/07/2019	V													1.08	0.020	181	215	1	6	0.92																		
24/07/2019	V													1.21	0.020	190	220	1	9	0.99																		
31/07/2019	V													1.18	0.020	97	216	2	7	1.15																		
7/08/2019	C	5.86	30.5	0.43	7.76	662		0				2.7		1.28	0.015	135	244	6	6	1.07			<0.1			<1				<0.0001		<5		<0.5	<0.5	<0.5	<1.5	<3
14/08/2019	V													1.47	0.040	178	281	3	20	1.16																		
4/09/2019	C	3.43	30.5	0.96	7.50	681		1				2.9		1.38	0.055	84	242	4	25	1.19			<0.1			<1				<0.0001		11		<0.5	<0.5	<0.5	<1.5	<3
2/10/2019	C	4.67	33.5	0.28	7.43	120		5		<10	<10	2.1		1.03	0.020	152	306	<1	23	0.83			<0.1			<1				<0.0001		25		<0.5	<0.5	<0.5	<1.5	<3
6/11/2019	C	3.46	33.6	0.80	7.58	824		3	<0.65	<10	<10	<1		1.14	0.040	357	350	37	4	1.10		<1	<0.1	<1		<1	<1	35	2	<0.0001	8	16	<1	<0.5	<0.5	<0.5	<1.5	<3
21/11/2019	V	3.80	33.6	0.74	7.41	815		<5	<0.65	<10	<10	17.0	<1	1.69	0.025	47	372	13	12	1.33		<1	<0.1	<1		1	<1	65	3	<0.0001	8	13	<1	<0.5	<0.5	<0.5	<1.5	<3
4/12/2019	C	3.61	35.2	0.95	7.75	904		1				2.3		1.62	0.035	326	357	8	19	1.30		<1	<0.1	<1		1	<1	44	7	<0.0001	12	18	<1	<0.5	<0.5	<0.5	<1.5	<3
11/12/2019	V	3.63	34.4	0.70	7.59	892		0						1.70	<0.020	350	250	8	<5	1.40		<1	<0.1	<1	<0.004	<1	<1	56	15	<0.0001	13	20	<1					
11/12/2019	V													1.57	0.035	392	297	9	19	0.97																		
17/12/2019	V	5.79	34.4	0.25	7.77	843		0						1.70	<0.02	310	300	6	8	1.40																		
17/12/2019	V													1.68	0.030	283	333	4	22	1.19																		
2020																																						
8/01/2020	C	3.11	34.2	0.68	7.58	902		1				5.6		1.65	0.04	376	365	11	14	1.35		<1	<0.1	<1	<0.001	<1	<1	95	5	<0.00005	5	8	<1	<1	<1	<1	<1	<4
15/01/2020	V													1.69	0.01	245	378	8	9	1.52		<1	<0.1	<1	<0.004	<1	<1	53	3	<0.0001	6	13	<1					
22/01/2020	V													1.15	0.01	186	466	15	11			<1	<0.1	<1		<1	<1	26	18	<0.0001	18	33	<1					
5/02/2020	C	3.35	33.3	0.57	7.34	808		1				3.2		1.14	0.02	293	191	18	11				<0.1			<1				<0.0001		27		<0.5	<0.5	<0.5	<1.5	<3
19/02/2020	C	3.88	33.0	0.46	7.66	800	459	0	<0.65	<10	<10	2.7	<1	1.10	0.01	222	274	14	11			<1	<0.1	<1		<1	<1	27	34	<0.0001	10	22	<1	<0.5	<0.5	<0.5	<1.5	<3
4/03/2020	C	3.55	33.3	0.26	8.19	573		1	<0.65	<10	<10	<1		1.16	0.015	219	350	11	12			<1	<0.1	<1	<0.004	<1	<1	19	67	<0.0001	8	20	<1	<0.5	<0.5	<0.5	<1.5	<3
1/04/2020	C	5.25	34.7	0.68	9.10	561		0				4.5		1.85	0.055	504	184	9	36				<0.1			1				<0.0001		7		<0.5	<0.5	<0.5	<1.5	<3
6/05/2020	C	0.60	33.4	1.42	7.73	708		0				10.0		1.53	0.735	218	201	27	14				<0.1			<1				<0.0001		7		<0.5	<0.5	<0.5	<1.5	<3
10/06/2020	C	1.58	31.8	1.87	7.57	855		1				6.5		1.88	0.05	460	112	22	29				<0.1			<1				<0.0001		<5		<0.5	<0.5	<0.5	<1.5	<3
17/06/2020	C	4.15	32.2	0.85	7.82	847	549	1	<0.65	<10	<10	3.9	<1	1.86	0.02	560	144	12	21	1.07		<1	<0.1	<1		<1	<1	89	210	<0.0001	3	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
8/07/2020	C	1.98	30.5	0.72	7.67	800		0				10.0		1.60	0.03	327	156	14	19				<0.1			1				<0.0001		8		<0.5	<0.5	<0.5	<1.5	<3
5/08/2020	C	2.34	30.5	1.05	7.54	580		0				4.6		1.25	0.03	200	172	11	12				<0.1			<1				<0.0001		10		<0.5	<0.5	<0.5	<1.5	<3
17/08/2020	C	1.65	31.4	1.12	7.49	840	420	1	<0.65	<10	<10	2.2	<1	1.26	0.25	242	157	15	15			<1	<0.1	<1		<1	<1	88	30	<0.0001	2	7	<1	<0.5	<0.5	<0.5	<1.5	<3
9/09/2020	C	2.82	33.0	1.08	7.52	804		0				5.6		1.27	0.10	376	140	13	100				<0.1			<1				<0.0001		5		<0.5	<0.5	<0.5	1.6	<3
7/10/2020	C	2.42	33.8	0.93	7.68	734		0		<10	<10	3.2	<1	1.05	0.02	165	260	3	8				<0.1			<1				<0.0001		7		<0.5	<0.5	<0.5	<1.5	<3
4/11/2020	C	3.75	35.2	1.41	7.72	837		0				2.2		1.49	0.015	444	312	5	2				<0.1			1				<0.0001		10		<0.5	<0.5	<0.5	<1.5	<3
9/11/2020	C	2.90	34.6	0.62	7.60	847		0	<0.65	<10	<10	3.0	<1	1.70	0.025	511	321	10	7			<1	<0.1	<1		1	<1	42	5	<0.0001	3	15	<1	<0.5	<0.5	<0.5	<1.5	<3
2/12/2020	C	3.83	34.5	0.82	7.54	706		0				2.1		0.99	0.135	316	206	9	2				<0.1			<1				<0.0001		15		<0.5	<0.5	<0.5	<1.5	<3
2021																																						
6/01/2021	C	0.98	34.3	0.84	7.56	704		0				11.0		1.69	0.020	258	155	13	4				<0.05			<1				<0.0001		<1		<1	<1	<1	<1	<2
3/02/2021	C	3.68	31.2	0.73	7.52	643		0				3.5		1.04	0.015	265	247	7	3				<0.1			<1				<0.0001		12		<0.5	<0.5	<0.5	<1.5	<3
23/02/2021	C	3.34	31.3	0.67	7.46	541		0	<0.65	<10	<10	3.5	<1	0.99	0.015	156	273	4	4			<1	<0.1	<1		1	<1	52	4	<0.0001	2	12	<1	<0.5	<0.5	<0.5	<1.5	<3
3/03/2021	C	3.17	32.9	1.17	7.47	725		0	<0.65	<10	<10	2.1		0.97	0.015	125	346	3	2				<0.1	<1		2	<1	54	21	<0.0001	6	52	<1	<0.5	<0.5	<0.5	<1.5	<3
24/03/2021	V																						<0.05			<1				<0.0001		15						
7/04/2021	C		27.2	0.93	7.53	692		0															<0.1			1				<0.0001		15						
5/05/2021	C	3.65	32.3	0.46	7.71	786		0																														
11/05/2021	C	4.42	31.6	0.29	7.59	701		0				2.7		1.39	0.010	394	325	4	6				<0.1			<1					2	16						
2/06/2021	C	4.23	31.7	0.62	7.76	750		0						1.01	0.030	477	217	8	17																			
7/07/2021	C	5.53	29.5	0.32	7.72	751		7																														
16/08/2021	C	5.16	31.8	0.83	7.76	694	460	0	<0.65	<1		2.5	<1	2.82	0.120	222	343	16	10			<1	<0.1	<1		<1	<1	26	7	<0.0001	2	12		<0.5	<0.5	<0.5	<1.5	<3
1/09/2021	C	0.30	32.5	1.16	7.55	840		1																														
8/09/2021										<10	<10																											
6/10/2021	c	1.49	34.0	1.16	7.70	910		0				22.0										1	<0.1	<1		<1	<1	82	17	<0.0001	2	13		<0.5	<0.5	<0.5	<1.5	<3
10/11/2021	C	4.50	34.8	0.96	7.82	859	424	0				<1	<1	1.67	0.01	413	258	7	10			1	<0.1	<1		2	<1	64	14	<0.0001	2	14	<1	<0.5	<0.5	<0.5	<1.5	<3
1/12/2021	C	4.01	26.1	0.43	7.93	1,165		0																														
5/01/2022		3.82	34.0	0.34	7.79	96		0						1.59	0.338	333	338	14	9																			
2022																																						
1/02/2022		5.37	31.7	0.40	7.79	876		0		<10	<10	1.1										1	<0.1	<1		2	<1	31	17	<0.0001	2	21	<1	<0.5	<0.5	<0.5	<1.5	<3
14/02/2022		5.31	32.7	0.51	7.74	893	554	0					<1	1.37	0.015	75	513	21	12				<0.1			2					2	20						
8/03/2022		0.08	25.7	1.23	7.54	829		3																														
6/03/2022		3.01	34.7	0.48	7.70	932		2																														
16/05/2022		1.21	34.8	1.11	7.53	750		0		52.000	<10	2.0	<1	1.73	0.035	584	157	8	13			1	<0.1	<1		1	<1	26	5	<0.0001	2	11	<1	<0.5	<0.5	<0.5	<1	<3
1/06/2022		3.46	32.8	0.41	7.74	781		1																														
12/07/2022		3.23	28.3	0.65	7.80	821		0																														
3/08/2022		3.51	30.9	0.58	7.92	919		0																														
22/08/2022		4.27	30.7	0.65	7.84	1,021		0					<1	1.64	0.015	224	318	19	8																			
7/09/2022		3.97	32.8	0.31	8.00	828		1																														
5/10/2022		2.62	33.7	0.69	7.98	984		3																														
2/11/2022		0.15	35.8	2.04	7.53	814		6																														

SEDIMENT POND 1 (1SC-2915)

Date Sampled / Analyte	Sampling Reason (Compliance / Retest / Voluntary)	DO	Temp	Turbidity	pH	EC	TDS	TSS	TRH	E Coli	Enterococci	BOD	Chlorophyll a	TN	TP	NH3-N	NO3-N	NO2-N	PO4-P	TKN	Al	As	Cd	Cr Total	Cr VI	Cu	Pb	Fe	Mn	Hg	Ni	Zn	Ag	Benzene	Toluene	Ethyl Benzene	Xylene	BTEX
		mg/L	˚C	NTU		µS/cm	mg/L	mg/L	mg/L	MPN/100mL	MPN/100mL	mg/L	µg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EPL 217 Trigger Value		**N/A**	**N/A**	**28**	**6-8.5**	**N/A**	**N/A**	**75**	**6**	**305**	**261**	**25**	**N/A**	**40**	**10**	**94**	**145**	**17**	**5**	**N/A**	**N/A**	**N/A**	**5.5**	**4.4**	**N/A**	**2**	**4.4**	**N/A**	**N/A**	**0.4**	**70**	**1000**	**1.4**	**N/A**	**N/A**	**N/A**	**N/A**	**700**
LOR			N/A		N/A				0.65	10	10	<1	1	0.01	0.005	1	1	1	1	10	5	1	0.1	1	0.004	1	1	5	1	0.0001	1	5	1	0.5	0.5	0.5	1.5	3
Testing Frequency		Monthly	Monthly	Monthly	Monthly	Monthly	N/A	Monthly	Annual	Biannual	Biannual	Monthly	N/A	Annual	Annual	Annual	Annual	Annual	Annual	N/A	N/A	Annual	Monthly	Annual	N/A	Monthly	Annual	Annual	Annual	Monthly	Annual	Monthly	Annual	Monthly	Monthly	Monthly	Monthly	Monthly
2016																																						
6/01/2016	C	3.98	31.6	0.80	5.72	111	77	0	<0.65	3	<1	6.3	2	0.16	0.005	26	16	<1	<1	0.15	<5	<1	0.1	<1	<0.005	<1	<1	130	400	<0.0001	<1	100	<1	<0.5	<0.5	<0.5	<1.5	<3
12/01/2016	V				2.24			0																														
14/01/2016	R							0													<5	<1	<0.1	<1	<0.005	3	<1	110	300	<0.0001	1	47	<1					
19/01/2016	V				2.23			0																														
27/01/2016	V				5.93			0																														
3/02/2016	C	3.91	28.5	2.66	7.08	101	67	0	<0.65	5	12	1.1	2	0.38	0.010	84	98	4	<1	0.33	<5	<1	<0.1	<1	<0.005	<1	<1	140	460	<0.0001	<1	98	<1	<0.5	<0.5	<0.5	<1.5	<3
10/02/2016	V				6.40			0																														
17/02/2016	V				6.97			0																														
24/02/2016	V				6.59			0																														
2/03/2016	C	5.67	32.6	2.51	7.30	96	65	0	<0.65	<1	11	<5	4	0.65	0.010	28	72	8	<1	0.65	<1	<1	<0.1	<1	<0.005	1	<1	180	770	<0.0001	<1	25	<1	<0.5	<0.5	<0.5	<1.5	<3
10/03/2016	V				6.06			0																														
16/03/2016	V				6.86			0																														
22/03/2016	V				5.99			0																														
30/03/2016	V				6.40			0																														
4/04/2016	C	4.21	32.0	2.90	5.87	118	79	0	<0.65	<1	33	<1	2	0.26	0.020	26	4	4	2	0.24	<5	<1	<0.1	<1	<0.005	<1	<1	360	910	<0.0001	<1	15	<1	<0.5	<0.5	<0.5	<1.5	<3
13/04/2016	V				6.06			0																														
20/04/2016	V				7.26			0																														
27/04/2016	V				6.92			0																														
4/05/2016	C	4.84	30.0	2.20	7.13	119	80	0	<0.65	1	8	<1	2	0.21	0.005	13	<1	<1	3	0.21	<5	<1	<0.1	<1	<0.005	1	<1	200	380	<0.0001	<1	10	<1	<0.5	<0.5	<0.5	<1.5	<3
11/05/2016	V				6.97			0																														
18/05/2016	V				6.88			0																														
25/05/2016	V				6.06			0																														
1/06/2016	C	5.41	29.3	1.10	6.54	158	109	0	<0.65	<1	93	<1	<1	0.25	0.015	7	2	3	6	0.18	<5	<1	<0.1	<1	<0.005	<1	<1	120	110	<0.0001	<1	6	<1	<0.5	<0.5	<0.5	<1.5	<3
8/06/2016	V				6.46			0																														
16/06/2016	V				7.37			0																														
22/06/2016	V				7.37			0																														
29/06/2016	V				6.21			0																														
5/07/2016	C	6.89	27.8	1.47	6.34	145	103	0	<0.65	3	48	<1	2	0.23	<0.005	30	2	<1	<1	0.23	<5	<1	<0.1	<1	<0.005	<1	<1	43	32	<0.0001	<1	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
13/07/2016	V				6.26			0																														
20/07/2016	V				7.15			0																														
27/07/2016	V				6.18			0																														
21/09/2016	V				5.97			0																														
2/11/2016	C	6.85	32.9	1.22	7.16	456	313	0	<0.65	42	53	1.8	2	0.37	0.025	22	3	1	2	0.35	<5	<1	0.1	<1	<0.004	<1	<1	92	1,900	<0.0001	3	120	<1	<0.5	<0.5	<0.5	<1.5	<3
23/11/2016	V				7.62			0																														
30/11/2016	V				6.26			0																														
14/12/2016	V				6.78			0																														
21/12/2016	V				6.36			0																														
28/12/2016	V				6.44			0																														
2017																																						
4/01/2017	C	5.22	28.3	1.88	6.30	95	65	0	<0.65	75	108	<1	1	0.2	0.015	8	46	3	1	0.18	17	<1	0.3	<1	<0.004	<1	<1	190	88	<0.00005	<1	240	<1	<0.5	<0.5	<0.5	<1.5	<3
9/01/2017	R									<10	<10																											
11/01/2017	V				6.30			0																														
17/01/2017	V				6.47			2																														
25/01/2017	V				6.32			0																														
1/02/2017	C	5.54	30.8	1.56	6.72	70	48	0	<0.65	20	10	<1	3	0.2	0.010	3	9	1	<1	0.14	18	<1	0.1	<1	<0.004	<1	<1	240	300	<0.0001	<1	120	<1	<0.5	<0.5	<0.5	<1.5	<3
8/02/2017	V				6.28			0																														
15/02/2017	V				7.79			0																														
22/02/2017	V				7.04			0																														
1/03/2017	C	3.76	31.2	1.19	7.24	110	76	1	<0.65	10	10	<1	3	0.2	0.010	28	6	<1	2	0.16	6	<1	<0.1	<1	<0.004	<1	<1	500	610	<0.0001	<1	66	<1	<0.5	<0.5	<0.5	<1.5	<3
9/03/2017	V				6.37			0																														
15/03/2017	V				7.42			0																														
22/03/2017	V				6.92			0																														
29/03/2017	V				7.44			0																														
5/04/2017	C	6.50	31.2	1.37	7.27	103	70	0	<0.65	10	10	2.6	2	0.2	<0.005	2	1	1	1	0.16	5	<1	<0.1	<1	<0.004	<1	<1	310	490	<0.0001	<1	83	<1	<0.5	<0.5	<0.5	<1.5	<3
11/04/2017	V				6.45			0																														
19/04/2017	V				7.09			0																														
26/04/2017	V				6.9			0																														
9/05/2017	C				7.13			1	<0.65	20	41	1.3	8	0.3	0.03	6	1	2	1	0.32	<5	<1	<0.1	<1	<0.004	<1	<1	430	310	<0.0001	<1	45	<1	<0.5	<0.5	<0.5	<1.5	<3
17/05/2017	C				6.70			1	<0.65	10	31	2.7	5	0.4	0.02	85	7	<1	1	0.35	6	<1	<0.1	<1	<0.004	<1	<1	440	1,500	<0.0001	1	54	<1	<0.5	<0.5	<0.5	<1.5	<3
25/10/2017	V				7.55			0																														
1/11/2017	C	7.63	31.3	7.08	6.24	235	122	0				<1											3.8			2				<0.0001		2,300		<0.5	<0.5	<0.5	<1.5	<3
6/12/2017	C	7.57	31.7	3.80	7.48	98	68	4				1.2											0.2			1				<0.0001		58		<0.5	<0.5	<0.5	<1.5	<3
2018																																						
3/01/2018	C	9.02	31.3	1.23	7.05	114		0				5.0											0.2			<1				<0.0001		93		<0.5	<0.5	<0.5	<1.5	<3
7/02/2018	C	5.18	29.0	1.84	5.91	64		0				<1											0.2			<1				<0.0001		180		<0.5	<0.5	<0.5	<1.5	<3
7/03/2018	C	5.34	31.5	1.43	7.55	109		0		31	62	1.0		0.22	0.01	11	18	2	6	<0.01		<1	0.2	<1	<0.004	<1	<1	130	47	<0.0001	<1	120	<1	<0.5	<0.5	<0.5	<1.5	<3
4/04/2018	C	5.5	30.7	1.20	7.66	137		0				1.3											<0.1			<1				<0.0001		84		<0.5	<0.5	<0.5	<1.5	<3
2/05/2018	C	5.94	29.1	0.75	7.22	137		0				<1		0.22	0.01	12	5	<1	2	<0.01			<0.1			<1				<0.0001		24		<0.5	<0.5	<0.5	<1.5	<3
6/06/2018	C	7.65	24.3	0.80	6.76	148		0				<1		0.26	0.01	4	8	<1	1	0.29			<0.1			<1				<0.0001		62		<0.5	<0.5	<0.5	<1.5	<3
4/07/2018	C	7.36	28.1	0.49	7.75	111		0				<1		0.24	<0.005	13	4	<1	3	0.20			<0.1			<1				<0.0001		20		<0.5	<0.5	<0.5	<1.5	<3
1/08/2018	C	0.56	26.9	0.71	7.56	146		0				4.8		0.5	<0.005	4	<1	2	4	0.19			<0.1			<1				<0.0001		22		<0.5	<0.5	<0.5	<1.5	<3
5/09/2018	C	6.13	30.3	0.77	6.95	164		0				1.0		0.26	<0.005	4	1	1	<1	0.33			<0.1			<1				<0.0001		9		<0.5	<0.5	<0.5	<1.5	<3
3/10/2018	C	5.79	29.4	1.50	7.46	151		0		52	20	<1		0.26	0.005	9	1	<1	2	0.17			<0.1			<1				<0.0001		7		<0.5	<0.5	<0.5	<1.5	<3
7/11/2018	C	5.61	30.3	0.82	6.95	172		0				<1		0.73	0.01	4	1	<1	<1	0.54			<0.1			<1				<0.0001		<5		<0.5	<0.5	<0.5	<1.5	<3
5/12/2018	C	5.64	32.4	0.74	6.34	152		0				<1		0.21	0.01	8	1	2	1	0.16			<0.1			<1				<0.0001		25		<0.5	<0.5	<0.5	<1.5	<3
2019																																						
2/01/2019	C	5.07	30.1	0.96	6.51	121		0				2.8		0.32	0.01	8	42	<1	<1	0.28			0.1			<1				<0.0001		130		<0.5	<0.5	<0.5	<1.5	<3
6/02/2019	C	4.71	28.1	1.30	6.51	72		0				1.2		0.20	0.01	11	30	3	4	0.17			0.1			<1				<0.0001		100		<0.5	<0.5	<0.5	<1.5	<3
6/03/2019	C	4.81	31.9	1.03	6.42	74		0	<0.65	20	<10	1.9		0.18	0.02	10	<1	<1	16	0.02	<5	<1	<0.1	<1	<0.004	<1	<1	87	260	<0.0001	<1	72	<1	<0.5	<0.5	<0.5	<1.5	<3
18/03/2019	R																					<1	<0.1	<1		<1	<1	140	240		<1		<1	<0.5	<0.5	<0.5	<1.5	<3
25/03/2019	R													0.24	0.010	125	95	3	1	0.13																		
3/04/2019	C	5.49	31.0	0.81	6.48	97		0				1.1		0.20	0.005	112	21	1	6	0.18			<0.1			<1				<0.0001		28		<0.5	<0.5	<0.5	<1.5	<3
1/05/2019	C	5.2	29.6	0.93	6.66	108		0				1.1		0.14	0.010	25	<1	2	<1	0.13			<0.1			<1				<0.0001		14		<0.5	<0.5	<0.5	<1.5	<3
5/06/2019	C	6.02	22.7	0.80	7.69	118		0				1.5		0.23	0.015	15	3	<1	<1	0.23			<0.1			<1				<0.0001		7		<1	<1	<1	<3	<6
3/07/2019	C	6.26	24.8	2.12	7.29	114		0				<1		0.21	0.010	13	<1	2	2	0.19			<0.1			<1				<0.0001		12		<0.5	<0.5	<0.5	<1.5	<3
7/08/2019	C	6.74	22.4	0.78	7.23	111		0				1.3		0.20	0.005	17	<1	5	<1	0.20			<0.1			<1				<0.0001		16		<0.5	<0.5	<0.5	<1.5	<3
4/09/2019	C	6.97	26.6	0.69	7.41	116		1				<1		0.18	0.005	4	3	2	2	0.10			<0.1			<1				<0.0001		7		<0.5	<0.5	<0.5	<1.5	<3
2/10/2019	C	6.37	30.1	0.72	7.43	120		2				2.3		0.29	0.005	35	<1	<1	3	0.28			<0.1			<1				<0.0001		<5		<0.5	<0.5	<0.5	<1.5	<3
15/10/2019	R								<0.65																									<0.5	<0.5	<0.5	<1.5	<3
6/11/2019	C	3.77	28.7	4.97	6.77	279		3	<0.65	272	235	<1		0.70	0.020	29	380	9	<1	0.45		<1	0.4	<1		<1	<1	150	790	<0.0001	2	520	<1	<0.5	<0.5	<0.5	<1.5	<3
11/11/2019	R									<10	<10																											
4/12/2019	C	4.46	30.9	0.73	6.89	211		0		10	<10	<1		0.28	0.015	35	3	2	15	0.28		<1	<0.1	<1		<1	<1	99	150	<0.0001	<1	24	<1	<0.5	<0.5	<0.5	<1.5	<3
11/12/2019	V	4.89	31.7	0.73	7.16	182		5		30	<10			0.38	<0.020	10	<5	<5	6	0.38		<1	<0.1	<1	<0.004	<1	<1	120	190	<0.0001	<1	11	<1					
11/12/2019	V													0.28	0.015	27	<1	1	<1	0.06																		
17/12/2019	V	4.71	31.7	0.56	6.86	183		0		<10	<10			0.32	<0.02	29	97	6	5	0.22		<1	<0.1	<1	<0.004	<1	<1	39	220	<0.0001	<1	99	<1					
17/12/2019	V													0.71	0.010	18	92	5	2	0.67																		
2020																																						
8/01/2020	C	3.45	29.5	1.93	6.48	127		3				1.3		0.31	0.030	62	13	3	<1	0.29		<1	<0.1	<1	<0.001	<1	<1	6	3	<0.00005	<1	40	<1	<1	<1	<1	<1	<4
15/01/2020	V													0.32	0.020	20	63	4	<1	0.23			0.1			<1				<0.0001		130						
22/01/2020	V													0.24	0.020	17	83	3	7																			
5/02/2020	C	4.67	28.7	1.77	6.71	132		1				<1											0.1			<1				<0.0001		130		<0.5	<0.5	<0.5	<1.5	<3
4/03/2020	C	5.88	29.6	1.36	7.07	139		2	<0.65	<10	10	<1		0.18	0.010	26	3	<1	<1			<1	<0.1	<1	<0.004	<1	<1	77	140	<0.0001	<1	80	<1	<0.5	<0.5	<0.5	<1.5	<3
1/04/2020	C	4.63	30.7	2.28	6.51	107		2				1.0											<0.1			<1				<0.0001		14		<0.5	<0.5	<0.5	<1.5	<3
6/05/2020	C	3.25	26.1	5.49	6.80	87		4	<0.65			3.2											<0.1			<1				<0.0001		<5		<0.5	<0.5	<0.5	<1.5	<3
10/06/2020	C	5.36	24.9	3.85	6.98	97		1				1.4											<0.1			<1				<0.0001		7		<0.5	<0.5	<0.5	<1.5	<3
8/07/2020	C	5.41	23.9	3.41	6.96	98		4				1.6											<0.1			<1				<0.0001		24		<0.5	<0.5	<0.5	<1.5	<3
5/08/2020	C	5.81	24.5	1.33	7.05	113		1				1.5											<0.1			<1				<0.0001		12		<0.5	<0.5	<0.5	<1.5	<3
9/09/2020	C	5.51	28.5	1.36	7.30	122		0				3.2											<0.1			<1				<0.0001		6		<0.5	<0.5	<0.5	<1.5	<3
7/10/2020	C	4.57	28.4	6.67	6.76	198		0		933	512	<1		0.63	0.015	41	313	3	8				0.6			<1				<0.0001		360		<0.5	<0.5	<0.5	<1.5	<3
19/10/2020	V	5.19	29.5	1.21	6.83	196		0		10	<10																											
28/10/2020	V	6.22	29.7	2.19	7.23	170		0		31	20																											
4/11/2020	V	6.33	30.6	7.28	6.64	177		0		31	10	<1											<0.1			<1				<0.0001		25		<0.5	<0.5	<0.5	<1.5	<3
11/11/2020	V	5.20	30.5	1.61	7.15	195		0		74	10																											
18/11/2020	V	5.34	30.8	0.81	7.11	167		0		52	<10																											
25/11/2020	V	5.20	28.4	2.19	6.70	143		0		10	146																											
2/12/2020	C	4.94	29.9	1.04	6.54	132		0				1.1											0.1			<1				<0.0001		180		<0.5	<0.5	<0.5	<1.5	<3

2021																																						
6/01/2021	C	6.25	31.0	2.06	7.18	88		0		10	31	<1		0.37	0.015	8	2	1	<1			<0.5	0.1	<0.5		<1	<0.2	120	80	<0.0001		61	<1	<1	<1	<1	<1	<2
3/02/2021	C	5.98	23.7	2.84	6.55	81		0				1.0											0.2			<1				<0.0001		130		<0.5	<0.5	<0.5	<1.5	<3
3/03/2021	C	5.28	29.2	1.58	6.81	91		0	<0.65	20	20	<1		0.06	0.005	11	3	1	<1			<1	<0.1	<1		<1	<1	110	300	<0.0001	6	52	<1	<0.5	<0.5	<0.5	<1.5	<3
7/04/2021	C	5.47	28.0	1.74	6.53	72		0				<1											<0.1			<1				<0.0001		64		<0.5	<0.5	<0.5	<1.5	<3
5/05/2021	C	5.40	27.0	1.54	6.87	86		0				1.9											<0.1			<1				<0.0001		7		<0.5	<0.5	<0.5	<1.5	<3
3/06/2021	C	5.46	26.1	1.50	6.95	100		0				1.9											<0.1			<1				<0.0001		5		<0.5	<0.5	<0.5	<1.5	<3
7/07/2021	C	6.67	23.2	1.28	6.79	101		0				2.7											<0.1			<1				<0.0001		9		<0.5	<0.5	<0.5	<1.5	<3
4/08/2021	C	4.71	27.2	2.21	6.88	108		4				<1											<0.1			<1				<0.0001		<5		<0.5	<0.5	<0.5	<1.5	<3
1/09/2021	C	5.19	27.9	1.35	7.16	113		0				<1											<0.1			<1				<0.0001		<5		<0.5	<0.5	<0.5	<1.5	<3
6/10/2021	c	5.89	25.8	6.92	7.46	197		0															<0.1			<1				<0.0001		32		<0.5	<0.5	<0.5	<1.5	<3
10/11/2021	C	4.36	29.6	6.61	6.73	112		1		75	52	<1		0.5700	0.0150	29	**193**	6.0					<0.1			2				<0.0001		48		<0.5	<0.5	<0.5	<1.5	<3
1/12/2021	C	7.04	29.0	3.28	6.90	164		7		20	10	<1											<0.1			<1				<0.0001		210		<0.5	<0.5	<0.5	<1.5	<3
13/12/2021																							0.20			<1				<0.0001		200						
2022																																						
5/01/2022		5.65	30.3	2.61	6.74	85		0				<1											0.30			<1				<0.0001		240		<0.5	<0.5	<0.5	<1.5	<3
1/02/2022		6.58	27.5	2.28	6.38	87.4		0		41	<10	2.5		0.23	0.15	14	39	<1	<1			<1	0.2	<1		<1	<1	5	190	<0.0001	<1	160	<1	<0.5	<0.5	<0.5	<1.5	<3
8/03/2022		4.55	32.1	1.67	7.12	122.2		2.3				2.5											<0.1			<1				<0.0001		64		<0.5	<0.5	<0.5	<1.5	<3
6/04/2022		4.57	26.5	8.94	6.41	128		4				3.7											0.7			<1				<0.0001		420		<0.5	<0.5	<0.5	<1.5	<3
4/05/2022		5	29.8	1.77	6.64	134.6		0				1.3											<0.1			<1				<0.0001		11		<0.5	<0.5	<0.5	<1.5	<3
1/06/2022																																						
12/07/2021		6.69	21.5	1.12	6.97	146.7		0				<1											<0.1			<1				<0.0001		15		<0.5	<0.5	<0.5	<1.5	<3
3/08/2022		7.7	35.1	1.77	7.27	126.8		1				1.1											<0.1			<1				<0.0001		7		<0.5	<0.5	<0.5	<1.5	<3
7/09/2022		5.17	28.3	1.77	7.14	146.4		0				2.3											<0.1			<1				<0.0001		14		<0.5	<0.5	<0.5	<1.5	<3
5/10/2022		3.59	29.8	2.13	6.84	219.6		0															0.7			<1				<0.0001		320		<0.5	<0.5	<0.5	<1.5	<3
2/11/2022		4.8	35	0.96	6.77	452.3		3															<0.1			<1				<0.0001		12		<0.5	<0.5	<0.5	<1.5	<3
4/01/2023																							0.2			<1				<0.0001		220		<0.5	<0.5	<0.5	<1.5	<3

SEDIMENT POND 2 (1SC-2916)

Date Sampled / Analyte	Sampling Reason (Compliance / Retest / Voluntary)	DO	Temp	Turbidity	pH	EC	TDS	TSS	TRH	E Coli	Enterococci	BOD	Chlorophyll a	TN
		mg/L	℃	NTU		µS/cm	mg/L	mg/L	mg/L	MPN/100m	MPN/100mL	mg/L	µg/L	mg/L
EPL 217 Trigger Value		**N/A**	**N/A**	**28**	**6-8.5**	**N/A**	**N/A**	**75**	**6**	**305**	**261**	**25**	**N/A**	**40**
LOR			N/A		N/A				0.65	10	10	<1	1	0.01
Testing Frequency		Monthly	Monthly	Monthly	Monthly	Monthly	N/A	Monthly	Annual	Biannual	Biannual	Monthly	N/A	Annual
2016														
21/01/2016	V				5.89			10						
3/02/2016	C	3.15	30.4	7.86	7.80	101	67	0	<0.65	11	34	37.0	3	7.26
25/02/2016	V				6.39			0						
10/03/2016	V				6.10			1						
16/03/2016	V				6.55			0						
22/03/2016	V				6.02			3						
21/09/2016	V				6.10			4						
23/11/2016	V				7.42			0						
30/11/2016	V				6.27			0						
14/12/2016	V				6.82			1						
21/12/2016	V				6.32			13						
28/12/2016	V				6.55			8						
2017														
4/01/2017	C	6.43	27.8	20.70	6.37	56	38	2	<0.65	85	216	<1	2	0.15
9/01/2017	R									<10	41			
25/01/2017	V				6.64			29						
1/02/2017	C	6.55	30.7	20.10	6.68	45	31	2	<0.65	241	173	<1	5	0.28
8/02/2017	R				6.33			0		10	120			
15/02/2017	V				7.75			0						
1/03/2017		6.75	32.2	1.63	7.94	121		1	0.65	10	<10	1.3	2	0.41
9/03/2017	V				6.44			4						
15/03/2017	V				7.42			<1						
22/03/2017	V				6.91			6						
2018														
7/02/2018	C	5.74	29.0	9.35	6.22	48		0				<1		
7/03/2018	C	3.12	30.8	7.82	6.89	121		0	<0.65	<10	52	7.4		1.89
2019														
2/01/2019	C	5.71	30.7	10.70	6.22	155		0				1.8		
6/02/2019	C	5.98	28.3	14.00	6.18	61		0				<1		
6/11/2019	C	4.98	29.2	105.00	6.68	405		57	<0.65	933	620	<1		1.38
11/11/2019	R									209	<10			
4/12/2019	C	4.20	31.4	10.00	6.56	401		5		109	175	<1		0.85
11/12/2019	V	6.34	32.1	5.86	6.88	398		5		20	<10			1.20
11/12/2019	V													0.69
17/12/2019	V	4.31	30.9	22.00	6.49	253		10		160	336			1.40
17/12/2019	V													1.14
2020														
8/01/2020	C	6.60	30.3	3.93	6.63	234		2		10	<10	<1		0.29
15/01/2020	V													0.23
22/01/2020	V													0.18
5/02/2020	C	5.83	30.3	20.6	6.85	106		15				<1		
4/03/2020	C	6.26	30.4	3.8	6.69	107		1	<0.65	10	10	1.2		0.18
7/10/2020	C	4.61	29.7	92.7	6.47	359		107		285	417	<1		1.15
19/10/2020	V	4.87	31.6	6.7	6.74	346		5		110	30			
28/10/2020	V	3.60	30.8	4.4	6.44	331		0		<10	504			
4/11/2020	V	6.18	31.7	4.3	6.49	359		0		10	209	<1		
11/11/2020	V	6.53	30.7	2.9	6.47	376		0		20	404			
18/11/2020	V	6.62	31.4	2.9	6.48	344		0		40	<10			
25/11/2020	V	4.26	29.8	18.9	6.39	238		8		75	63			
16/12/2020	V	5.45	28.7	51.9	6.31	112		56		161	521			
2021														
3/02/2021	C	6.34	28.6	15.1	6.66	68		6		561	98	<1		
15/03/2021	C	5.05	29.3	11.00	6.66	93		2	<0.65	768	120	<1		0.2
10/11/2021	C	6.00	28.3	18.00	6.56	109		7		73	86	<1		0.36
2022														
5/01/2022		4.32	30.5	8.32	6.34	115		2		31	>24196	<1		
1/02/2022		6.38	28.5	11.00	6.38	87		3		41	20	1.1		0.18
8/03/2022														
6/04/2022		5.69	28.4	64.80	6.37	119		24				2.3		
5/10/2022		4.98	28.5	39.10	6.60	354		17						
2/11/2022														

Date Sampled / Analyte	TP	NH3-N	NO3-N	NO2-N	PO4-P	TKN	Al	As	Cd	Cr Total	Cr VI	Cu	Pb	Fe	Mn	Hg	Ni	Zn	Ag	Benzene	Toluene	Ethyl Benzene	Xylene	BTEX
	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EPL 217 Trigger Value	**10**	**94**	**145**	**17**	**5**	**N/A**	**N/A**	**N/A**	**5.5**	**4.4**	**N/A**	**2**	**4.4**	**N/A**	**N/A**	**0.4**	**70**	**1000**	**1.4**	**N/A**	**N/A**	**N/A**	**N/A**	**700**
LOR	0.005	1	1	1	1	10	5	1	0.1	1	0.004	1	1	5	1	0.0001	1	5	1	0.5	0.5	0.5	1.5	3
Testing Frequency	Annual	Annual	Annual	Annual	Annual	N/A	N/A	Annual	Monthly	Annual	N/A	Monthly	Annual	Annual	Annual	Monthly	Annual	Monthly	Annual	Monthly	Monthly	Monthly	Monthly	Monthly
2016																								
21/01/2016																								
3/02/2016	0.03	308	89	9	<1	7.20	19	<1	<0.1	<1	<0.005	5	<1	29	17	<0.0001	<1	15	<1	<0.5	<0.5	<0.5	<1.5	<3
25/02/2016																								
10/03/2016																								
16/03/2016																								
22/03/2016																								
21/09/2016																								
23/11/2016																								
30/11/2016																								
14/12/2016																								
21/12/2016																								
28/12/2016																								
2017																								
4/01/2017	0.03	4	68	1	2	0.09	10	<1	<0.1	<1	<0.004	1	<1	19	64	<0.00005	<1	40	<1	<0.5	<0.5	<0.5	<1.5	<3
9/01/2017																								
25/01/2017																								
1/02/2017	0.02	8	16	<1	3	0.24	85	<1	<0.1	<1	<0.004	<1	<1	100	110	<0.0001	<1	44	<1	<0.5	<0.5	<0.5	<1.5	<3
8/02/2017																								
15/02/2017																								
1/03/2017	0.01	37	16	5	11		<5	<1	<0.1	<1	<0.004	1	<1	270	7	<0.0001	<1	5	<1	<0.5	<0.5	<0.5	<1.5	<3
9/03/2017																								
15/03/2017																								
22/03/2017																								
2018																								
7/02/2018												1				<0.0001		44		<0.5	<0.5	<0.5	<1.5	<3
7/03/2018	<0.005	270	116	8	2	1.49		<1	<0.1	<1	<0.004	<1	<1	140	2	<0.0001	<1	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
2019																								
2/01/2019									<0.1			2				<0.0001		74		<0.5	<0.5	<0.5	<1.5	<3
6/02/2019									<0.1			1				<0.0001		45		<0.5	<0.5	<0.5	<1.5	<3
6/11/2019	0.05	210	534	23	3	0.89		<1	0.20	<1		4	<1	290	3,400	<0.0001	8	320	<1	<0.5	<0.5	<0.5	<1.5	<3
11/11/2019																								
4/12/2019	<0.005	35	68	5	<1	0.84		<1	<0.1	<1		2	<1	200	1,800	0.0001	7	120	<1	<0.5	<0.5	<0.5	<1.5	<3
11/12/2019	<0.020	16	<5	<5	6	1.20		<1	<0.1	<1	<0.004	<1	<1	380	950	<0.0001	3	68	<1					
11/12/2019	0.020	39	2	2	2	0.60																		
17/12/2019	0.030	150	500	12	<5	0.87		<1	0.20	<1	<0.004	2	<1	140	1,700	<0.0001	5	200	<1					
17/12/2019	0.015	120	511	13	13	0.29																		
2020																								
8/01/2020	0.045	7	7	4	<1	0.28		<1	<0.1	<1	<0.001	1	<1	14	270	<0.00005	2	58	<1	<1	<1	<1	<1	<4
15/01/2020	0.020	33	84	1	<1	0.07																		
22/01/2020	0.045	17	96	3	3																			
5/02/2020									<0.1			2				<0.0001		52		<0.5	<0.5	<0.5	<1.5	<3
4/03/2020	0.010	31	17	<1	3			<1	<0.1	<1	<0.004	1	<1	76	78	<0.0001	<1	27	<1	<0.5	<0.5	<0.5	<1.5	<3
7/10/2020	0.02	129	625	7	<1				0.30			4				<0.0001		270		<0.5	<0.5	<0.5	<1.5	<3
19/10/2020																								
28/10/2020																								
4/11/2020									<0.1			<1				<0.0001		75		<0.5	<0.5	<0.5	<1.5	<3
11/11/2020																								
18/11/2020																								
25/11/2020																								
16/12/2020																								
2021																								
3/02/2021									<0.1			1				<0.0001		56		<0.5	<0.5	<0.5	<1.5	<3
15/03/2021	0.01	7	8	2	<1			<1	<0.1	<1		1	<1	120	200	<0.0001	<1	32	<1	<0.5	<0.5	<0.5	<1.5	<3
10/11/2021	0.015	29	115	4	1				0.10			2				<0.0001		130		<0.5	<0.5	<0.5	<1.5	<3
2022																								
5/01/2022									<0.1			2				<0.0001		93		<0.5	<0.5	<0.5	<1	<3
1/02/2022	0.015	8	56	<1	3			<1	<0.1	<1		1	<1	93	190	<0.0001	<1	69	<1	<0.5	<0.5	<0.5	<1.5	<3
8/03/2022																								
6/04/2022									0.30			3				<0.0001		150		<0.5	<0.5	<0.5	<1.5	<3
5/10/2022									0.40			6				<0.0001		340		<0.5	<0.5	<0.5	<1.5	<3
2/11/2022																								

SEDIMENT POND 3 (1SC-2917)

Date Sampled / Analyte	Sampling Reason (Compliance / Retest / Voluntary)	DO	Temp	Turbidity	pH	EC	TDS	TSS	TRH	E Coli	Enterococci	BOD	Chlorophyll a	TN	TP	NH3-N	NO3-N	NO2-N	PO4-P	TKN	Al	As	Cd	Cr Total	Cr VI	Cu	Pb	Fe	Mn	Hg	Ni	Zn	Ag	Benzene	Toluene	Ethyl Benzene	Xylene	BTEX
		mg/L	℃	NTU		µS/cm	mg/L	mg/L	mg/L	MPN/100m	MPN/100mL	mg/L	µg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EPL 217 Trigger Value		**N/A**	**N/A**	**28**	**6-8.5**	**N/A**	**N/A**	**75**	**6**	**305**	**261**	**25**	**N/A**	**40**	**10**	**94**	**145**	**17**	**5**	**N/A**	**N/A**	**N/A**	**5.5**	**4.4**	**N/A**	**2**	**4.4**	**N/A**	**N/A**	**0.4**	**70**	**1000**	**1.4**	**N/A**	**N/A**	**N/A**	**N/A**	**700**
LOR			N/A		N/A				0.65	10	10	<1	1	0.01	0.005	1	1	1	1	10	5	1	0.1	1	0.004	1	1	5	1	0.0001	1	5	1	0.5	0.5	0.5	1.5	3
Testing Frequency		Monthly	Monthly	Monthly	Monthly	Monthly	N/A	Monthly	Annual	Biannual	Biannual	Monthly	N/A	Annual	Annual	Annual	Annual	Annual	Annual	N/A	N/A	Annual	Monthly	Annual	N/A	Monthly	Annual	Annual	Annual	Monthly	Annual	Monthly	Annual	Monthly	Monthly	Monthly	Monthly	Monthly
2016																																						
21/01/2016	V				6.05			3																														
28/01/2016	V				6.50			0																														
3/02/2016	C	6.75	29.7	4.30	6.05	84	56	3	<0.65	6	3	1.9	3	0.100	0.015	19	<1	<1	<1	0.08	8	<1	<0.1	<1	<0.005	1	<1	31	19	<0.0001	<1	24	<1	<0.5	<0.5	<0.5	<1.5	<3
25/02/2016	V				6.38			0																														
10/03/2016	V				6.19			0																														
16/03/2016	V				6.73			0																														
22/03/2016	V				**5.96**			0																														
7/09/2016	C	4.66	32.6	6.22	7.43	200	138	0	<0.65	50	7	2.7	6	0.350	0.050	19	52	5	<1	0.35	<5	<1	<0.1	<1	<0.004	1	<1	170	53	<0.0001	<1	14	<1	<0.5	<0.5	<0.5	<1.5	<3
14/09/2016	V				6.96			0																														
21/09/2016	V				6.48			0																														
28/09/2016	V				8.10			0																														
5/10/2016	C	7.25	31.8	1.93	7.83	172	121	0	<0.65	46	31	1.1	2	0.200	0.025	27	<1	<1	1	0.14	<5	<1	<0.1	<1	<0.004	<1	<1	140	53	<0.0001	<1	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
19/10/2016	V				6.55			0																														
26/10/2016	V				7.67			0																														
2/11/2016	C	8.83	33.8	1.91	7.75	159	109	0	<0.65	20	20	1.5	2	0.200	0.020	24	<1	<1	**6**	0.15	<5	<1	<0.1	<1	<0.004	<1	<1	84	2	<0.0001	<1	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
9/11/2016	V				7.17			0																														
16/11/2016	V				8.40			0																											<0.5			
23/11/2016	V				7.35			0																														
30/11/2016	V				6.25			0																														
7/12/2016	C	7.33	32.9	2.15	7.87	152	106	0	<0.65	8	7	1.6	3	0.170	0.020	7	4	2	5	0.10	<5	<1	<0.1	<1	<0.004	<1	<1	79	<1	<0.0001	<1	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
14/12/2016	V				6.86			0																														
21/12/2016	V				6.34			3																														
28/12/2016	V				6.63			0																														
2017																																						
4/01/2017	C	6.98	28.2	7.91	6.35	104	71	0	<0.65	156	130	<1	2	0.11	0.010	<1	46	<1	<1	0.04	<5	<1	<0.1	<1	<0.004	<1	<1	21	1	<0.00005	<1	26	<1	<0.5	<0.5	<0.5	<1.5	<3
9/01/2017	R									<10	41																											
11/01/2017	V				6.60			0																														
17/01/2017	V				7.15			0																														
25/01/2017	V				6.47			3																														
1/02/2017	C	6.79	31.3	7.19	6.60	84	58	0	<0.65	41	74	<1	3	0.11	0.010	<1	11	<1	2	0.11	33	<1	<0.1	<1	<0.004	<1	<1	120	38	<0.0001	<1	16	<1	<0.5	<0.5	<0.5	<1.5	<3
8/02/2017	V				6.39			0																														
15/02/2017	V				**8.58**			0																														
22/02/2017	V				7.34			0																														
1/03/2017	C	6.75	32.2	1.63	7.94	121	83	0	<0.65	10	<10	1.3	2	0.40	0.010	37	16	5	**11**	0.37	<5	<1	<0.1	<1	<0.004	<1	<1	93	8	<0.0001	<1	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
9/03/2017					6.51			0																														
15/03/2017	V				8.27			0																														
22/03/2017	V				6.91			0																														
29/03/2017	V				7.32			0																														
5/04/2017	C	8.71	32.0	1.46	7.36	112	76	0	<0.65	41	20	1.8	1	0.11	0.005	5	3	<1	3	0.11	<5	<1	<0.1	<1	<0.004	<1	<1	41	<1	<0.0001	<1	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
11/04/2017	V				6.60			0																														
19/04/2017	V				7.17			0																														
26/04/2017	V				6.86			0																														
3/05/2017	C	8.62	30.5	1.76	6.87	119	81	1	<0.65	52	**318**	<1	5	0.15	0.010	6	<1	<1	5	0.15	<5	<1	<0.1	<1	<0.004	<1	<1	82	<1	<0.0001	<1	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
10/05/2017	V				7.16			0																														
17/05/2017	V				7.90			0																														
24/05/2017	V				8.23			0																														
31/05/2017	V				8.02			0																														
7/06/2017	C	6.53	26.6	1.11	7.59	105	71	0	<0.65	20	41	1.5	2	0.21	0.005	3	<1	<1	4	0.19	<5	<1	<0.1	<1	<0.004	<1	<1	77	<1	<0.0001	<1	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
14/06/2017	V				7.59			0																														
21/06/2017	V				8.04			0																														
28/06/2017	V				7.76			0																														
5/07/2017	C	6.97	28.5	0.95	6.33	98	67	0	<0.65	<10	20	<1	2	0.16	0.010	35	1	<1	<1	0.16	<5	<1	<0.1	<1	<0.004	1	<1	48	<1	<0.0001	<1	5	<1	<0.5	<0.5	<0.5	<1.5	<3
12/07/2017	V				8.10			0																														
19/07/2017	V				7.31			0																														
25/07/2017	V				7.61			0																														
2/08/2017	C	6.12	26.3	1.05	7.42	101	66	0	<0.65	11	2	<1	3	0.25	0.130	4	2	2	**49**	0.25	<5	<1	<0.1	<1	<0.004	<1	<1	47	<1	<0.0001	<1	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
9/08/2017	V				7.73			0																														
16/08/2017	V				8.26			0																														
23/08/2017	V				7.53			0																														
30/08/2017	V				**8.76**			0																														
6/09/2017	C	6.60	27.4	4.41	6.23	119	81	0	<0.65	10	41	1.5	3	0.21	0.015	19	2	<1	**6**	0.20	<5	<1	<0.1	<1	<0.004	<1	<1	70	1	<0.0001	<1	<5	<1	<0.5	<0.5	<0.5	<1.5	<3
13/09/2017	V				**8.97**			0																														
20/09/2017	V				6.98			0																														
4/10/2017	C	1.96	29.0	6.84	6.47	216	149	0	<0.65	86	85	1.7	5	0.32	0.025	50	86	12	**7**	0.30	13	<1	<0.1	<1	<0.004	<1	<1	99	65	<0.0001	<1	11	<1	<0.5	<0.5	<0.5	<1.5	<3
1/11/2017	C	7.44	31.9	5.64	7.23	257	177	0				<1											<0.1			1				<0.0001		16		<0.5	<0.5	<0.5	<1.5	<3
2018																																						
3/01/2018	C	4.76	31.6	3.76	7.66	141		0				5.8											<0.1			<1				<0.0001		<5		<0.5	<0.5	<0.5	<1.5	<3
7/02/2018	C	5.44	29.5	6.97	6.24	82		0				<1											<0.1			<1				<0.0001		24		<0.5	<0.5	<0.5	<1.5	<3
7/03/2018	C	6.26	31.9	7.98	7.28	128		0		20	211	1.4		0.15	0.010	8	26	2	3	0.27	27	<1	<0.1	<1	<0.004	<1	<1	170	<1	<0.0001	<1	6	<1	<0.5	<0.5	<0.5	<1.5	<3
5/12/2018	C	5.62	32.0	17.60	**3.52**	338		5				<1											0.40			**8**				<0.0001		1,000		<0.5	<0.5	<0.5	<1.5	<3
5/12/2018	R																						0.40			**8**				<0.0001		**1,100**						
2019																																						
2/01/2019	C	4.21	30.2	8.42	6.31	121		0				1.1											<0.1			1				<0.0001		69		<0.5	<0.5	<0.5	<1.5	<3
6/02/2019	C	7.97	28.3	9.70	6.68	78		0				2.4											<0.1			<1				<0.0001		41		<0.5	<0.5	<0.5	<1.5	<3
6/03/2019	C	10.09	31.8	3.06	**8.61**	74		0	<0.65	146	<10	1.5		0.18	0.005	20	<1	<1	4	0.17		<1	<0.1	<1	<0.004	<1	<1	320	19	<0.0001	<1	19	<1	<0.5	<0.5	<0.5	<1.5	<3
3/04/2019	C	7.67	31.3	1.77	6.74	92		0				1.2											<0.1			<1				<0.0001		27		<0.5	<0.5	<0.5	<1.5	<3
1/05/2019	C																																					
6/11/2019	C	4.93	27.4	**39.30**	6.20	270		27	<0.65	**323**	75	<1		1.00	0.030	91	**397**	8	2	0.59		<1	<0.1	<1		**3**	<1	480	500	<0.0001	5	240	<1	<0.5	<0.5	<0.5	<1.5	<3
11/11/2019	R									189	10																											
4/12/2019	C	6.55	30.8	3.62	6.79	251		2		97	30	<1		0.36	0.015	9	<1	3	<1	0.37		1	<0.1	<1		<1	<1	530	150	<0.0001	2	29	<1	<0.5	<0.5	<0.5	<1.5	<3
11/12/2019	V	7.33	32.1	5.67	6.90	253		5		97	<10			0.59	<0.020	16	<5	<5	<5	0.59		1	<0.1	<1	<0.004	<1	<1	940	100	<0.0001	2	14	<1					
11/12/2019	V													0.38	0.020	6	2	3	4	0.36																		
17/12/2019	V	6.58	32.2	4.13	6.60	253		2		86	<10			0.54	0.020	46	**190**	7	<5	0.34		<1	<0.1	<1	<0.004	1	<1	610	180	<0.0001	2	53	<1					
17/12/2019	V													0.79	0.015	40	**183**	9	3	0.75																		
2020																																						
8/01/2020	C	5.33	30.4	1.91	6.65	138		2				1.2		0.29	0.015	33	12	2	<1	0.20		<1	<0.1	<1	<0.001	<1	<1	170	15	<0.00005	<1	11	<1	<1	<1	<1	<1	<4
15/01/2020	V													0.18	0.015	36	37	2	<1	0.17																		
5/02/2020	C	5.67	27.2	5.49	6.72	164		5				1.6											<0.1			<1				<0.0001		32		<0.5	<0.5	<0.5	<1.5	<3
4/03/2020	C	7.45	30.3	3.18	7.04	118		1	<0.65	75	<10	<1		0.13	0.010	24	<1	<1	<1			<1	<0.1	<1	<0.004	<1	<1	380	2	<0.0001	<1	20	<1	<0.5	<0.5	<0.5	<1.5	<3
1/04/2020	C	7.55	32.2	1.55	7.14	144		0				1.1											<0.1			<1				<0.0001		16		<0.5	<0.5	<0.5	<1.5	<3
7/10/2020	C	3.63	28.2	**33.00**	6.46	240		31		**602**	231	<1		0.87	0.025	49	**319**	3	**9**				<0.1			1				<0.0001		84		<0.5	<0.5	<0.5	<1.5	<3
19/10/2020	V	3.63	30.8	4.41	6.72	224		1		132	<10																											
28/10/2020	V	3.63	31.8	4.71	6.67	208		0		74	**414**																											
4/11/2020	C	3.63	31.7	3.75	6.89	205		0		109	74	<1											<0.1			<1				<0.0001		<5		<0.5	<0.5	<0.5	<1.5	<3
11/11/2020	V	3.63	30.7	3.02	7.22	220		0		**17329**	**723**																											
18/11/2020	V	3.63	31.8	2.66	7.27	197		0		**24196**	**318**																											
25/11/2020	V	3.63	29.3	8.22	6.82	136		0		108	63																											
2/12/2020	C	3.63	30.6	2.03	7.64	139		0		**313**	85	<1											<0.1			<1				<0.0001		11		<0.5	<0.5	<0.5	<1.5	<3
9/12/2020	V	3.63	29.0	1.98	7.26	141		0		228	<10																											
16/12/2020	V	3.63	28.3	19.9	6.51	68.5		13		**663**	**776**																											
2021																																						
6/01/2021	C	7.41	32.3	10.6	7.23	115.5		0		**341**	<10	1		0.19	0.015	8	1	<1	3				<0.05			<1				<0.0001		14		<1	<1	<1	<1	<2
3/02/2021	C	6.58	28.2	6.24	6.67	95.3		0		**408**	41	1.1											<0.1			<1				<0.0001		35		<0.5	<0.5	<0.5	<1.5	<3
3/03/2021	C	7.37	31.4	2.20	6.91	111.1		0	<0.65	10	<10	<1		0.07	0.005	9	3	1	<1			<1	<0.1	**11**		2	<1	520	48	<0.0001	29	22	<1	<0.5	<0.5	<0.5	<1.5	<3
24/03/2021	V																					<0.5	<0.05	<0.5		<1	<0.2	180	0.5	<0.0001	<0.5	2	<1					
7/04/2021	C	6.68	29.0	1.8	6.68	90.4		0				<1											<0.1	<1		<1				<0.0001		8		<0.5	<0.5	<0.5	<1.5	<3
10/11/2021	C	6.50	29.8	7.8	6.58	76.4		2		226	41	<1		0.37	0.020	19	48	3	4				<0.1			2				<0.0001		48		<0.5	<0.5	<0.5	<1	<3
1/12/2021	C	8.95	29.2	2.3	7.28	141.6		7		52	10	<1											<0.1			<1				<0.0001		11		<0.5	<0.5	<0.5	<1	<3
13/12/2021	R																						<0.1			<1				<0.0001		13						
2022																																						
5/01/2022		7.79	30.3	3.2	6.92	90.4		0				<1											<0.1			<1				<0.0001		32		<0.5	<0.5	<0.5	<1	<3
1/02/2022		7.28	28.0	3.8	6.68	90.5		1		52	63	<1		0.17	0.015	8	39	<1	<1			<1	<0.1	<1		<1	<1	180	3	<0.0001	<1	31	<1	<0.5	<0.5	<0.5	<1.5	<3
8/03/2022		5.67	30.9	2.5	6.99	132.2		3				1.8																										
6/04/2022		4.13	28.8	14.4	6.37	77.2		7				2.9											<0.1			<1				<0.0001		41		<0.5	<0.5	<0.5	<1.5	<3
5/10/2022		5.60	30.2	14.90	6.49	164		7															<0.1			2				<0.0001		140		<0.5	<0.5	<0.5	<1.5	<3
2/11/2022																																						

Attachment B – Mangrove Data

Mangroves - Chemical Analysis

Location		Wickham Pt											Control Site					
Site		LG1	LG2	LG3	SP1	SP1-A	SP1-B	SP1-C	SP2	SP2-A	SP3	SP3-A	M3	E1	E2	C2	QA1	Comments
SEDIMENTS																		
		CADMIUM IN SEDIMENTS (total mg/kg)																
ANZG (2018) DGV (Default Guideline Value)		1.5																"N/G" indicates no guidelines; "ND" indicates no data In 2012 Site C2 was established to replace site C1 Changed to weak acid extractable metals analysis only in 2020
ANZG (2018) GV-High		10.0																
2006		0.10	0.10	0.10	ND	ND	0.10	ND	0.10				0.10	0.10	0.10	ND	ND	
2007		0.10	0.10	0.10	ND	0.10	0.10	0.10	0.10				0.10	0.10	0.10	ND	ND	
2008		0.10	0.10	0.10	ND	0.10	0.10	0.10	0.10				0.10	0.10	0.10	ND	ND	
2009		0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10				0.10	0.10	0.10	ND	ND	
2010		0.30	0.40	0.30	0.50	1.00	0.20	0.10	0.50				0.20	0.40	0.30	ND	ND	
2011		0.10	0.10	0.10	0.10	0.30	0.10	0.10	0.10				0.10	0.10	0.10	ND	ND	
2012		0.10	0.20	0.10	0.70	0.10	0.10	0.10	0.20				0.10	0.10	0.10	0.20	ND	
2013		0.50	0.90	0.60	1.00	0.50	0.10	0.20	0.40				0.60	0.40	0.70	1.10	ND	
2014		0.60	0.60	0.40	1.10	0.40	0.50	0.40	0.40				0.80	0.80	0.80	0.50	ND	
2015		0.10	0.90	0.70	0.20	0.60	0.40	0.60	0.30				1.30	1.00	1.10	0.80	ND	
2016		0.20	0.20	0.10	0.20	0.50	0.40	0.50	0.30				0.40	0.30	0.30	0.20	ND	
2017		0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10				0.10	0.10	0.10	0.10	ND	
2018		0.40	0.10	0.30	0.10	0.60	0.40	0.50	0.40				0.50	0.50	ND	0.60	0.90	
2019		<0.1	<0.1	<0.1	<0.1	0.4	<0.1	<0.1	<0.1				<0.1	<0.1	ND	<0.1	<0.1	
		CADMIUM IN SEDIMENTS (weak acid mg/kg)																
ANZG (2018) DGV (Default Guideline Value)		1.5																Commenced weak acid analysis in 2018
ANZG (2018) GV-High		10.0																
2018		0.10	0.20	0.10	0.10	0.60	0.20	0.10	0.10	ND	ND	ND	0.30	0.30	ND	0.30	0.40	
2019		0.10	0.10	0.10	0.10	0.40	0.10	0.10	0.10	ND	ND	ND	0.10	0.10	ND	0.10	0.10	
2020		0.10	0.10	0.10	1.10	0.50	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	ND	0.10	0.10	
2022		0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	ND	0.10	<0.1	
		CHROMIUM IN SEDIMENTS (total mg/kg)																
ANZG (2018) DGV (Default Guideline Value)		80																"N/G" indicates no guidelines; "ND" indicates no data In 2012 Site C2 was established to replace site C1 Changed to weak acid extractable metals analysis only in 2020
ANZG (2018) GV-High		370																
2006		14.0	25.0	21.0	ND	ND	14.0	ND	12.0				16.0	20.0	20.0	ND	ND	
2007		30.0	29.0	17.0	ND	26.0	6.3	14.0	18.0				21.0	28.0	25.0	ND	ND	
2008		40.0	34.0	24.0	44.0	10.0	6.2	7.6	17.0				24.0	21.0	19.0	ND	ND	
2009		34.0	33.0	8.8	46.0	11.0	9.8	15.0	17.0				17.0	23.0	17.0	ND	ND	
2010		16.0	23.0	9.0	48.0	18.0	5.9	4.9	14.0				12.0	14.0	14.0	ND	ND	
2011		19.0	15.0	10.0	31.0	14.0	3.1	9.0	16.0				16.0	11.0	21.0	ND	ND	
2012		38.0	32.0	27.0	31.0	12.0	4.1	7.3	31.0				8.8	32.0	29.0	1.9	ND	
2013		28.0	47.0	25.0	25.0	14.0	3.0	10.0	17.0				29.0	25.0	34.0	26.0	ND	
2014		32.0	27.0	20.0	16.0	11.0	11.0	18.0	16.0				39.0	25.0	31.0	25.0	ND	
2015		28.0	24.0	20.0	38.0	12.0	5.0	12.0	7.5				19.0	21.0	24.0	23.0	ND	
2016		31.0	34.0	18.0	47.0	14.0	8.3	17.0	12.0				39.0	25.0	25.0	22.0	ND	
2017		28.0	36.0	22.0	16.0	16.0	21.0	36.0	29.0				39.0	21.0	29.0	26.0	ND	
2018		9.0	19.0	3.0	16.0	10.0	4.0	7.0	6.0				31.0	22.0	ND	12.0	13.0	
2019		39.0	36.0	18.0	27.0	17.0	6.0	20.0	15.0				48.0	21.0	ND	22.0	21.0	
		CHROMIUM IN SEDIMENTS (weak acid mg/kg)																
ANZG (2018) DGV (Default Guideline Value)		80																Commenced weak acid analysis in 2018
ANZG (2018) GV-High		370																
2018		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	ND	ND	ND	7.1	4.7	ND	7.2	4.9	
2019		12.0	9.0	8.0	5.0	3.0	2.0	5.0	5.0	ND	ND	ND	9.0	4.0	ND	9.0	8.0	
2020		36.0	45.0	8.0	18.0	11.0	2.0	4.0	18.0	27.0	24.0	16.0	54.0	11.0	ND	22.0	24.0	
2022		2.5	3.6	1.0	1.2	1.0	1.0	1.0	1.6	1.6	3.1	1.8	5.0	2.4	ND	1.0	2.2	
		COPPER IN SEDIMENTS (total mg/kg)																
ANZG (2018) DGV (Default Guideline Value)		65																"N/G" indicates no guidelines; "ND" indicates no data In 2012 Site C2 was established to replace site C1 Changed to weak acid extractable metals analysis only in 2020
ANZG (2018) GV-High		270																
2006		4.5	4.4	5.3	ND	ND	12.0	ND	4.5				2.0	3.4	3.1	ND	ND	
2007		9.5	5.0	3.4	ND	17.0	3.3	4.2	11.0				3.4	3.6	8.7	ND	ND	
2008		6.9	5.0	3.4	8.9	17.0	3.3	4.2	11.0				3.4	3.6	8.7	ND	ND	
2009		7.4	7.2	1.4	11.0	5.4	2.8	3.5	7.0				4.0	3.5	2.9	ND	ND	
2010		4.1	7.7	2.4	8.2	15.0	2.9	2.1	9.7				2.6	3.4	2.8	ND	ND	
2011		6.6	6.6	3.4	4.7	11.0	2.2	4.1	11.0				4.4	3.3	5.7	ND	ND	
2012		7.0	8.5	5.1	4.9	4.1	1.1	1.3	19.0				0.6	5.0	4.6	1.9	ND	
2013		4.1	9.6	3.0	2.9	5.9	1.1	2.0	5.7				7.6	4.6	5.6	1.4	ND	
2014		5.8	7.7	4.0	2.1	3.0	4.9	3.0	4.7				5.9	4.9	5.6	2.4	ND	
2015		6.8	6.5	3.7	5.1	2.9	1.9	3.6	2.9				4.8	3.7	1.9	2.6	ND	
2016		7.1	11.0	3.7	6.5	5.5	2.2	4.4	4.6				8.6	5.2	4.8	2.2	ND	
2017		6.0	8.0	3.0	5.0	4.0	4.0	3.0	10.0				5.0	4.0	6.0	2.0	ND	
2018		2.0	3.0	1.0	2.0	4.0	2.0	1.0	2.0				3.6	4.8	ND	0.5	0.6	
2019		8.0	8.0	4.0	9.0	5.0	1.0	4.0	5.0				6.0	4.0	ND	<1	<1	
		COPPER IN SEDIMENTS (weak acid mg/kg)																
ANZG (2018) DGV (Default Guideline Value)		65																Commenced weak acid analysis in 2018
ANZG (2018) GV-High		270																
2018		1.0	1.0	1.0	2.0	2.0	1.0	1.0	1.0	ND	ND	ND	3.3	3.5	ND	0.8	0.6	
2019		3.0	2.0	1.0	3.0	2.0	1.0	1.0	3.0	ND	ND	ND	4.0	2.0	ND	1.0	1.0	
2020		2.0	6.0	3.0	43.0	6.0	1.0	1.0	8.0	7.0	6.0	1.0	2.0	1.0	ND	1.0	1.0	
2022		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	7.3	6.3	1.0	1.1	1.0	ND	1.0	<1	

Location		Wickham Pt											Control Site					
Site		LG1	LG2	LG3	SP1	SP1-A	SP1-B	SP1-C	SP2	SP2-A	SP3	SP3-A	M3	E1	E2	C2	QA1	Comments
		IRON IN SEDIMENTS (total mg/kg)																
ANZG (2018) DGV (Default Guideline Value)		N/G																"N/G" indicates no guidelines; "ND"
ANZG (2018) GV-High		N/G																indicates no data
2006																		In 2012 Site C2 was established to
2007																		replace site C1
2008																		Changed to weak acid extractable
2009																		metals analysis only in 2020
2010																		
2011																		
2012																		
2013																		
2014																		
2015																		
2016		19,000	24,000	11,000	86,000	12,000	6,400	14,000	8,700				26,000	23,000	24,000	26,000	ND	
2017		21,000	26,000	16,000	12,000	15,000	18,000	42,000	25,000				23,000	23,000	27,000	24,000	ND	
2018		6,000	17,000	3,700	16,000	5,600	6,300	7,400	5,200				18,000	16,000	ND	21,000	30,000	
2019		28,000	29,000	14,000	42,000	30,000	7,500	17,000	12,000				44,000	26,000	ND	57,000	56,000	
		IRON IN SEDIMENTS (weak acid mg/kg)																
ANZG (2018) DGV (Default Guideline Value)		N/G																Commenced weak acid analysis in
ANZG (2018) GV-High		N/G																2018
2018		500	2,000	140	11,000	2,100	200	450	400	ND	ND	ND	8,800	10,000	ND	9,200	14,000	
2019		19,000	11,000	5,700	17,000	19,000	2,600	4,400	10,000	ND	ND	ND	18,000	19,000	ND	21,000	16,000	
2020		18,000	25,000	7,100	32,000	20,000	2,100	1,600	9,800	38,000	28,000	7,400	38,000	14,000	ND	14,000	19,000	
2022		1,300	3,400	590	24,000	3,200	1,200	490	810	11,000	10,000	1,900	7,900	5,400	ND	350	1,100	
		LEAD IN SEDIMENTS (total mg/kg)																
ANZG (2018) DGV (Default Guideline Value)		50																"N/G" indicates no guidelines; "ND"
ANZG (2018) GV-High		220																indicates no data
2006		4.1	6	6.2	ND	ND	9.3	ND	5.9				2.9	6.2	6.2	ND	ND	In 2012 Site C2 was established to
2007		13	9	6.6	ND	25	3.1	5.7	13				5.5	9.8	18	ND	ND	replace site C1
2008		12	11	8.4	21	5.6	3.6	2.5	11				8.3	9.8	9.5	ND	ND	Changed to weak acid extractable
2009		12	13	2	29	4.7	3.5	5	9.4				4.7	6	4.4	ND	ND	metals analysis only in 2020
2010		7	8.0	3.9	23	19	3.7	2.3	14				5.3	8.1	7.6	ND	ND	
2011		8.2	6.0	4.7	17	11	2.6	3.5	17				7.3	6.3	12	ND	ND	
2012		10	7.7	7	12	5	1.8	2.6	25				1.6	11	9.4	2.7	ND	
2013		12	18.0	11	9.6	8.8	1.7	3.9	10				16	12	16	7.2	ND	
2014		15	12.0	9.3	9.8	6.4	7.1	8.6	9.1				19	13	16	8.4	ND	
2015		14.1	12.3	4.3	24.8	6.9	4.3	6.6	5.4				12.4	5.8	6.6	6.9	ND	
2016		14	16	6.9	26	8.8	4.3	9.1	8.2				20	13	13	7.7	ND	
2017		10	13	8	8	6	8	8	13				13	10	13	6	ND	
2018		7	11	4	31	13	7	6	7				12	12	ND	5	7	
2019		11	9	6	13	10	3	8	12				18	8	ND	6.0	6.0	
		LEAD IN SEDIMENTS (weak acid mg/kg)																
ANZG (2018) DGV (Default Guideline Value)		50																Commenced weak acid analysis in
ANZG (2018) GV-High		220																2018
2018		1.0	4.0	1.0	8.0	6.0	2.0	1.0	3	ND	ND	ND	9.0	7.0	ND	3.0	4	
2019		11.0	9.0	6.0	7.0	10.0	2.0	5.0	12.0	ND	ND	ND	18.0	8.0	ND	5.0	4.0	
2020		6.0	9.0	6.0	21.0	18.0	2.0	2.0	5	22.0	21.0	3.0	13.0	2.0	ND	5.0	5	
2022		3.4	2.6	1.2	6.0	2.0	1.7	1.5	2	7.2	7.2	2.1	5.5	1.3	ND	1.0	3	
		NICKEL IN SEDIMENTS (total mg/kg)																
ANZECC & ARMCANZ (2000)ISQG-Low (Trigger value)		21																"N/G" indicates no guidelines; "ND"
ANZECC & ARMCANZ (2000) ISQG-High		52																indicates no data
2006		6.6	9.7	9.2	ND	ND	15	ND	6.1				5.9	8.7	8.8	ND	ND	In 2012 Site C2 was established to
2007		10	9.5	6.2	ND	18	5.5	5	9.3				6	7.5	8.6	ND	ND	replace site C1
2008		12	11	7.3	12	8.6	3.6	2.4	6.8				5.6	6.2	6	ND	ND	Changed to weak acid extractable
2009		10	9.6	2.6	13	3.9	3.2	4.2	5.9				4.7	6	4.4	ND	ND	metals analysis only in 2020
2010		4.7	6.9	2.2	8.2	9.0	2.0	1.4	5.5				3.0	3.9	4.0	ND	ND	
2011		6.6	4.7	2.8	6.4	8.9	1.7	2.7	5.8				4.6	3.5	6.9	ND	ND	
2012		11	8.9	6.7	6.2	2.7	1.3	2	10				0.9	7.9	7.3	4.1	ND	
2013		6.7	11	4.6	3.4	4.1	0.8	2.1	4.1				6.9	5.3	7.4	2.4	ND	
2014		8.7	8.3	4.9	3.5	2.6	3.9	4.4	5				11.0	7.1	8.4	3	ND	
2015		9.7	8.2	3.6	7.2	2.5	2.5	3.7	2.4				6	4	2	2.8	ND	
2016		8.3	8.6	3.3	8.6	3.9	1.7	4.2	3.4				8.5	5.8	5.2	2.6	ND	
2017		8	10	6	3	3	5	2	8				8	5	7	3	ND	
2018		2	6	1	9	3	2	2	2				7.3	6.3	ND	4.8	6.6	
2019		7	7	4	3	3	2	4	3				6	2	ND	7	6	
		NICKEL IN SEDIMENTS (weak acid mg/kg)																
ANZG (2018) DGV (Default Guideline Value)		21																Commenced weak acid analysis in
ANZG (2018) GV-High		52																2018
2018		1.0	1.0	1.0	2.0	1.0	1.0	1.0	1.0	ND	ND	ND	2.5	2.0	ND	2.1	3.4	
2019		4	3	3	2	2.0	1.0	2.0	2	ND	ND	ND	5.0	2.0	ND	7	4	
2020		3.0	13.0	2.0	12.0	6	1	1	2.0	15.0	6.0	2.0	14	1	ND	1.0	1.0	
2022		1.0	1.2	1.0	2.9	1	1	1	1.0	1.7	2.0	1.0	2	1	ND	1.0	<1	
		ZINC IN SEDIMENTS (total mg/kg)																
ANZG (2018) DGV (Default Guideline Value)		200																"N/G" indicates no guidelines; "ND"
ANZG (2018) GV-High		410																indicates no data
2006		20	33	33	ND	ND	**210**	ND	53				11	28	54	ND	ND	In 2012 Site C2 was established to
2007		44	24	24	ND	**450**	95	21	67				13	25	37	ND	ND	replace site C1
2008		29	23	23	200	62	32	9.4	56				12	21	18	ND	ND	Changed to weak acid extractable
2009		30	27	6.2	**380**	51	38	32	52				18	19	14	ND	ND	metals analysis only in 2020
2010		15	20	6.4	140	**510**	47	12	65				10	18	17	ND	ND	
2011		22	14	8	180	**350**	19	17	49				12	14	29	ND	ND	
2012		31	24	18	**210**	69	19	14	85				4.7	28	25	6.7	ND	
2013		16	26	8.9	87	170	21	4.9	50				28	18	28	5	ND	
2014		27	23	15	84	92	150	26	66				28	25	30	7.8	ND	
2015		33	24	12	140	62	48	24	37				28	6	9	11	ND	
2016		29	29	9.4	200	180	16	28	38				31	27	25	10	ND	
2017		24	25	17	53	48	42	40	68				21	19	27	7	ND	
2018		8	18	4	**440**	**290**	110	19	20				22	28	ND	9	12	
2019		35	30	15	42	**210**	70	35	32				36	19	ND	13.00	11.00	
		ZINC IN SEDIMENTS (weak acid mg/kg)																
ANZG (2018) DGV (Default Guideline Value)		200																Commenced weak acid analysis in
ANZG (2018) GV-High		410																2018
2018		2	3	1.0	170	170	73	3	9.0	ND	ND	ND	11	15.0	ND	5	6	
2019		27	18	13.0	33	48	64	27	30.0	ND	ND	ND	24	15.0	ND	6	5	
2020		27	30	11.0	**520**	**340**	13	9	64.0	100	46	13	35	4.0	ND	6	8	
2022		10	11	8.1	150	57	18	14	17.0	79	44	6.2	11	10.0	ND	3.6	8.2	

Location		Wickham Pt											Control Site					
Site		LG1	LG2	LG3	SP1	SP1-A	SP1-B	SP1-C	SP2	SP2-A	SP3	SP3-A	M3	E1	E2	C2	QA1	Comments
MUDWHELKS																		
		CADMIUM IN MUDWHELKS (mg/kg wet weight)																
FSANZ maximum level		2.00																"N/G" indicates no guidelines; "ND"
GEL 90th percentile		N/G																indicates no data - in
2006		0.2	0.14	0.11	ND	ND	0.12	NC	0.2				0.08	0.22	0.2	ND	ND	2012 Site C2 was established to
2007		0.1	0.1	0.1	ND	0.1	0.1	0.1	0.1				0.1	0.25	0.1	ND	ND	replace site C1
2008		0.1	0.1	0.1	ND	0.1	0.2	0.1	0.1				0.1	0.1	0.1	ND	ND	
2009		0.1	0.1	0.1	ND	0.1	0.1	0.1	0.1				0.1	0.1	0.1	ND	ND	
2010		0.1	0.1	0.1	ND	0.1	0.1	0.1	0.1				0.1	0.1	0.1	ND	ND	
2011		0.05	0.05	0.05	ND	0.05	0.05	0.05	0.05				0.05	0.05	0.05	ND	ND	
2012		0.10	0.10	0.10	ND	0.20	0.05	0.05	0.10				0.10	0.10	0.10	0.10	ND	
2013		0.10	0.10	0.10	ND	0.10	0.10	0.10	0.10				0.05	0.10	0.10	0.10	ND	
2014		0.42	0.34	0.32	ND	0.17	0.14	0.19	0.08				0.17	0.47	0.48	0.12	ND	
2015		0.20	0.11	0.11	ND	0.01	0.09	0.08	0.13				0.12	0.05	0.05	0.08	ND	
2016		0.03	0.06	0.03	ND	0.03	0.03	0.03	0.03				0.03	0.03	0.03	0.03	ND	
2017		0.03	0.03	0.03	ND	0.03	0.06	0.03	0.03				0.03	0.03	0.03	0.03	ND	
2018		0.07	0.66	0.09	0.06	0.06	0.19	0.13	0.05				0.12	0.11	ND	0.10	0.07	
2019		0.09	0.18	0.20	0.10	0.23	0.24	0.30	0.08				0.31	0.11	ND	0.18	0.10	
2020		0.03	0.03	0.16	0.03	0.11	0.05	<0.1	0.05			0.10	0.08	<0.1	ND	0.02	<0.1	
2022		0.14	0.08	0.33	0.11	0.12	0.02	0.02	0.08			0.62	0.18	0.32		0.22	0.30	
		CADMIUM IN MUDWHELKS (mg/kg dry weight)																
2006		0.7	0.5	0.4	ND	ND	0.5	ND	0.8				0.3	0.8	<0.04	ND	ND	
2007		0.1	0.2	<0.1	ND	0.1	<0.2	<0.2	0.2				0.1	0.2	0.4	ND	ND	
2008		0.10	0.1	<0.1	ND	0.1	0.4	0.1	0.1				<0.1	0.1	0.1	ND	ND	
2009		0.1	0.1	0.1	ND	0.1	<0.1	0.1	0.1				0.1	0.1	<0.1	ND	ND	
2010		<0.1	<0.1	0.1	ND	0.1	<0.1	<0.1	<0.1				<0.1	<0.1	<0.1	ND	ND	
2011		<0.1	<0.1	<0.1	ND	<0.1	<0.1	<0.1	<0.1				<0.1	<0.1	<0.1	ND	ND	
2012		0.3	0.1	0.1	ND	0.3	<0.1	<0.1	0.1				0.1	0.2	0.2	0.2	ND	
2013		0.2	0.2	0.2	ND	0.2	0.3	0.2	0.2				<0.1	0.2	0.2	0.2	ND	
2014		0.1	0.2	0.1	ND	<0.1	<0.1	0.1	0.1				<0.1	0.1	0.2	<0.1	ND	
2015		0.7	0.4	0.5	ND	<0.1	0.4	0.3	0.5				0.5	0.2	0.2	0.4	ND	
2016		0.1	0.2	0.1	ND	0.1	0.1	0.1	0.1				0.1	0.1	0.1	0.1	ND	
2017		0.1	0.1	0.1	ND	0.1	0.2	0.1	0.1				0.1	0.1	0.1	0.1	ND	
2018		0.3	2.2	0.4	0.3	0.3	1	0.5	0.2				0.4	0.5	ND	0.4	0.3	
2019		0.3	0.6	0.7	0.4	0.9	0.9	1	0.3				1.3	0.4	ND	0.7	0.4	
2020		0.1	0.1	0.8	0.1	0.5	0.2	<0.1	0.2			0.4	0.3	<0.1	ND	0.1	<0.1	
		CHROMIUM IN MUDWHELKS (mg/kg wet weight)																
FSANZ maximum level		N/G																"N/G" indicates no guidelines; "ND"
GEL 90th percentile		N/G																indicates no data In
2006		0.29	0.25	0.22	ND	ND	0.28	ND	0.23				0.26	0.28	0.24	ND	ND	2012 Site C2 was established to
2007		0.35	0.31	0.3	ND	0.2	0.2	0.2	0.2				0.11	0.21	0.32	ND	ND	replace site C1
2008		2.32	1.6	0.21	ND	0.4	0.39	0.6	0.52				1.68	1.19	1.61	ND	ND	
2009		0.20	0.20	0.20	ND	0.20	0.20	0.20	0.20				0.20	0.20	0.20	ND	ND	
2010		0.20	0.20	0.38	ND	0.82	0.22	0.20	0.20				0.20	0.20	0.20	ND	ND	
2011		0.20	0.20	0.20	ND	0.20	0.20	0.20	0.20				0.20	0.20	0.20	ND	ND	
2012		0.20	2.20	0.20	ND	0.50	0.30	0.10	0.20				0.60	1.10	1.10	1.20	ND	
2013		0.90	1.10	0.20	ND	0.30	0.40	1.00	0.40				0.20	0.20	0.30	0.20	ND	
2014		0.42	0.34	0.32	ND	0.17	0.14	0.19	0.08				0.17	0.47	0.48	0.12	ND	
2015		0.46	0.09	0.02	ND	0.14	0.02	0.08	0.03				0.08	0.02	0.02	0.02	ND	
2016		0.11	0.34	0.20	ND	0.11	0.18	0.19	0.28				0.08	0.20	0.15	0.13	ND	
2017		0.19	0.34	0.11	ND	0.09	0.25	0.28	0.31				0.30	0.26	0.64	0.34	ND	
2018		0.04	0.54	0.09	0.34	0.13	0.81	0.11	0.09				2.77	2.28	ND	1.84	1.66	
2019		0.61	<1	<1	<1	<1	<1	<1	<1				<1	<1	ND	<1	1.00	
2020		<1	<1	<1	<1	<1	<1	<1	<1			<1	<1	<1	ND	<1	<1	
2022		0.58	0.32	<0.1	<0.1	0.36	<0.1	0.28	0.7			0.4	1.3	1.02	ND	0.36	1.50	
		CHROMIUM IN MUDWHELKS (mg/kg dry weight)																
2006		1.0	0.9	0.8	ND	ND	1.2	ND	0.9				1.0	1.0	0.9	ND	ND	
2007		1.1	1.2	1.0	ND	0.6	<0.2	<0.2	<0.2				0.4	1.2	1.4	ND	ND	
2008		6.10	4.0	0.5	ND	1.0	1.0	1.5	1.2				4.1	3.3	5.2	ND	ND	
2009		0.2	0.2	<0.2	ND	0.2	0.2	0.3	0.2				0.3	0.3	0.3	ND	ND	
2010		<0.2	0.3	1.5	ND	3.9	0.8	<0.2	<0.2				<0.2	<0.2	0.2	ND	ND	
2011		0.2	<0.2	<0.2	ND	0.4	0.2	0.3	0.2				0.2	0.3	0.4	ND	ND	
2012		0.5	4.7	0.4	ND	1.0	0.6	0.2	0.2				1.3	2.7	2.8	2.9	ND	
2013		2.8	3.7	0.3	ND	1.0	1.4	3.6	1.0				0.4	0.5	0.8	0.4	ND	
2014		1.5	1.3	1.0	ND	0.6	0.5	0.6	0.3				0.6	1.7	1.7	0.5	ND	
2015		1.7	0.4	0.1	ND	0.6	0.1	0.3	0.1				0.3	0.1	0.1	0.1	ND	
2016		0.4	1.2	0.8	ND	0.4	0.7	0.7	1.1				0.3	0.7	0.5	0.4	ND	
2017		0.6	1.1	0.4	ND	0.3	0.8	1.1	0.9				0.9	0.8	2.2	1.2	ND	
2018		0.2	1.8	0.4	1.7	0.6	4.3	0.4	0.4				8.9	10	ND	7.4	7	
2019		2	<1	<1	<1	<1	<1	<1	<1				<1	<1	ND	<1	<1	
2020		<1	<1	<1	<1	<1	<1	<1	<1			<1	<1	<1	ND	<1	<1	

Location		Wickham Pt											Control Site					
Site		LG1	LG2	LG3	SP1	SP1-A	SP1-B	SP1-C	SP2	SP2-A	SP3	SP3-A	M3	E1	E2	C2	QA1	Comments
		COPPER IN MUDWHELKS (mg/kg wet weight)																
FSANZ maximum level		N/G																"N/G" indicates no guidelines; "ND"
GEL 90th percentile		30.00																indicates no data In
2006		**44**	**34**	**31**	ND	ND	21	ND	**35**				18	22	21	ND	ND	2012 Site C2 was established to
2007		0.35	29	30	ND	**36**	22	22	**56**				16	10	20	ND	ND	replace site C1
2008		27	24	23.1	ND	14	**32**	23	**38**				**31**	13	5.3	ND	ND	
2009		12	11	8	ND	8	7	10	9				3	4	2	ND	ND	
2010		21	13	7	ND	4	15	6	11				5	4	2	ND	ND	
2011		10	3	4	ND	10	8	9	8				13	0.25	1	ND	ND	
2012		**37**	**32**	24	ND	17	15	24	26				18	6	5	20	ND	
2013		**39**	**41**	**42**	ND	**40**	22	**31**	26				20	9	5	22	ND	
2014		30	**34**	**31**	ND	18	**33**	24	**33**				**31**	7	6	27	ND	
2015		30	**48**	17	ND	12	18	21	30				14	5	3	24	ND	
2016		5	9	5	ND	5	4	6	9				5	3	4	10	ND	
2017		28	26	15	ND	16	14	13	15				16	8	6	16	ND	
2018		**45**	30	27	15.52	**45**	18	17	**51**				**34**	19	ND	**32**	**31**	
2019		**43**	29	**37**	**45**	21	25	27	**34**				20	30	ND	**34**	**38**	
2020		**53**	**44**	**32**	24	17	19	**41**	**35**			**43**	**33**	27	ND	**41**	**46**	
2022		6.9	16.59	7.5	5.75	11.28	2.72	5.2	8.91			28.8	7.5	4	ND	14.88	**39**	
		COPPER IN MUDWHELKS (mg/kg dry weight)																
2006		150	120	110	ND	ND	93	ND	140				68	80	83	ND	ND	
2007		110	110	100	ND	130	83	81	180				60	46	88	ND	ND	
2008		71	60	55	ND	35	82	58	88				76	36	17	ND	ND	
2009		30	31	20	ND	23	19	27	25				11	14	8.5	ND	ND	
2010		65	53	29	ND	19	79	24	37				19	14	7.0	ND	ND	
2011		39	12	11	ND	42	23	37	30				55	<0.5	5.0	ND	ND	
2012		79	70	66	ND	34	28	64	61				39	15	13	50	ND	
2013		120	140	130	ND	130	73	110	68				59	30	16	73	ND	
2014		110	130	98	ND	64	120	76	130				110	10	21	110	ND	
2015		110	190	78	ND	52	92	83	120				64	20	12	110	ND	
2016		16	31	18	ND	19	16	23	37				20	10	14	30	ND	
2017		89	86	55	ND	53	45	52	44				50	26	20	55	ND	
2018		200	100	120	78	210	96	63	220				110	85	ND	130	130	
2019		140	100	130	180	81	91	88	120				84	110	ND	130	160	
2020		190	160	160	77	81	71	120	130			170	130	95	ND	170	210	
		NICKEL IN MUDWHELKS (mg/kg wet weight)																
FSANZ maximum level		N/G																"N/G" indicates no guidelines; "ND"
GEL 90th percentile		N/G																indicates no data In
2006		1.39	0.84	0.98	ND	NC	0.85	NC	1.18				0.55	1.51	1.05	ND	ND	2012 Site C2 was established to
2007		0.22	0.23	0.1	ND	0.25	0.16	0.11	0.22				0.11	0.11	0.25	ND	ND	replace site C1
2008		1.22	0.8	0.1	ND	0.1	0.2	0.8	0.22				0.49	0.5	0.71	ND	ND	
2009		0.1	0.1	0.1	ND	0.1	0.1	0.1	0.1				0.1	0.1	0.1	ND	ND	
2010		0.1	0.2	0.1	ND	0.1	0.1	0.1	0.1				0.1	0.1	0.1	ND	ND	
2011		0.80	0.05	0.05	ND	0.10	0.20	0.05	0.10				0.05	0.05	0.10	ND	ND	
2012		0.50	1.20	0.05	ND	0.80	0.40	0.10	0.30				0.30	1.10	1.00	0.80	ND	
2013		0.30	0.40	0.10	ND	0.20	0.20	0.30	0.40				0.10	0.30	0.30	0.30	ND	
2014		0.17	0.19	0.16	ND	0.06	0.08	0.19	0.10				0.11	0.19	0.23	0.07	ND	
2015		0.35	0.48	0.20	ND	0.09	0.39	0.12	0.43				0.24	0.54	0.26	0.08	ND	
2016		0.09	0.31	0.13	ND	0.20	0.13	0.08	0.15				0.11	0.11	0.21	0.13	ND	
2017		0.06	0.12	0.06	ND	0.15	0.09	0.08	0.21				0.13	0.10	0.17	0.09	ND	
2018		0.20	3.58	0.16	0.62	0.15	0.81	0.24	0.49				0.90	1.05	ND	0.77	0.48	
2019		0.61	0.58	1.14	0.50	0.76	1.09	0.91	0.56				1.69	0.81	ND	0.78	0.48	
2020		<1	<1	0.40	<1	0.42	<1	<1	0.27			0.50	0.25	<1	ND	<1	<1	
2022		0.76	2.1	1.58	0.25	0.62	0.65	0.36	0.95			2.3	0.88	1.58	ND	1.32	2.90	
		NICKEL IN MUDWHELKS (mg/kg dry weight)																
2006		4.8	3.0	3.5	ND	ND	3.7		4.7				2.1	5.4	4.2	ND	ND	
2007		0.7	0.9	<0.1	ND	0.9	0.6	0.4	0.7				0.4	1.0	1.1	ND	ND	
2008		3.2	2.0	0.2	ND	<0.1	0.5	2.0	0.5				1.2	1.4	2.3	ND	ND	
2009		<0.1	0.1	<0.1	ND	0.2	<0.1	<0.1	<0.1				0.3	<0.1	<0.1	ND	ND	
2010		<0.1	0.5	0.2	ND	0.4	0.5	<0.1	<0.1				<0.1	0.2	0.2	ND	ND	
2011		2.9	<0.1	<0.1	ND	0.1	0.6	<0.1	0.1				<0.1	<0.1	0.5	ND	ND	
2012		1.1	2.6	<0.1	ND	1.7	0.8	0.3	0.8				0.7	2.6	2.5	2.0	ND	
2013		0.9	1.3	0.3	ND	0.8	0.8	1.2	1.0				0.2	1.0	0.9	0.9	ND	
2014		0.6	0.7	0.5	ND	0.2	0.3	0.6	0.4				0.4	0.7	0.8	0.6	ND	
2015		1.3	1.9	0.9	ND	0.4	2	0.5	1.7				1.1	2.3	1.1	0.4	ND	
2016		0.3	1.1	0.5	ND	0.7	0.5	0.3	0.6				0.4	0.4	0.7	0.4	ND	
2017		0.2	0.4	0.2	ND	0.5	0.3	0.3	0.6				0.4	0.3	0.6	0.3	ND	
2018		0.9	12	0.7	3.1	0.7	4.3	0.9	2.1				2.9	4.6	ND	3.1	2	
2019		2.0	2.0	4.0	2.0	3.0	4.0	3.0	2.0				7.0	3.0	ND	3.0	2.0	
2020		<1	<1	2	<1	2	<1	<1	1			2	1	<1	ND	<1	<1	

Location		Wickham Pt											Control Site					
Site		LG1	LG2	LG3	SP1	SP1-A	SP1-B	SP1-C	SP2	SP2-A	SP3	SP3-A	M3	E1	E2	C2	QA1	Comments
		LEAD IN MUDWHELKS (mg/kg wet weight)																
FSANZ maximum level		2.00																"N/G" indicates no guidelines; "ND"
GEL 90th percentile		N/G																indicates no data In
2006		0.15	0.28	0.25	ND	ND	0.25	ND	0.25				0.21	0.22	0.25	ND	ND	2012 Site C2 was established to
2007		0.1	0.1	0.48	ND	0.39	0.16	0.14	0.28				0.1	0.1	0.14	ND	ND	replace site C1
2008		0.3	0.52	0.21	ND	0.2	0.2	0.2	0.1				0.29	0.4	0.4	ND	ND	
2009		0.3	0.3	0.2	ND	0.2	0.2	0.3	0.2				0.2	0.2	0.1	ND	ND	
2010		0.1	0.2	0.1	ND	0.1	1.6	0.1	0.1				0.1	0.1	0.1	ND	ND	
2011		0.05	0.05	0.05	ND	0.30	0.10	0.05	0.05				0.05	0.05	0.05	ND	ND	
2012		0.40	0.40	0.10	ND	0.20	0.10	0.10	0.10				0.10	0.30	0.40	0.80	ND	
2013		0.50	0.60	0.20	ND	0.30	0.30	0.50	0.50				0.10	0.10	0.30	0.20	ND	
2014		0.19	0.16	0.13	ND	0.14	0.08	0.10	0.05				0.08	0.41	0.37	0.05	ND	
2015		0.12	0.03	0.02	ND	0.05	0.04	0.04	0.04				0.05	0.05	0.03	0.01	ND	
2016		0.06	0.06	0.13	ND	0.03	0.13	0.08	0.15				0.08	0.09	0.06	0.03	ND	
2017		0.10	0.15	0.06	ND	0.06	0.09	0.13	0.14				0.10	0.13	0.32	0.11	ND	
2018		0.07	0.33	0.07	0.60	0.78	0.13	0.08	0.30				1.03	0.91	ND	0.72	0.55	
2019		0.31	<1	<1	<1	0.51	<1	<1	<1				0.726	<1	ND	<1	1	
2020		<1	<1	<1	<1	<1	<1	<1	<1			<1	<1	<1	ND	<1	<1	
2022		0.94	0.84	0.75	0.49	1.25	0.73	0.84	**2.38**			0.36	0.98	0.42	ND	0.41	2	
		LEAD IN MUDWHELKS (mg/kg dry weight)																
2006		0.5	1.0	0.9	ND	ND	1.1	ND	1.0				0.8	0.8	1.0	ND	ND	
2007		<0.1	<0.1	1.6	ND	1.4	0.6	0.5	0.9				<0.1	0.4	0.6	ND	ND	
2008		0.8	1.3	0.5	ND	0.5	0.5	0.5	0.2				0.7	1.1	1.3	ND	ND	
2009		0.8	0.8	0.5	ND	0.5	0.5	0.7	0.6				0.7	0.5	0.5	ND	ND	
2010		0.1	0.6	0.2	ND	0.3	6	<0.1	0.1				<0.1	<0.1	<0.1	ND	ND	
2011		0.1	<0.1	<0.1	ND	1.1	0.2	<0.1	<0.1				<0.1	<0.1	1.9	ND	ND	
2012		0.8	0.8	0.1	ND	0.4	0.2	0.3	0.1				0.3	0.8	1.1	0.8	ND	
2013		1.4	1.9	0.6	ND	0.9	1.1	1.9	1.3				0.4	0.5	1.0	0.5	ND	
2014		0.7	0.6	0.4	ND	0.5	0.3	0.3	0.2				0.3	1.5	1.3	0.2	ND	
2015		0.5	0.1	0.1	ND	0.2	0.2	0.1	0.1				0.2	0.2	0.2	0.1	ND	
2016		0.2	0.2	0.5	ND	0.1	0.5	0.3	0.6				0.3	0.3	0.2	0.1	ND	
2017		0.3	0.5	0.2	ND	0.2	0.3	0.5	0.4				0.3	0.4	1.1	0.4	ND	
2018		0.3	1.1	0.3	3	3.7	0.7	0.3	1.3				3.3	4	ND	2.9	2.3	
2019		1	<1	<1	<1	2	<1	<1	<1				3	<1	ND	<1	<1	
2020		<1	<1	<1	<1	<1	<1	<1	<1			<1	<1	<1	ND	<1	<1	
		ZINC IN MUDWHELKS (mg/kg wet weight)																
FSANZ maximum level		N/G																"N/G" indicates no guidelines; "ND"
GEL 90th percentile		290.00																indicates no data In
2006		73	190	90	ND	ND	76	ND	153				47	106	75	ND	ND	2012 Site C2 was established to
2007		12	12	15	ND	15	10	14	19				10	8	10	ND	ND	replace site C1
2008		14	8	6	ND	7	13	48	15				11	9	8	ND	ND	
2009		7	5	5	ND	5	5	7	7				17	4	3	ND	ND	
2010		8	6	4	ND	4	10	3	5				3	3	2	ND	ND	
2011		4	0.7	1	ND	3.1	2	3	4				2	4	3	ND	ND	
2012		31	15	11	ND	**318**	109	12	19				9	11	16	12	ND	
2013		13	13	13	ND	70	19	39	60				12	17	33	21	ND	
2014		11.9	11.9	8.2	ND	13.7	14.1	12.8	11.7				10.9	12.1	9.1	10.6	ND	
2015		18.4	20.3	12.5	ND	77.9	72.5	15.3	32.5				13.8	16.9	23.2	11.8	ND	
2016		4.0	8.2	4.5	ND	44.8	5.0	5.5	8.8				3.5	5.7	5.2	4.8	ND	
2017		6.0	9.5	6.4	ND	15.1	8.3	7.9	20.9				8.2	4.9	5.5	6.0	ND	
2018		16	143	22	149	34	**414**	19	81				12	21	ND	25	9	
2019		20	21	68	57	229	98	242	65				119	149	ND	26	16	
2020		48	18	24	37	165	42	17	35			23	71	28	ND	22	24	
2022		25.3	20.16	40	8.64	84	6.12	7.2	27	160.8		160.8	22.25	22	ND	38.4	72	
		ZINC IN MUDWHELKS (mg/kg dry weight)																
2006		250	680	320	ND	ND	330	ND	610				180	380	300	ND	ND	
2007		38	47	51	ND	54	36	52	60				39	39	45	ND	ND	
2008		37	20	14	ND	18	33	120	35				27	24	26	ND	ND	
2009		16	14	12	ND	14	14	18	20				60	13	13	ND	ND	
2010		25	19	15	ND	20	38	13	16				11	9.7	8.4	ND	ND	
2011		14	2.6	3.7	ND	13	5	12	17				10	12	13	ND	ND	
2012		65	33	30	ND	650	210	32	45				20	27	41	31	ND	
2013		40	46	40	ND	260	63	140	160				34	59	100	68	ND	
2014		43	45	26	ND	48	51	40	46				39	44	32	44	ND	
2015		68	80	57	ND	340	370	61	130				62	72	100	54	ND	
2016		14	29	18	ND	160	19	20	35				13	20	17	15	ND	
2017		19	31	23	ND	50	27	31	61				25	15	19	21	ND	
2018		72	480	100	750	160	2,200	69	350				37	90	ND	100	36	
2019		65	71	240	230	900	360	800	230				490	550	ND	100	67	
2020		170	64	120	120	780	160	49	130			92	280	100	ND	93	110	

Mangroves - Surveillance Data (Canopy, Sediment Height and Groundwater)

Site	SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9	SS10	SS11	SS12	SS13	SS14	SS15	SS15A	SS16	SS16A	SS17	SS18	SS19	SS20	SS21	SS22	SS23	Comments
MEAN CANOPY COVER (%)																										
2003	90	90	90	94	37	*	85	*	79	94	97	92	92	81	88	*	93	*	*	*	52	61	*	*	*	2017 and 2018 use the standard
2004	92	90	91	93	40	*	87	59	74	91	95	93	90	84	84	*	72	*	92	92	63	74	93	92	93	densiometer data (not that recorded using
2005	93	88	85	92	45	*	84	66	80	92	94	94	89	80	86	*	77	*	93	92	67	74	94	91	90	the 17 point densiometer) so the following
2006	85	88	86	91	51	*	82	57	71	84	89	86	83	75	82	*	76	*	88	89	65	73	89	85	88	graphs display data collected using the
2007	88	87	84	92	47	*	80	53	77	87	88	86	83	83	86	*	77	*	89	89	61	75	91	84	87	same method
2008	91	86	93	96	41	*	84	56	75	84	91	91	88	79	85	*	81	*	96	94	54	69	92	87	88	
2009	89	88	85	91	47	*	83	58	81	87	90	89	88	79	90	*	74	*	90	90	72	66	94	89	89	
2010	81	84	83	94	62	*	82	49	74	88	90	88	90	82	84	*	62	*	91	91	63	64	91	89	90	
2011	91	88	86	93	49	*	81	61	78	89	89	89	92	82	90	*	62	*	91	91	52	54	90	86	91	
2012	87	84	71	88	46	*	82	55	79	87	89	85	90	80	87	*	55	*	86	86	53	58	92	88	89	
2013	88	84	75	92	53	*	81	56	76	85	86	90	89	74	87	*	59	*	90	89	55	59	92	83	89	
2014	85	83	74	91	53	*	77	65	81	87	87	89	89	73	93	*	53	*	90	90	51	64	92	88	90	
2015	90	88	74	93	47	*	83	63	78	90	91	92	92	79	*	74	*	64	93	89	52	67	96	89	92	
2016	91	94	74	94	47	*	79	62	82	89	92	87	93	82	*	76	*	69	94	90	52	57	95	88	88	
2017	91	93	76	95	53	22	78	56	85	88	89	91	94	84	*	71	*	74	92	85	51	48	95	85	88	
2018	97	99	78	98	80	66	90	84	91	85	90	95	98	94	*	87	*	77	98	97	80	80	96	93	84	17-point densiometer method (data change from previous report)
2019	97	98	76	98	75	56	83	79	90	87	90	96	97	83	*	83	*	74	97	91	70	68	98	92	79	17-point densiometer method
2020	94	98	79	98	76	68	89	73	91	89	92	97	99	84	*	84	*	80	97	93	69	70	97	94	79	
2021	96	97	81	99	72	65	87	70	93	92	94	98	100	86	*	81	*	79	98	95	63	67	99	98	79	
2022	93	97	81	98	72	63	86	70	93	92	90	96	99	82	*	79	*	79	98	92	56	61	93	93	79	
MEAN RELATIVE SEDIMENT HEIGHT (cm)																										
2003	76	76	73	77	85	83	76	74	90	94	76	100	85	93		E		E	119	113	90	114	89	E	E	"R" indicates that the site was filled in by
2004	77	76	73	77	85	83	77	75	88	94	76	97	86	92		E		E	119	113	90	114	86	108	119	site reclamation works and a replacement
2005	77	76	73	78	84	83	76	74	88	93	74	98	86	92		E		E	119	113	90	113	85	110	118	site was established in Nov 2003
2006	76	75	72	77	85	83	77	73	86	92	72	95	85	92		E		E	118	111	90	112	85	109	119	
2007	76	76	73	77	85	82	77	73	86	91	72	96	85	93		E		E	118	112	90	112	84	110	119	E indicates that the site had not yet been
2008	76	75	72	77	85	83	77	73	86	92	72	95	85	92		E		E	118	111	90	112	85	109	119	established
2009	76	76	72	77	85	83	77	73	86	92	72	96	85	91		E		E	118	112	90	113	85	110	120	
2010	75	75	72	77	85	83	77	72	85	90	72	94	84	91		E		E	118	110	90	112	84	110	121	Sediment height measurements were
2011	76	75	72	77	85	83	77	71	84	89	70	94	84	91		E		E	118	110	90	112	85	110	119	collected at a quarterly frequency during
2012	76	75	72	77	83	83	77	71	82	89	69	92	84	92		E		E	117	109	89	112	85	110	120	the construction phase (2003-2006) and
2013	76	75	72	77	84	82	79	69	82	89	69	92	83	92		E		E	116	108	89	112	85	108	119	the annual values provided above for
2014	75	75	72	77	83	81	78	67	80	86	69	91	83	91		E		E	117	107	90	111	82	108	119	2003-2006 are the mean values calculated
2015	75	75	72	77	83	81	78	67	78	84	68	91	83	91		70		67	117	107	90	111	82	107	119	from the quarterly data
2016	75	75	72	77	82	81	78	66	77	83	67	91	83	90		70		66	116	106	90	112	81	108	119	
2017	75	74	72	77	83	82	79	64	77	81	67	89	82	90		68		66	116	106	90	111	81	108	120	
2018	74	74	73	77	83	82	79	63	73	74	69	87	81	90		68		66	115	104	90	112	83	107	118	
2019	75	75	72	75	82	81	79	63	74	70	67	87	81	91		74		66	115	104	90	111	83	110	122	
2020	75	75	72	75	81	82	79	63	74	67	66	87	81	91		75		67	115	105	90	111	82	107	121	
2021	75	72	72	76	81	81	76	61	74	67	61	86	81	90		65		64	114	104	90	111	82	106	120	
2022	74	73	72	87	81	81	75	60	72	53	61	85	81	88		66		64	115	93	90	111	81	107	120	
GROUNDWATER SALINITY DATA (‰)																										
2003	NI	70	68	68	NI	76	58		70				NI	66							NI	NI	67			"NC" indicates that sample/data was not
2004	68	40	30	48	60	65	38		68				48	36							48	55	49			collected due to lack of water in the bore
2004	6	22	26	22	40	48	2		38				12	12							4	5	5			
2004	NC	45	48	43	46	57	30		60				44	54							38	26	27			
2004	NC	56	58	64	58	68	45		62				NC	63							65	NC	48			
2004	78	66	64	70	48	72	61		72				62	55							62	12	54			
2005	42	41	45	42	56	52	30		60				30	33							30	11	22			
2005	70	65	60	NC	62	60	42		64				NC	56							NC	NC	25			
2005	NC	62	72	NC	66	71	54		73				NC	71							NC	NC	32			
2005	60	60	58	63	63	72	52		70				50	48							56	10	21			
2006	21	40	22	32	55	45	5		56				23	24							15	9	8			
2006	NC	65	68	NC	64	60	70		65				NC	65							NC	65	22			
2007	NC	66	68	NC	65	65	52		72				NC	68							NC	64	45			
2008	NC	69	66	72	60	64	53		71				NC	64							68	NC	54			
2009	NC	70	64	73	65	54	48		70				60	62							64	NC	43			
2010	NC	66	66	70	48	58	38		71				51	60							62	64	34			
2011	NC	66	66	62	62	62	32		65				NC	59							58	NC	19			
2012	NC	68	64	68	62	60	44		64				NC	62							67	NC	42			
2013	NC	NC	67	61	62	62	NC		67				NC	68							NC	NC	NC			
2014	NC	62	64	69	60	62	52		68				61	66							65	70	19			
2015	NC	70	66	67	62	68	48		68				50	68							64	NC	50			
2016	NC	NC	NC	NC	60	70	NC		67				NC	68							65	NC	NC			
2017	NC	70	69	66	59	61	48		70				NC	67							22	NC	40			
2018	NC	73	67	NC	58	NC	NC		72				24	69							NC	NC	41			
2019	NC	NC	68	NC	55	NC	NC		70				NC	66							NC	NC	NC			
2020	NC	65	66	63	60	62	45		60				52	37							54	26	41			
2021	NC	NC	64	62	52	56	42		68				50	58							50	NC	22			
2022	NC	NC	51	NC	58	52	39		33				NC	NC							63	65	NC			

	GROUNDWATER DEPTH (cm BGL)																									
2003	NI	80	70	30	NI	15	50		5				NI	18							NI	NI	42			"NC" indicates that sample/data was not
2004	20	5	9	7	10	5	18		15				22	7							1	17	19			collected due to lack of water in the bore
2004	12	0	3	3	5	6	1		1				4	9							0	1	1			
2004	NC	53	48	51	12	29	52		10				54	44							59	20	43			
2004	NC	70	71	52	62	41	80		4				NC	40							90	NC	69			
2004	38	43	47	41	28	45	44		42				51	24							56	31	53			
2005	22	2	5	11	9	6	7		23				10	9							6	0	11			
2005	60	80	90	NC	52	41	95		51				NC	60							NC	NC	88			
2005	NC	80	86	NC	21	44	99		40				NC	56							NC	NC	57			
2005	34	27	35	40	24	22	32		25				31	20							25	0	22			
2006	16	2	0	1	3	0	0		2				5	8							1	7	2			
2006	NC	80	86	NC	37	41	95		29				NC	61							NC	55	105			
2007	NC	79	84	NC	28	37	90		29				NC	49							NC	55	86			
2008	NC	74	55	40	25	29	53		38				NC	31							72	NC	60			
2009	NC	54	50	40	40	40	58		56				54	30							60	NC	43			
2010	NC	39	25	38	0	20	61		40				48	34							55	50	40			
2011	NC	63	65	44	27	44	67		64				NC	22							70	NC	51			
2012	NC	78	72	37	48	40	78		9				NC	36							81	NC	64			
2013	NC	NC	84	6	3	4	NC		0				NC	56							NC	NC	NC			
2014	NC	12	15	9	3	7	35		0				40	57							27	27	12			
2015	NC	62	53	43	15	39	65		32				68	55							78	NC	79			
2016	NC	NC	NC	NC	0	46	NC		50				NC	75							65	NC	NC			
2017	NC	74	55	21	1	0	46		8				NC	26							42	NC	46			
2018	NC	16	70	NC	52	7	2		99				11	26							47	1	96			
2019	NC	NC	18	NC	109	NC	NC		88				NC	13							NC	NC	NC			
2020	NC	75	21	49	90	49	76		110				18	59							65	21	80			
2021	NC	NC	29	63.5	119	42	107.4		149				23	85.6							92.5	NC	22			
2022			10.5		102.5	40	77		114					7.5							92	66				
	GROUNDWATER PH																									
2018	NC	5.94	6.07	NC	6.34	NC	NC		6.39				6.14	5.70							NC	NC	5.95			"NC" indicates that sample/data was not
2019	NC	NC	6.4	NC	6.26	NC	NC		6.49				NC	5.71							NC	NC	NC			collected due to lack of water in the bore
2020	NC	6.01	5.9	6.26	6.46	6.33	5.48		6.4				5.4	5.4							5.93	6.53	6.31			
2021	NC	NC	5.62	6.04	6.54	5.31	2.27		6.58				5.86	5.35							4.79	NC	4.64			
2022	NC	NC	NC	NC	NC	NC	NC		NC				NC	NC							NC	NC	NC			

Santos

Attachment C – Stack Emission Data

Compressor Turbines

NOX_g/s		Unit						EPL217
Year	Month	U1411	U1421	U1511	U1521	U1611	U1621	Max Emission Rate (g/s)
2016	2	6.5	5.5	5.2	7.2	5.4	5.6	25
	4	7	6.1	5.8	7.4	6.7	5.6	25
	9	5.9	5.2	4.6	7.2	6.7	5.8	25
	11	6	6.3	4.7	5.7	5.6	4.8	25
2017	3	6.6	6	6.6	6	6.7	6.2	25
	5	9.1	9.6	9	9	7.9	7.5	25
	8	6.7	6.9	6.6	6.3	7.6	7.1	25
	10	6.1	6.1	5.8	5.5	6.9	6.5	25
2018	4	5.1	5.7	8	6.6	6.4	6.7	25
	10	7.3	7.2	7	7.3	5.6	5.8	25
2019	3	5.8	5.9	7	7	4.6	5.4	25
	11	10	8.4	6.7	7.5	7.1	7.5	25
2020	8	12	10	10	11	8.2	10	25
	11	9.2	9.6	10	9.9	11	8.2	25
2021	6	11	11	9.8	9.3	12	11	25
	12	9.5	8.9	9.3	8	6.8	7.4	25
2022	4	8.6		7.3		8.5		25
	6		11		6.9		8.7	25
	10	8.5		6.9		7.4		25

NOX_mg/Nm³		Unit						EPL217
Year	Month	U1411	U1421	U1511	U1521	U1611	U1621	Concentration Limit (mg/Nm3)
2016	2	91	75	75	105	73	79	212
	4	95	83	84	108	88	77	212
	9	82	73	66	106	88	78	212
	11	83	88	72	91	77	66	212
2017	3	92	84	105	98	103	96	212
	5	99	98	103	104	92	89	212
	8	92	92	101	98	99	93	212
	10	86	86	96	93	96	90	212
2018	4	72	78	113	95	102	102	212
	10	100	100	108	110	80	82	212
2019	3	81	91	100	101	71	80	212
	11	147	120	108	123	115	123	212
2020	8	172	144	150	162	148	174	212
	11	138	144	152	149	161	118	212
2021	6	170	170	140	130	160	150	212
	12	150	130	150	130	120	140	212
2022	4	140		130		130		212
	6		160		120		140	212
	10	140		120		130		212

CO g/s		Unit						EPL217
Year	Month	U1411	U1421	U1511	U1521	U1611	U1621	Max Emission Rate (g/s)
2016	2	0.7	0.95	0.69	0.55	1.5	0.92	5
	4	0.59	1.5	0.7	1.5	1.8	0.99	5
	9	0.71	1.1	0.96	1.2	1.3	1.4	5
	11	0.67	1.2	0.99	0.65	1.1	0.54	5
2017	3	0.7	0.71	0.43	0.66	0.85	0.38	5
	5	1.7	1.6	1.2	1.6	2.4	0.96	5
	8	0.89	0.8	0.52	0.68	1.1	0.64	5
	10	0.96	1.1	0.5	0.74	0.59	0.61	5
2018	4	0.59	0.83	0.62	0.74	0.72	0.51	5
	10	0.44	0.7	0.58	0.58	0.9	0.87	5
2019	3	0.52	0.68	0.67	0.66	0.98	0.78	5
	11	0.61	0.67	0.8	0.42	0.32	0.6	5
2020	8	0.68	0.71	1.1	0.39	0.47	0.28	5
	11	0.62	0.48	0.45	0.42	0.56	0.42	5
2021	6	0.52	0.58	0.49	0.5	0.48	0.59	5
	12	0.57	0.4	0.5	0.43	0.42	0.44	5
2022	4	0.57		0.45		0.3		5
	6		0.48		0.52		0.74	5
	10	0.47		0.41		0.22		5

CO_mg/Nm³		Unit						EPL217
Year	Month	U1411	U1421	U1511	U1521	U1611	U1621	Concentration Limit (mg/Nm3)
2016	2	9.7	13	10	8.1	20	13	70
	4	8	20	10	21	24	14	70
	9	10	15	14	17	17	19	70
	11	9	17	15	10	15	7	70
2017	3	10	10	7	11	13	6	70
	5	19	17	14	19	28	11	70
	8	12	11	8	11	15	8.3	70
	10	14	16	8.2	13	8.2	8.5	70
2018	4	8.2	11	8.7	11	11	7.8	70
	10	6	9.6	8.8	8.8	13	12	70
2019	3	7.3	10	9.6	9.6	15	12	70
	11	8.9	9.6	13	6.8	5.2	9.9	70
2020	8	9.9	11	16	5.7	8.5	4.8	70
	11	9.3	7.2	6.6	6.3	7.9	6.1	70
2021	6	7.7	8.7	6.9	7.1	6.4	7.7	70
	12	8.8	5	7.8	7.3	7.3	8.3	70
2022	4	9.1		7.9		5		70
	6		7		9.1		12	70
	10	7.7		7.2		3.9		70

SO2 g/s		Unit						EPL217
Year	Month	U1411	U1421	U1511	U1521	U1611	U1621	Max Emission Rate (g/s)
2016	2	0.18	0.18	0.17	0.18	0.19	0.18	4.7
	4	0.19	0.19	0.18	0.18	0.19	0.19	4.7
	9	0.17	0.18	0.17	0.17	0.19	0.19	4.7
	11	0.17	0.18	0.17	0.16	0.17	0.17	4.7
2017	3	0.17	0.19	0.17	0.19	0.17	0.18	4.7
	5	0.50	0.50	0.50	0.50	0.40	0.40	4.7
	8	0.40	0.40	0.48	0.54	0.36	0.37	4.7
	10	0.40	0.30	0.40	0.30	0.40	0.30	4.7
2018	4	0.30	0.40	0.40	0.30	0.30	0.30	4.7
	10	0.40	0.40	0.30	0.30	0.30	0.30	4.7
2019	3	0.30	0.30	0.30	0.30	0.30	0.30	4.7
	11	0.40	0.30	0.30	0.30	0.30	0.30	4.7
2020	8	2.20	0.90	2.50	2.10	2.10	2.20	4.7
	11	0.85	0.30	2.00	0.40	0.40	1.10	4.7
2021	6	0.30	0.30	0.44	0.49	0.40	0.59	4.7
	12	0.30	0.40	0.30	0.30	0.30	0.39	4.7
2022	4	0.89		0.86		0.20		4.7
	6		0.3		0.2		0.2	4.7
	10	0.30		0.30		0.30		4.7

SO2 mg/Nm³		Unit						EPL217
Year	Month	U1411	U1421	U1511	U1521	U1611	U1621	Concentration Limit (mg/Nm3)
2016	2	2.6	2.5	2.5	2.7	2.5	2.6	65
	4	2.6	2.5	2.6	2.6	2.4	2.6	65
	9	2.4	2.5	2.4	2.4	2.5	2.5	65
	11	2.3	2.5	2.6	2.6	2.4	2.4	65
2017	3	2.4	2.6	2.6	3.2	2.6	2.9	65
	6	5	5	5	5	5	5	65
	9	5	5	7.4	8.5	4.8	4.8	65
	10	5	5	6	6	5	5	65
2018	4	4	5	5	5	5	5	65
	10	5	5	5	5	5	5	65
2019	3	5	5	5	5	5	5	65
	11	5	5	5	5	5	5	65
2020	8	33	14	37	30	37	38	65
	11	13	5	30	5	5	16	65
2021	6	5	5	6.1	7	5	5	65
	12	5	5	5	5	6	7.2	65
2022	4	14		7.9		4		65
	6		4		5		4	65
	10	5		6		6		65

Power Generation Turbines

NOX_g/s		Unit					EPL217
Year	Month	U3101	U3102	U3103	U3104	U3105	Max Emission Rate (g/s)
2016	2	0.24	0.2		0.17	0.23	1
	4	0.36	0.3	0.14	0.044		1
	8	0.27	0.18	0.12	0.19		1
	11	0.25	0.23	0.17	0.13	0.26	1
2017	3	0.2	0.32	0.08	0.14	0.22	1
	6	0.34	0.37	0.15	0.19	0.37	1
	8	0.28	0.38	0.096	0.16	0.34	1
	10	0.25	0.3	0.076	0.12	0.23	1
2018	4	0.17	0.17	0.036	0.074	0.15	1
	10	0.37	0.31	0.12	0.15	0.26	1
2019	3	0.28	0.41	0.091	0.014	0.043	1
	11	0.3	0.3	0.11	0.041	0.12	1
2020	8	0.34	0.11	0.08	0.15	0.09	1
	11	0.24	0.24	0.079	0.17	0.27	1
2021	6	0.22	0.34	0.03	0.16	0.20	1
	12	0.16	0.17	0.05	0.16	0.29	1
2022	4	0.22	0.16	0.03		0.16	1.0
	10	0.19	0.13			0.12	1.0

NOX_mg/Nm³		Unit					EPL217
Year	Month	U3101	U3102	U3103	U3104	U3105	Concentration Limit (mg/Nm3)
2016	2	29	24		20	27	70
	4	37	32	15	5		70
	8	30	19	13	20	21	70
	11	26	24	17	13	27	70
2017	3	22	34	9	15	24	70
	6	35	37	14	19	33	70
	9	31	40	10	19	36	70
	10	28	32	8.2	15	25	70
2018	4	19	18	3.9	9.1	16	70
	10	41	32	13	18	28	70
2019	3	33	46	9.6	1.6	4.6	70
	11	32	32	11	4.4	13	70
2020	8	37	12	8	16	9.6	70
	11	27	25	8.3	18	29	70
2021	6	25	36	3	20	22	70
	12	16	18	5	16	27	70
2022	4	21	14	3		14	70
	10	22	14			13	70

CO g/s		Unit					EPL217
Year	Month	U3101	U3102	U3103	U3104	U3105	Max Emission Rate (g/s)
2016	2	0.012	0.048		0.012	0.047	0.4
	4	0.014	0.042	0.01	0.014		0.4
	8	0.012	0.053	0.012	0.04		0.4
	11	0.013	0.013	0.013	0.013	0.013	0.4
2017	3	0.012	0.013	0.012	0.012	0.015	0.4
	6	0.032	0.022	0.016	0.01	0.015	0.4
	8	0.012	0.015	0.013	0.012	0.012	0.4
	10	0.012	0.013	0.014	0.01	0.012	0.4
2018	4	0.012	0.011	0.015	0.011	0.024	0.4
	10	0.012	0.013	0.01	0.011	0.01	0.4
2019	3	0.011	0.013	0.013	0.012	0.012	0.4
	11	0.012	0.013	0.013	0.013	0.026	0.4
2020	8	0.012	0.014	0.012	0.013	0.01	0.4
	11	0.011	0.013	0.013	0.01	0.01	0.4
2021	6	0.011	0.012	0.01	0.01	0.012	0.4
	12	0.07	0.06	0.07	0.07	0.07	0.4
2022	4	0.07	0.06	0.06		0.07	0.4
	10	0.01	0.01			0.01	0.4

CO_mg/Nm³		Unit					EPL217
Year	Month	U3101	U3102	U3103	U3104	U3105	Concentration Limit (mg/Nm3)
2016	2	1.5	5.7		1.5	5.6	32
	4	1.4	4.4	1	1.5		32
	8	1.3	5.7	1.3	4.3	7.4	32
	11	1.3	1.3	1.4	1.4	1.3	32
2017	3	1.2	1.4	1.2	1.3	1.7	32
	6	3.3	2.2	1.6	1	1.4	32
	8	1.4	1.6	1.4	1.4	1.3	32
	10	1.3	1.4	1.5	1	1.3	32
2018	4	1.3	1.2	1.6	1.4	2.6	32
	10	1.3	1.3	1	1.4	1	32
2019	3	1.3	1.5	1.3	1.4	1.3	32
	11	1.3	1.4	1.4	1.4	2.7	32
2020	8	1.3	1.5	1.3	1.4	1	32
	11	1.2	1.4	1.4	1	1	32
2021	6	1.3	1.3	1	1	1.3	32
	12	6	6	7	7	7	32
2022	4	7	5	6		6	32
	10	1	1			1	32

SO2_g/s		Unit					EPL217
Year	Month	U3101	U3102	U3103	U3104	U3105	Max Emission Rate (g/s)
2016	2	0.028	0.027		0.029	0.027	0.2
	4	0.031	0.03	0.023	0.032		0.2
	8	0.029	0.029	0.029	0.03		0.2
	11	0.03	0.029	0.03	0.031	0.029	0.2
2017	3	0.027	0.03	0.027	0.028	0.027	0.2
	6	0.06	0.06	0.06	0.06	0.07	0.2
	8	0.06	0.06	0.06	0.06	0.06	0.2
	10	0.06	0.06	0.06	0.05	0.06	0.2
2018	4	0.06	0.05	0.07	0.05	0.06	0.2
	10	0.06	0.06	0.06	0.05	0.06	0.2
2019	3	0.05	0.05	0.06	0.05	0.06	0.2
	11	0.06	0.06	0.06	0.06	0.06	0.2
2020	8	0.06	0.06	0.06	0.06	0.06	0.2
	11	0.05	0.06	0.06	0.06	0.06	0.2
2021	6	0.05	0.06	0.06	0.05	0.06	0.2
	12	0.06	0.06	0.07	0.06	0.07	0.2
2022	4	0.07	0.06	0.05		0.06	0.2
	10	0.05	0.05			0.05	0.2

SO2_mg/Nm³		**Unit**					EPL217
Year	Month	U3101	U3102	U3103	U3104	U3105	Concentration Limit (mg/Nm3)
2016	2	3.4	3.2		3.4	3.2	23
	4	3.2	3.1	2.4	3.4		23
	8	3.1	3.2	3.1	3.2	3.2	23
	11	3.1	3.1	3.2	3.2	3.1	23
2017	3	2.9	3.2	2.9	3	2.9	23
	6	6	6	6	6	6	23
	8	7	7	7	7	7	23
	10	6	6	7	6	6	23
2018	4	6	5	7	6	6	23
	10	6	6	6	6	6	23
2019	3	6	6	6	6	6	23
	11	6	6	6	6	6	23
2020	8	6	6	6	6	6	23
	11	6	6	6	7	6	23
2021	6	6	6	6	6	6	23
	12	6	6	6	6	6	23
2022	4	6	5	5		5	23
	10	6	6			6	23

Acid Gas Incinerator

NOX_g/s			EPL217
Year	**Month**	**K-1904**	**Max Emission Rate (g/s)**
2016	2	0.67	1.5
	4	1	1.5
	9	0.88	1.5
	11	1.2	1.5
2017	3	0.948555525	1.5
	6	0.7	1.5
	8	0.8	1.5
	11	0.77	1.5
2018	2	0.75	1.5
	4	0.66	1.5
	12	0.42	1.5
2019	1	0.65	1.5
	4	0.37	1.5
	8	0.47	1.5
	11	0.21	1.5
2020	2	0.36	1.5
	8	0.51	1.5
	11	0.32	1.5
2021	3	0.21	1.5
	6	0.37	1.5
	9	0.43	1.5
	12	0.19	1.5
2022	2	0.27	1.5
	4	0.47	1.5
	8	0.31	1.5
	10	0.27	1.5

NOX_mg/Nm³		Unit	EPL217
Year	**Month**	**K-1904**	**Concentration Limit (mg/Nm3)**
2016	2	30	64
	4	44	64
	9	34	64
	11	38	64
2017	3	30	64
	6	34	64
	8	40	64
	11	38	64
2018	2	37	64
	4	31	64
	12	22	64
2019	1	32	64
	4	30	64
	8	23	64
	11	13	64
2020	2	20	64
	8	26	64
	11	19	64
2021	3	12.0	64
	6	18.0	64
	9	22.0	64
	12	11.0	64
2022	2	16.0	64
	4	71.0	64
	8	59.0	64
	10	46.0	64

CO_g/s		Unit	EPL217
Year	**Month**	**K-1904**	**Max Emission Rate (g/s)**
2016	2	1.7	3
	4	0.65	3
	9	1.8	3
	11	0.99	3
2017	3	2.8	3
	6	1.3	3
	9	0.74	3
	11	0.69	3
2018	2	1.2	3
	4	1	3
	12	0.67	3
2019	1	1	3
	4	0.23	3
	8	2.7	3
	11	1.2	3
2020	2	0.68	3
	8	0.72	3
	11	0.53	3
2021	3	0.61	3
	6	0.44	3
	9	0.64	3
	12	0.46	3
2022	2	0.57	3
	4	0.1	3
	8	0.058	3
	10	0.043	3

CO_mg/Nm³		Unit	EPL217
Year	**Month**	**K-1904**	**Concentration Limit (mg/Nm3)**
2016	2	79	339
	4	29	339
	9	69	339
	11	31	339
2017	3	87	339
	6	61	339
	9	37	339
	11	34	339
2018	2	59	339
	4	46	339
	12	36	339
2019	1	52	339
	4	18	339
	8	130	339
	11	71	339
2020	2	38	339
	8	37	339
	11	32	339
2021	3	33	339
	6	22	339
	9	33	339
	12	26	339
2022	2	35	339
	4	15	339
	8	11	339
	10	7	339

SO2_g/s			EPL217
Year	**Month**	**K-1904**	**Max Emission Rate (g/s)**
2016	2	1.6	4.6
	4	2.5	4.6
	9	2.7	4.6
	11	3.5	4.6
2017	3	2.9	4.6
	6	2	4.6
	8	2.4	4.6
	11	2.5	4.6
2018	2	1.9	4.6
	4	2.1	4.6
	12	2.2	4.6
2019	1	2.2	4.6
	4	1.4	4.6
	8	1.6	4.6
	11	1.8	4.6
2020	2	2.1	4.6
	8	2.4	4.6
	11	1.4	4.6
2021	3	1.8	4.6
	6	1.4	4.6
	9	2.2	4.6
	12	3.4	4.6
2022	2	1.8	4.6
	4	0.88	4.6
	8	0.62	4.6
	10	0.68	4.6

SO2_mg/Nm³			EPL217
Year	**Month**	**K-1904**	**Concentration Limit (mg/Nm3)**
2016	2	74	194
	4	112	194
	9	103	194
	11	106	194
2017	3	90	194
	6	98	194
	9	122	194
	11	126	194
2018	2	92	194
	4	95	194
	12	117	194
2019	1	112	194
	4	110	194
	8	76	194
	11	109	194
2020	2	119	194
	8	121	194
	11	81	194
2021	3	97	194
	6	22	194
	9	120	194
	12	190	194
2022	2	110	194
	4	130	194
	8	120	194
	10	120	194

H2S g/s			EPL217		EPL217
Year	**Month**	**K1904**	**H2S Concentration Limit (mg/Nm3)**	**K1904**	**Maximum mass emission rate H2S (g/s)**
2017	11	0.8	5	0.02	0.1
2018	2	0.8	5	0.02	0.1
	4	0.8	5	0.02	0.1
	12	0.6	5	0.01	0.1
2019	1	0.6	5	0.01	0.1
	4	0.6	5	0.008	0.1
	8	0.4	5	0.009	0.1
	11	0.4	5	0.007	0.1
2020	2	0.4	5	0.007	0.1
	8	0.4	5	0.008	0.1
	11	0.7	5	0.012	0.1
2021	3	0.4	5	0.008	0.1
	6	0.3	5	0.006	0.1
	9	0.4	5	0.008	0.1
	12	0.4	5	0.008	0.1
2022	2	0.2	5	0.004	0.1
	4	0.5	5	0.004	0.1
	8	0.4	5	0.002	0.1
	10	0.9	5	0.005	0.1

Boiler

NOX_g/s			EPL217
Year	Month	B-3801	Max Emission Rate (g/s)
2016	2	0.26	0.70
	4	0.21	0.70
	9	0.20	0.70
	11	0.14	0.70
2017	3	0.22	0.70
	6	0.45	0.70
	8	0.49	0.70
	10	0.25	0.70
2018	4	0.18	0.70
	11	0.20	0.70
2019	3	0.16	0.70
	11	0.15	0.70
	11	0.17	0.70
2020	8	0.19	0.70
	11	0.17	0.70
2021	6	0.20	0.70
	12	0.24	0.70
2022	4	0.27	0.70

NOX_mg/Nm³			EPL217
Year	Month	B-3801	Concentration Limit (mg/Nm3)
2016	2	124.0	190
	4	114.0	190
	9	114.0	190
	11	111.0	190
2017	3	105.0	190
	6	139.0	190
	9	139.0	190
	10	100.0	190
2018	4	101.0	190
	11	103.0	190
2019	3	103.00	190
	11	134.00	190
	11	121.00	190
2020	8	128.00	190
	11	110.00	190
2021	6	150.00	190
	12	120.00	190
2022	4	130.00	190

CO_g/s			EPL217
Year	Month	B-3801	Max Emission Rate (g/s)
2016	2	0.003	0.2
	4	0.01	0.2
	9	0.06	0.2
	11	0.002	0.2
2017	3	0.004	0.2
	6	0.006	0.2
	9	0.006	0.2
	10	0.005	0.2
2018	4	0.004	0.2
	11	0.037	0.2
2019	3	0.021	0.2
	11	0.120	0.2
	11	0.0042	0.2
2020	8	0.0030	0.2
	11	0.0030	0.2
2021	6	0.0046	0.2
	12	0.0200	0.2
2022	4	0.02	0.2

CO_mg/Nm³			EPL217
Year	Month	B-3801	Concentration Limit (mg/Nm3)
2016	2	1.4	42
	4	3.2	42
	9	36	42
	11	1.9	42
2017	3	1.9	42
	6	2	42
	9	2	42
	10	2	42
2018	4	2	42
	11	19	42
2019	3	13	42
	11	107	42
	11	3	42
2020	8	2	42
	11	2	42
2021	6	3.5	42
	12	9	42
2022	4	8	42

SO2_g/s			EPL217
Year	Month	B-3801	Max Emission Rate (g/s)
2016	2	0.007	0.25
	4	0.006	0.25
	9	0.007	0.25
	11	0.005	0.25
2017	3	0.009	0.25
	6	0.030	0.25
	9	0.020	0.25
	10	0.020	0.25
2018	4	0.020	0.25
	11	0.020	0.25
2019	3	0.020	0.25
	11	0.010	0.25
	11	0.010	0.25
2020	8	0.010	0.25
	11	0.010	0.25
2021	6	0.010	0.25
	12	0.020	0.25
2022	4	0.020	0.25

SO2_mg/Nm³			EPL217
Year	Month	B-3801	Concentration Limit (mg/Nm3)
2016	2	3.20	65
	4	3.10	65
	9	4.20	65
	11	4.30	65
2017	3	4.30	65
	6	9.00	65
	9	6.00	65
	10	9.00	65
2018	4	9.00	65
	11	10.00	65
2019	3	10.00	65
	11	10.00	65
	11	9.00	65
2020	8	9.00	65
	11	9.00	65
2021	6	9.00	65
	12	9.00	65
2022	4	8.00	65

Solvent Regenerator Reflux Drum (Acid Gas Removal Vent)

H2S					
Year	Month	V1206	H2S Concentration Limit (mg/Nm3)	V1206	Maximum mass emission rate H2S (g/s)
2017	10	86.00	136	0.82	1.5
2018	2	44.00	136	0.54	1.5
	4	31.00	136	0.36	1.5
	7	95.00	136	1.10	1.5
	10	142.00	136	1.40	1.5
2019	1	67.00	136	0.66	1.5
	4	60.00	136	0.54	1.5
	8	68.00	136	0.70	1.5
	11	107	136	1.0	1.5
2020	2	82.00	136	0.78	1.5
	8	44.00	136	0.38	1.5
	11	51.00	136	0.53	1.5
2021	3	88.00	136	0.76	1.5
	6	5.00	136	0.06	1.5
	9	85.00	136	0.87	1.5
	12	5.00	136	0.02	1.5
2022	1	6.00	136	0.04	1.5
	2	6.00	136	0.04	1.5
	4	4.00	136	0.01	1.5
	8	49.00	136	0.16	1.5
	10	23.00	136	0.07	1.5

Benzene					
Year	Month	V1206	Benzene Concentration Limit (mg/Nm3)	V1206	Maximum mass emission rate Benzene (g/s)
2017	10	6.20	16	0.059	0.18
2018	2	5.60	16	0.068	0.18
	4	2.70	16	0.031	0.18
	7	1.20	16	0.014	0.18
	10	6.10	16	0.061	0.18
2019	1	9.70	16	0.096	0.18
	4	34.00	16	0.30	0.18
	8	8.80	16	0.09	0.18
	11	16.00	16	0.15	0.18
2020	2	14.00	16	0.13	0.18
	8	13.00	16	0.11	0.18
	11	5.80	16	0.06	0.18
2021	3	13.00	16	0.11	0.18
	6	7.30	16	0.08	0.18
	9	9.30	16	0.10	0.18
	12	24.00	16	0.10	0.18
2022	1	24.00	16	0.18	0.18
	2	24.00	16	0.18	0.18
	4	42.00	16	0.13	0.18
	8	24.00	16	0.08	0.18
	10	44.00	16	0.13	0.18

Attachment D – Groundwater Data

GROUNDWATER

Sample	Date Sampled	pH	Electrical Conductivity (EC)	Dissolved Oxygen	Total Dissolved Solids (grav)	Total Suspended Solids	Turbidity	Total Nitrogen	Ammonia as N	Nitrite + Nitrate as N	Nitrate as N	Nitrite as N	Kjeldahl Nitrogen Total	Dissolved Reactive Phosphorus as P	Phosphate as P	Total Phosphorus	Calcium - Dissolved	Potassium - Dissolved	Magnesium - Dissolved
Biannual Testing Frequency		pH Units	µS/cm	mg/L	mg/L	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR		0.1	1	0.1	1	1	0	0.1	0.01	0.01	0.01	0.01	0.1	0.01	0.005	0.01	1	1	1
BH1																			
BH1	16/03/2015	5.78	2,110	8.6	1,070	531		0.6	0.04		0.18	<0.01		<0.01		0.18	27	8	40
BH1	25/08/2015	5.39	91,100	7.0	50,400	9,480		2	0.37		0.35	<0.01		<0.1		3.14	865	360	2,300
BH1	27/04/2016	5.4	14,000	9.3	9,300	430		1	0.01		0.44	0.006			<0.005	0.02	170	60	400
BH1	10/08/2016	4.9	69,000		50,000	7,600		2.2	0.51		0.83	<0.005			0.015	0.13	770	310	2,000
BH1	27/04/2017	5.53	5,030	8.7	2,720	439		1	0.13		0.18	<0.01	0.8	<0.01		0.78	46	18	98
BH1	22/08/2017	5.14	91,800	7.1	78,700	2,240		<2	0.6	0.19	<0.01	0.19	<2.0	0.02		0.9	1,100	442	2,940
BH1	11/04/2018	5.7	4,400	9.1	3,300	280		0.4	0.03	0.14	0.14	<0.02	0.3	<0.05		0.14	63	23	130
BH1	9/08/2018	4.2	76,000	7.6	8	56,000		<0.5	0.70	0.26	0.59	0.59	<0.02	<0.2	<0.05	0.12	910	430	2,300
BH1	2/04/2019	5.2	9,850	7.7	5,550	735		1.1	0.38	0.63	0.63	<0.01	0.5	<0.01		0.08	89	32	190
BH1	14/08/2019	5.0	72,800	7.7	57,600	3,520		<2	0.80	0.36	0.36	<0.01	<2	0.01		0.84	898	357	2,220
BH1	8/04/2020	4.7	17,400	6.7	9,950	3,430	1,530	0.8	0.1	0.15	0.15	<0.01	0.6	<0.01		0.41	220	75	555
BH1	5/08/2020	5.3	48,700	8.5	43,400	1,030	417	0.7	0.1	0.34	0.34	<0.002	0.4	0.026		0.06	612	233	1,550
BH1	7/04/2021	5.9	2,160	4.7	1,250	776		0.3	0.38	0.032	0.03	<0.002	0.25	0.0004		0.21	25	14	42
BH1	10/08/2021	4.2	64,100	10.6	45,100	183		0.5	0.0	0.36	0.35	<0.002	0.2	<0.01	<0.01	0.12	721	237	1,630
BH1	27/04/2022	5.2	20,100		12,500	131		<0.5	0.07	0.03	0.03	<0.01	<0.5			<0.5	211	57	447
BH1	9/08/2022	4.2	35,700	63.9	24,300	38		0.8	0.2	0.19	0.19	<0.01	0.6			0.08	297	104	
BH2																			
BH2	18/03/2015	7.08	82,800	6.4	63,000	2,500		2.3	2.02		0.02	<0.01		<0.01		1.1	1,310	653	2,350
BH2	26/08/2015	7.4	74,700	7.1	48,200	2,890		28.4	27.3		0.04	<0.01		<0.1		0.77	776	472	1,500
BH2	27/04/2016	6.2	55,000		38,000	1,200		66	39		1.61	<0.05			<0.05	<0.01	530	250	1,300
BH2	10/08/2016	6.7	75,000		54,000	7,100		26	15		<0.01	<0.05			<0.05	0.12	980	510	2,000
BH2	26/04/2017	7.19	58,900	6.5	52,200	21,500		21	15.6		<0.002	<0.01	21.3	<0.01		2.37	660	326	1,280
BH2	22/08/2017	7.48	66,500	6.2	55,600	7,920		13,100	11.9	<0.01	<0.01	<0.01	13.1	<0.01		1.73	858	468	1,830
BH2	11/04/2018	7.7	66,000	8.9	44,000	720		9.6	11	<0.05	<0.02	<0.02	9.6	<0.05		1.5	780	440	1,600
BH2	8/08/2018	7.7	62,000	9.0	9	48,000		<0.5	16.00	14	<0.05	<0.02	<0.02	16	< 0.05		0	890	560
BH2	2/04/2019	7.1	65,800	4.6	50,600	2,390		21.3	19.80	0.03	0.03	<0.01	21.3	<0.01		0.26	754	441	1,610
BH2	13/08/2019	7.0	54,100	7.5	42,700	460		26.4	27.30	<0.01	<0.01	<0.01	26.4	<0.01		0.19	556	358	1,380
BH2	7/04/2020	7.0	70,000	4.6	52,200	3,760	4,560	19.8	13.5	0.05	0.05	<0.01	19.8	<0.01		0.14	844	477	1,890
BH2	6/08/2020	7.2	50,500	8.6	45,200	892	337	27.9	23.8	<0.002	<0.002	<0.002	27.9	0.003		<0.005	494	347	1,250
BH2	7/04/2021	7.3	35,600	6.6	24,100	758		15.4	13.80	0.017	0.02	<0.002	15.40	0.014		0.20	450	252	928
BH2	11/08/2021	7.0	63,300	6.5	46,700	9,040		14.6	13.4	<0.002	<0.002	<0.002	15.5	<0.01	<0.01	0.46	725	410	1,440
BH2	26/04/2022	5.7	58,600		43,100	370		12.8	11.4		<0.01	<0.01	12.8			0.12	760	357	1,310
BH2	9/08/2022	6.1	42,100	76.4	27,700	684		35.8	30.9	<0.01	<0.01	<0.01	35.8			<0.05	321	176	
BH3																			
BH3	18/03/2015	5.54	376	5.7	184	8,950		4	0.04		3.15	0.02		<0.01		1.46	20	<1	3
BH3	25/08/2015	4.23	574	5.8	560	13,200		<1	0.14		0.04	<0.01		<0.1		4.66	16	<1	4
BH3	27/04/2016	4.7	230		200	2,800		1.4	0.016		0.38	<0.005			<0.005	0.21	30	7	71
BH3	10/08/2016	5.5	340		200	3,900		1.1	0.12		0.012	<0.005			<0.005	0.16	6	3	4
BH3	26/04/2017	6.42	98	7.0	214	6,940		6	0.25		0.04	<0.01	5.6	<0.01		4.94	6	3	3
BH3	22/08/2017	6.04	472	7.5	97	15,600		800	0.33	0.04	<0.01	0.04	0.8	<0.01		1.55	4	4	2
BH3	11/04/2018	6.4	120	7.9	76	6,200		0.65	0.38	0.05	0.05	< 0.02	0.6	< 0.05		0.32	9	3	4
BH3	8/08/2018	6.1	130	8.9	140	3,600		0.9	0.63	<0.05	<0.02	< 0.02	0.9	< 0.05		0.13	13	8	6
BH3	2/04/2019	6.1	115	5.6	177	2,800		2.4	0.39	0.05	0.05	<0.01	2.4	<0.01		1.76	5	4	3
BH3	13/08/2019	6.6	261	5.8	508	20,300		1.3	0.38	<0.01	<0.01	<0.01	1.3	<0.01		3.97	6	4	4
BH3	7/04/2020	6.0	174	5.9	136	4,630	6,010	1.9	0.1	0.36	0.36	<0.01	1.5	0.02		1.11	7	5	4
BH3	6/08/2020	6.1	199	7.8	260	4,590	5,030	0.8	0.1	0.01	0.01	0.003	0.8	<0.001		0.02	7	4	4
BH3	7/04/2021	6.3	121	4.0	323	4,790		2.0	0.24	<0.01	0.03	<0.01	1.97	0.003		0.76	5	7	3
BH3	10/08/2021	6.2	147	8.4	228	1,830		5.0	1.6	0.02	0.02	<0.002	5.7	<0.01	<0.01	0.99	10	7	6
BH3	26/04/2022	5.7	137		287	746		2.3	0.6		0.01	<0.01	2.3			0.54	11	5	6
BH3	9/08/2022	6.3	159	53.0	2	96		0.1	1.3	<0.01	0.03	3.9	<0.0001			<50	5	0	
BH4																			
BH4	18/03/2015	6.05	634	6.9	308	7,840		0.7	0.02		0.03	<0.01		<0.01		0.84	30	4	9
BH4	25/08/2015	6.21	903	3.7	1,930	48,000		2.9	0.09		0.03	<0.01		<0.1		3.55	30	4	9
BH4	27/04/2016	5.7	480		290	330		0.2	0.021		<0.005	<0.005			<0.005	0.03	20	4	9
BH4	10/08/2016	5.2	500		320	6,900		0.4	0.02		0.006	<0.005			<0.005	0.11	11	5	11
BH4	26/04/2017	4.37	448	7.6	314	1,330		0.4	0.11		0.02	<0.01	0.4	<0.01		0.25	7	4	10
BH4	21/08/2017	4.48	149	6.4	319	9,480		1,800	0.02	0.02	<0.01	0.02	1.8	<0.01		1.66	11	4	13
BH4	10/04/2018	4.3	400	8.6	320	430		<0.2	<0.01	<0.05	<0.02	<0.02	<0.2	<0.05		0.08	8	3	9
BH4	9/08/2018	4.1	420	8.5	260	220		<0.2	<0.01	<0.05	<0.02	<0.02	<0.2	<0.05		0.08	7	6	10
BH4	2/04/2019	4.7	429	5.2	260	169		0.6	<0.01	0.05	0.05	<0.01	0.5	<0.01		0.37	5	4	10
BH4	14/08/2019	5.3	415	6.3	443	5,440		0.9	0.01	0.03	0.03	<0.01	0.9	<0.01		1.15	6	4	10
BH4	7/04/2020	5.1	422	6.7	258	1,850	1,840	<0.1	<0.01	0.03	0.03	<0.01	<0.1	<0.01		0.01	6	3	8
BH4	6/08/2020	5.4	411	7.6	236	1,390	869	0.0	0.0	0.02	0.02	<0.002	0.0	0.006		0.02	5	4	10
BH4	7/04/2021	0.5	399	4.3	236	538		0.0	<0.01	0.004	0.00	<0.002	0.03	0.008		0.08	5	5	9
BH4	11/08/2021	5.1	357	7.7	237	2,560		0.2	0.0	0.04	0.04	<0.002	0.0	<0.01	<0.01	0.04	5	5	8
BH4	26/04/2022	3.7	321		203	96		<0.1	<0.01		0.08	<0.01	<0.1			0.02	5	3	8
BH4	9/08/2022	3.9	346	73.9	<0.01	204		0.0	0.0	<0.01	0.04	7	<0.0001			<50	7	0	
BH5																			
BH5	16/03/2015	7.34	3,340	5.7	1,840	13,600		2.8	0.18		0.18	<0.01		0.01		2.42	148	10	54
BH5	26/08/2015	6.93	2,280	7.1	1,320	1,390		1.1	0.06		0.46	<0.01		<0.1		0.17	60	4	32
BH5	27/04/2016	6.4	2,000		1,200	180		1	0.033		0.63	<0.005			<0.005	0.03	110	6	43
BH5	10/08/2016	5.6	1,700		990	2,700		3.1	<0.005		1.8	<0.005			0.005	0.1	21	2	25
BH5	27/04/2017	6.78	1,850	8.3	992	14,300		3	0.08		2.36	<0.01	0.7	<0.01		0.21	34	2	26
BH5	21/08/2017	7.03	1,960	6.2	1,220	46,800		2,800	0.14	0.91	0.01	0.9	1.9	<0.01		0.88	48	4	26
BH5	11/04/2018	6.3	1,200	8.9	780	510		1.5	0.03	1.5	1.50	<0.02	<0.2	<0.05		0.61	35	2	21
BH5	8/08/2018	7.4	1,700	9.3	1,000	1,800		0.9	0.09	0.91	0.91	<0.02	<0.2	<0.05		0.23	57	8	26
BH5	3/04/2019	6.2	1,320	8.8	732	91		1.5	0.07	1.17	1.17	<0.01	0.3	<0.01		0.05	21	2	21
BH5	14/08/2019	6.8	2,000	7.1	1,080	5,860		1.1	0.06	0.44	0.44	<0.01	0.7	<0.01		0.38	40	4	26
BH5	8/04/2020	5.8	1,800	5.2	932	2,260	1,070	4.1	0.0	2.96	2.96	<0.01	1.1	<0.01		0.27	24	3	23
BH5	6/08/2020	5.4	1,600	7.5	778	74	17	1.4	0.0	1.36	1.36	<0.002	<0.10	0.012		0.05	13	2	20
BH5	6/04/2021	5.5	1,770	6.7	978	434		3.4	0.01	2.830	2.83	<0.002	0.60	0.018		0.09	28	2	25
BH5	11/08/2021	4.6	1,420	7.9	782	245		1.5	0.0	1.61	1.61	<0.002	0.3	<0.01	<0.01	0.08	16	4	20
BH5	27/04/2022	5.7	1,600		1,060	1,590		0.7	<0.01		0.40	<0.01	0.3			0.13	25	5	24
BH5	9/08/2022	5.7	1,260	110.2	784	774		0.6	0.0	0.03	0.03	<0.01	0.6			0.17	18	2	
BH6																			
BH6	18/03/2015	5.9	2,220	6.4	1,040	6,580		1.1	0.67		0.02	<0.01		<0.01		0.48	20	9	42
BH6	25/08/2015	5.96	21,400	5.7	12,500	9,400		0.7	0.46		0.07	<0.01		<0.1		0.09	230	54	550
BH6	27/04/2016	6	36,000		25,000	3,100		0.8	0.007		0.01	<0.005			<0.005	0.03	480	100	1,200
BH6	10/08/2016	5.3	11,000		7,000	740		1.1	0.35		0.017	<0.005			<0.005	<0.01	85	38	250
BH6	27/04/2017	6.01	1,510	6.4	762	605		1	0.7		0.09	<0.01	1	<0.01		0.1	13	8	30
BH6	21/08/2017	5.68	8,340	6.8	4,850	708		600	0.38	0.05	<0.01	0.05	0.5	<0.01		0.05	61	29	166
BH6	10/04/2018	6.1	3,700	8.4	2,500	240		0.6	0.58	<0.05	<0.02	<0.02	0.6	<0.05		<0.05	49	21	120
BH6	8/08/2018	6.1	6,100	8.9	3,600	460		0.3	0.07	<0.05	0.02	<0.02	0.3	<0.05		0.10	140	46	370
BH6	3/04/2019	6.5	1,110	6.3	564	112		0.6	0.30	0.02	0.02	<0.01	0.6	<0.01		0.01	8	6	20
BH6	14/08/2019	5.9	6,750	6.7	3,430	956		0.7	0.38	0.03	0.03	<0.01	0.7	<0.01		0.04	27	15	70
BH6	7/04/2020	5.9	1,090	5.4	568	196	98	0.5	0.3	<0.01	<0.01	<0.01	0.5	<0.01		<0.01	10	6	22
BH6	5/08/2020	5.7	3,230	7.6	1,810	444	206	0.4	0.3	0.02	0.02	<0.002	0.4	0.002		<0.005	28	16	78
BH6	6/04/2021	5.9	1,100	5.9	632	1,960		0.8	0.41	0.008	0.01	<0.002	0.80	0.003		0.16	11	7	22
BH6	11/08/2021	5.6	2,680	6.4	1,490	290		0.2	0.4	<0.01	<0.01	<0.002	0.2	<0.01	<0.01	0.11	23	14	57
BH6	27/04/2022	5.8	19,100		13,600	69		0.2	0.2		<0.01	<0.01	0.2			<0.02	237	47	518
BH6	9/08/2022	5.1	2,300	29.8	1,320	<5		0.5	0.3	0.02	0.02	<0.01	0.5			0.03	18	12	
BH7																			
BH7	16/03/2015	6.44	3,500	4.5	1,750	3,500		3.4	3.08		0.04	<0.01		<0.01		0.39	28	23	76
BH7	26/08/2015	6.42	13,500	4.8	7,680	35,400		4.4	3.5		<0.05	<0.05		<0.1		1.21	84	88	210
BH7	27/04/2016	6.2	2,900		1,800	1,200		14	3.7		<0.005	<0.05			<0.05	<0.01	24	22	66
BH7	10/08/2016	6.3	7,100		4,400	4,400		6.2	2.8		<0.005	<0.005			<0.005	<0.01	47	51	140
BH7	27/04/2017	6.58	2,040	6.1	1,040	452		3	1.86		0.04	<0.01	2.7	<0.01		0.06	16	14	41
BH7	21/08/2017	6.53	8,910	5.5	5,470	34,000		5,900	2.95	0.04	<0.01	0.04	5.9	<0.01		0.71	67	65	197
BH7	10/04/2018	6.4	1,600	7.9	1,000	370		3.8	2.9	<0.05	<0.02	<0.02	3.8	<0.05		0.07	15	14	37
BH7	8/08/2018	6.6	11,000	9.1	7,600	580		4.7	3.4	0.05	0.05	<0.02	4.6	<0.05		0.47	47	49	130
BH7	3/04/2019	6.7	1,450	6.2	813	165		2.5	1.8	0.03	0.03	<0.01	2.5	<0.01		0.04	12	12	29
BH7	13/08/2019	6.3	9,060	7.6	5,400	2,340		2.7	2.8	<0.01	<0.01	<0.01	2.7	<0.01		0.08	71	66	193
BH7	8/04/2020	6.3	1,470	5.1	793	194	149	3.0	1.44	0.02	0.02	<0.01	3.0	<0.01		0.08	12	12	29
BH7	6/08/2020	6.4	5,230	7.5	3,240	3,520	1,420	2.8	1.9	0.01	0.00	0.008	2.8	0.007		0.01	36	36	99
BH7	6/04/2021	6.3	1,080	4.2	607	65		2.0	1.26	<0.01	<0.01	0.02	1.98	0.002		0.02	11	10	24
BH7	11/08/2021	6.2	6,040	8.0	3,410	256		2.1	2.1	<0.01	<0.01	0.02	2.4	<0.01	<0.01	0.07	38	10	95
BH7	27/04/2022	7.51	1,000		636	161		2	1.12		<0.01	<0.01	2			0.01	13	12	22
BH7	9/08/2022	6.1	1,750	12.0	937	170		2.3	<0.01	0.02	0.02	<0.01	2.3			0.05	18	19	

GROUNDWATER

Sample	Date Sampled	Sodium - Dissolved	Bicarbonate HCO3 as CaCO3	Carbonate CO32- as CaCO3	Hydroxide OH- as CaCO3	Total Alkalinity as CaCO3	Chloride	Sulphate	Fluoride	Anions Total	Cations Total	Ionic Balance	Hardness as CaCO3	Aluminium-Dissolved	Arsenic-Dissolved	Cadmium-Dissolved	Chromium-Dissolved	Dissolved CrIII	Dissolved CrVI	Copper-Dissolved	Iron-Dissolved	Lead-Dissolved
Biannual Testing Frequency		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR		1	1	1	1	1	1	1	0.1	0.1	0.1	0.01	3	0.01	0.001	0.0001	0.001	0.001	0.001	0.01	0.01	0.001
BH1																						
BH1	16/03/2015	286	5	<1	<1	5	615	113	<0.1			6.8		0.02	<0.001	<0.0001	<0.001	<0.01	<0.01	<0.001	<0.05	<0.001
BH1	25/08/2015	16,700	32	<1	<1	32	24,200	4,140	0.3			11.4		0.44	<0.01	0.0032	<0.01	<0.01	<0.01	0.013	0.15	<0.01
BH1	27/04/2016	3,000	10	<5	<5	10	4,800	590	1.3			7.9	2,100	0.05	0.002	0.0006	<0.001	<0.005	<0.005	0.002	1.1	<0.001
BH1	10/08/2016	15,000	9	<5	<5	9	28,000	3,400	<5			0.57	10,000	1.6	0.006	0.0035	<0.002	<0.005	<0.1	0.047	0.44	0.014
BH1	27/04/2017	759	3	<1	<1	3	1,350	247	<0.1			0.63		0.25	0.001	0.0006	<0.001	<0.01	<0.01	0.005	1.02	<0.001
BH1	22/08/2017	20,800	2	<1	<1	2	34,400	4,340	0.1			6.69		1.46	<0.010	0.0029	<0.010	<0.001	<0.01	0.059	<0.10	<0.010
BH1	11/04/2018	1,000	<20	<10	<20	<20	1,500	260	<0.5					0.11	0.001	<0.0002	<0.001	<0.001	<0.001	0.003	1	<0.001
BH1	9/08/2018	19,000	<20	<10	<20	<20	27,000	3,300	720						<0.01	0.0026	<0.01	<0.01	<0.001	0.076	1	<0.01
BH1	2/04/2019	1,430	<1	<1	<1	<1	3,020	304	<0.1						<0.001	0.0004	<0.001	<0.01	<0.01	0.008	<0.05	<0.001
BH1	14/08/2019	16,400	2	<1	<1	2	29,400	4,100	0.2			1.89			<0.01	0.0031	<0.01	<0.01	<0.01	0.082	1	<0.01
BH1	8/04/2020	3,790	<1	<1	<1	<1	5,620	733	<0.1	174.0	223	12.50		0.84	0.004	0.0008	0.001	<0.10	0.014	<0.10	0.2	0.001
BH1	5/08/2020	11,200	6	<1	<1	6	18,100	3,050	0.4	574.0	651	6.29		2.07	0.0045	0.0031	0.0008	<0.01	<0.001	0.089	2.32	0.0028
BH1	7/04/2021	302	7	<1	<1	7	567	113	<0.1	18.5	18	0.79	-	0.026	<0.0002	0.00006	0.0032	0.002	<0.001	0.005	0.10	0.0002
BH1	10/08/2021	12,000	<1	<1	<1	<1	21,700	3,080	0.1	676.0	698	1.59		1.56	0.0049	0.0024	<0.0005	<0.010	<0.010	0.071	0.41	0.0021
BH1	27/04/2022	2,890	8			8	6,600	868	0.1	204.0	174	7.90		0.52	0.001	0.0007	0.002			0.032	0.75	
BH1	9/08/2022																					
BH2																						
BH2	18/03/2015	18,200	645	<1	<1	645	32,500	4,230	0.2			2.36		<0.1	0.032	<0.001	<0.01	<0.01	<0.01	<0.01	1.66	<0.01
BH2	26/08/2015	14,300	629	<1	<1	629	21,800	1,750	0.5			9.05		<0.1	0.016	<0.001	<0.01	<0.01	<0.01	<0.01	2.35	<0.01
BH2	27/04/2016	13,000	510	<5	<5	510	24,000	120	<5			1.4	6,500	0.02	0.12	<0.0001	<0.001	<0.005	<0.005	0.003	280	<0.001
BH2	10/08/2016	17,000	800	<5	<5	800	30,000	2,600	<5			3.2	11,000	<0.02	0.05	<0.0002	<0.002	<0.005	<0.1	<0.002	20	<0.002
BH2	26/04/2017	11,100	376	<1	<1	376	18,800	2,100	0.3			3.95		<0.10	<0.010	<0.0010	<0.010	<0.01	<0.01	<0.010	<0.10	<0.010
BH2	22/08/2017	14,900	571	<1	<1	571	23,800	2,400	0.5			7.61		<0.10	<0.010	<0.0010	<0.010	<0.001	<0.01	<0.010	<0.10	<0.010
BH2	11/04/2018	15,000	500	<10	<20	500	16,000	2,400	<0.5					3.2	0.032	<0.0002	<0.001	<0.001	<0.001	0.010	1.5	0.006
BH2	8/08/2018	1,700	14000	590	<10	<20	590	24,000	2,700			2500			<0.01	<0.002	<0.01	<0.01	<0.001	<0.01	< 0.5	<0.01
BH2	2/04/2019	13,300	580	<1	<1	580	25,000	2,320	0.5						<0.01	<0.001	<0.01	<0.01	<0.01	0.025	<0.1	<0.01
BH2	13/08/2019	12,400	432	<1	<1	432	17,700	1,290	0.5			12.7			<0.01	<0.001	<0.01	<0.01	<0.01	<0.01	3	<0.01
BH2	7/04/2020	15,200	701	<1	<1	701	24,200	3,280	0.6	765.0	871	6.48		3.78	0.126	<0.0010	<0.010	<0.01	0.111	<0.01	45.7	0.032
BH2	6/08/2020	11,600	455	<1	<1	455	18,400	1,140	0.9	552.0	641	7.47		0.006	0.0116	<0.0002	<0.0005	<0.01	<0.001	<0.001	0.2	0.0008
BH2	7/04/2021	8,060	205	<1	<1	205	12,800	893	0.4	384.0	456	8.59	-	0.005	0.0331	<0.0002	0.0024	<0.010	<0.001	<0.001	7.1	0.0004
BH2	11/08/2021	12,500	693	<1	<1	693	21,700	2,470	0.4	677.0	709	2.27		0.013	0.0515	<0.0002	<0.0005	<0.010	<0.010	<0.001	4.73	0.0007
BH2	26/04/2022	11,000	569				21,600	2,260	0.4	668.0	633	2.64		<0.1	0.17	<0.001	<0.010			<0.010	63	<0.01
BH2	9/08/2022																					
BH3																						
BH3	18/03/2015	40	9	<1	<1	9	81	12	0.1					0.08	0.001	<0.0001	<0.001	<0.01	<0.01	0.003	1.98	<0.001
BH3	25/08/2015	62	<1	<1	<1	<1	112	15	<0.1			4.84		0.5	0.002	<0.0001	<0.001	<0.01	<0.01	0.003	12.1	0.001
BH3	27/04/2016	380	<5	<5	<5	<5	52	9	0.2			87	370	0.61	<0.001	0.0002	<0.001	<0.005	<0.005	0.009	0.52	0.001
BH3	10/08/2016	36	11	<5	<5	11	79	10	<0.1			-8.6	31	0.51	0.016	<0.0001	<0.001	<0.005	<0.005	0.01	5.3	0.001
BH3	26/04/2017	7	25	<1	<1	25	8	5	0.1			5.59		0.2	0.002	<0.0001	<0.001	<0.01	<0.01	0.004	0.26	<0.001
BH3	22/08/2017	13	10	<1	<1	10	23	14	<0.1					0.03	0.014	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.05	<0.001
BH3	11/04/2018	9	31	<10	<20	31	37	14	<0.5					0.09	0.010	<0.0002	<0.001	<0.001	<0.001	0.008	0.79	0.005
BH3	8/08/2018	36	<20	<10	<20	<20	27	8	<0.5						0.032	<0.0002	<0.001	<0.001	<0.001	0.002	<0.05	<0.001
BH3	2/04/2019	9	12	<1	<1	12	26	3	<0.1						0.003	<0.0001	<0.001	<0.01	<0.01	0.004	0	<0.001
BH3	13/08/2019	26	46	<1	<1	46	47	6	0.2						0.008	<0.0001	<0.001	<0.01	<0.01	0.001	9	<0.001
BH3	7/04/2020	16	28	<1	<1	28	27	12	0.1	1.6	2			0.08	0.006	<0.0001	<0.001	<0.01	0.006	<0.01	0.2	<0.001
BH3	6/08/2020	17	35	<1	<1	35	29	10	<0.1	1.7	2	-		<0.005	0.0517	<0.00005	<0.0002	<0.001	<0.001	0.0008	0.9	<0.0001
BH3	7/04/2021	7	24	<1	<1	24	13	10	<0.1	1.1	1	-	-	0.072	0.0073	<0.00005	0.0003	<0.001	<0.001	0.0023	0.7	0.0008
BH3	10/08/2021	15	46	<1	<1	46	20	7	0.1	1.6	2	-		<0.005	0.0186	<0.00005	<0.0002	<0.010	<0.010	0.001	0.092	<0.0001
BH3	26/04/2022	9	42			42	18	2	<0.1	1.4	1.56	-		0.04	0.037	<0.001	<0.001			<0.001	7.810	1.000
BH3	9/08/2022																					
BH4																						
BH4	18/03/2015	56	43	<1	<1	43	132	43	<0.1			6.84		0.04	0.007	<0.0001	<0.001	<0.01	<0.01	<0.001	0.45	<0.001
BH4	25/08/2015	64	52	<1	<1	52	105	47	<0.1			1.43		0.06	0.015	<0.0001	<0.001	<0.01	<0.01	0.001	1.04	<0.001
BH4	27/04/2016	60	18	<5	<5	18	110	34	0.1			2	86	0.03	0.008	<0.0001	<0.001	<0.005	<0.005	<0.001	1.2	<0.001
BH4	10/08/2016	59	6	<5	<5	6	120	41	<0.1			-2.5	71	0.08	0.01	<0.0001	<0.001	<0.005	<0.005	0.001	1.2	<0.001
BH4	26/04/2017	56	<1	<1	<1	<1	110	30	<0.1			0.23		0.47	0.001	<0.0001	<0.001	<0.01	<0.01	<0.001	<0.05	<0.001
BH4	21/08/2017	76	<1	<1	<1	<1	103	40	<0.1			14.7		0.38	0.002	<0.0001	<0.001	<0.001	<0.01	0.004	0.13	<0.001
BH4	10/04/2018	44	<20	<10	<20	<20	130	31	<0.5					0.62	0.003	<0.0002	<0.001	<0.001	<0.001	0.004	0.70	0.001
BH4	9/08/2018	53	<20	<10	<20	<20	110	34	<0.5						0.001	<0.0002	<0.001	<0.001	<0.001	0.002	0	<0.001
BH4	2/04/2019	54	<1	<1	<1	<1	118	39	<0.1						0.017	<0.0001	<0.001	<0.01	<0.01	0.034	<0.05	<0.001
BH4	14/08/2019	53	3	<1	<1	3	86	43	<0.1			2.15			0.004	<0.0001	<0.001	<0.01	<0.01	0.008	0	<0.001
BH4	7/04/2020	47	2	<1	<1	2	80	31	<0.1	2.9	3	2.27		1.57	0.004	<0.0001	<0.001	<0.01	0.007	<0.01	0.8	0.002
BH4	6/08/2020	47	6	<1	<1	6	78	42	<0.1	3.2	3	0.38		0.486	0.0027	0.00005	0.0007	<0.001	<0.001	0.0054	0.7	0.0067
BH4	7/04/2021	44	<1	<1	<1	<1	85	38	<0.1	3.2	3	2.52	-	0.852	0.004	<0.00005	0.0006	<0.001	<0.001	0.0009	1.1	0.0017
BH4	11/08/2021	44	3	<1	<1	3	82	38	<0.1	3.1	3	2.27		0.331	0.005	<0.00005	<0.0002	<0.0010	<0.0010	0.0009	1.79	0.001
BH4	26/04/2022	40	2			2	85	26	0.2	2.98	2.72	-		1.08	0.001	<0.001	<0.001			0.004	0.25	0.001
BH4	9/08/2022																					
BH5																						
BH5	16/03/2015	440	215	<1	<1	215	850	191	0.1			1.61		0.06	0.002	<0.0001	<0.001	<0.01	<0.01*	<0.001	<0.05*	<0.001
BH5	26/08/2015	276	68	<1	<1	68	460	87	<0.1			4.68		0.04	0.003	<0.0001	<0.001	<0.01	<0.01*	<0.001	<0.05*	<0.001
BH5	27/04/2016	380	99	<5	<5	99	440	71	<0.1			24	450	0.06	0.005	0.0001	<0.001	<0.005	<0.005	<0.001	0.23	<0.001
BH5	10/08/2016	240	9	<5	<5	9	470	61	<0.1			-3	150	0.06	<0.001	0.0003	<0.001	<0.005	<0.005	0.001	0.02	<0.001
BH5	27/04/2017	269	13	<1	<1	13	525	66	<0.1			2.67		0.02	0.001	<0.0001	<0.001	<0.01	<0.01	<0.001	<0.05	<0.001
BH5	21/08/2017	295	54	<1	<1	54	546	76	<0.1			1.67		0.02	0.003	<0.0001	<0.001	<0.001	<0.01	<0.001	<0.05	<0.001
BH5	11/04/2018	240	41	<10	<20	41	270	61	<0.5					0.22	0.001	<0.0002	<0.001	<0.001	<0.001	0.003	0	0.005
BH5	8/08/2018	290	59	<10	<20	59	420	73	<0.5						0.002	<0.0002	<0.001	<0.001	<0.001	<0.001	<0.05	< 0.001
BH5	3/04/2019	223	3	<1	<1	3	410	61	0.4						<0.001	0.0002	<0.001	<0.01	<0.01	<0.001	<0.05	<0.001
BH5	14/08/2019	275	66	<1	<1	66	537	75	0.1			5.34			0.002	<0.0001	<0.001	<0.01	<0.01	<0.001	<0.05	<0.001
BH5	8/04/2020	245	11	<1	<1	11	532	74	<0.1	16.8	14.1	8.66		0.12	<0.001	0.0003	<0.001	<0.001	<0.001	<0.01	<0.05	<0.001
BH5	6/08/2020	203	3	<1	<1	2	414	59	0.2	13.0	11	7.42		0.198	0.0007	0.00033	0.0003	<0.001	<0.001	0.0071	0.0	0.0004
BH5	6/04/2021	250	2	<1	<1	2	518	82	0.1	16.4	14	6.44	-	0.26	0.0009	0.00042	0.06914	0.085	<0.001	0.0094	0.6	0.0004
BH5	11/08/2021	213	<1	<1	<1	<1	389	75	0.1	12.5	12	3.19		0.0224	0.0008	0.00028	0.001	<0.0010	<0.0010	0.0	<0.002	0.0
BH5	27/04/2022	242	13			13	489	79	0.2	15.7	14	6.16		0.05	1	0.0001	<0.001			0.005	<0.05	1.0
BH5	9/08/2022																					
BH6																						
BH6	18/03/2015	339	33	<1	<1	33	561	188	<0.1			2.45		0.01	0.002	<0.0001	<0.001	<0.01	<0.01*	<0.001	15	<0.001
BH6	25/08/2015	3,410	44	<1	<1	44	5,220	951	0.2			10.3		<0.01	0.004	0.0011	<0.001	<0.01	<0.01*	0.001	3.4	0.002
BH6	27/04/2016	7,100	52	<5	<5	52	14,000	1,700	<2			1.1	6,300	0.01	0.003	0.0012	<0.001	<0.005	<0.05	0.002	1.2	0.004
BH6	10/08/2016	1,900	12	<5	<5	12	3,500	550	<1			-0.42	1,200	0.08	0.003	0.0011	<0.001	<0.005	<0.005	0.005	8.9	0.003
BH6	27/04/2017	206	23	<1	<1	23	390	158	<0.1			4.95		<0.01	<0.001	<0.0001	<0.001	<0.01	<0.01	<0.001	14.9	<0.001
BH6	21/08/2017	1,320	5	<1	<1	5	2,450	419	<0.1			2.01		0.03	0.002	0.0007	<0.001	<0.001	<0.01	0.003	9.97	<0.001
BH6	10/04/2018	890	21	<10	<20	21	1,200	250	<0.5					0.13	0.001	<0.0002	<0.001	<0.001	<0.001	0.003	10.0	<0.001
BH6	8/08/2018	2,400	< 20	<10	<20	<20	1,700	310	<0.5						<0.001	0.0003	<0.001	<0.001	<0.001	0.002	14	<0.001
BH6	3/04/2019	148	20	<1	<1	20	279	128	<0.1						<0.001	<0.0001	<0.001	<0.01	<0.01	<0.001	6	<0.001
BH6	14/08/2019	578	11	<1	<1	11	1,780	364	<0.1			28.00			<0.001	0.0001	<0.001	<0.01	<0.01	0.001	14	<0.001
BH6	7/04/2020	159	26	<1	<1	26	253	146	<0.1	10.7	10.2	2.24		0.06	0.001	<0.0001	<0.001	<0.01	0.002	<0.01	10.6	<0.001
BH6	5/08/2020	622	12	<1	<1	12	885	222	<0.1	29.8	35	8.38		0.016	0.0013	0.00022	<0.0002	<0.01	<0.01	0.0049	7.7	0.0007
BH6	6/04/2021	143	14	<1	<1	14	276	121	<0.1	10.6	9	9.44	-	0.013	0.00005	0.00005	0.002	0.002	<0.001	<0.0005	4.8	0.0003
BH6	11/08/2021	479	17	<1	<1	17	688	195	<0.1	23.8	27	6.34		0.012	0.0014	0.00012	<0.0002	<0.0010	<0.0010	0.001	7.95	0.0003
BH6	27/04/2022	2,920	10			10	6,290	877	<0.1	196.0	1,283	3.49		0.05	0.006	0.0006	<0.001			0.011	3.61	0.002
BH6	9/08/2022																					
BH7																						
BH7	16/03/2015	516	69	<1	<1	69	936	267	0.3			4.16		<0.01	0.001	<0.0001	<0.001	<0.01	<0.01*	<0.001	65.9	<0.001
BH7	26/08/2015	1,870	58	<1	<1	58	3,590	803	0.2			6.3		0.02	0.007	0.0003	<0.001	<0.01	<0.01*	0.002	36.3	<0.001
BH7	27/04/2016	420	89	<5	<5	89	770	250	0.2			-6.2	330	<0.01	0.005	<0.0001	<0.001	<0.005	<0.005	<0.001	69	<0.001
BH7	10/08/2016	1,300	84	<5	<5	84	2,000	420	<0.5			3	710	0.01	0.009	<0.0001	<0.001	<0.005	<0.005	<0.001	47	<0.001
BH7	27/04/2017	247	74	<1	<1	74	485	224	0.2			6.42		<0.01	<0.001	<0.0001	<0.001	<0.01	<0.01	<0.001	16.8	<0.001
BH7	21/08/2017	1,670	50	<1	<1	50	2,580	462	0.2			5.9		<0.01	0.002	0.0002	<0.001	<0.001	<0.01	<0.001	9.97	<0.001
BH7	10/04/2018	250	57	<10	<20	57	300	180	<0.5					< 0.05	<0.001	<0.0002	<0.001	<0.001	<0.001	0.003	17	< 0.001
BH7	8/08/2018	1,100	42	<10	<20	42	2,700	570	<0.5						<0.001	<0.0002	<0.001	<0.001	<0.001	<0.001	7.9	< 0.001
BH7	3/04/2019	166	43	<1	<1	43	337	183	0.3						<0.001	<0.0001	<0.001	<0.01	<0.01	<0.001	5.8	<0.001
BH7	13/08/2019	1,620	31	<1	<1	31	2,930	520	0.3			1.36			0.001	0.0002	<0.001	<0.01	<0.01	<0.001	6.1	<0.001
BH7	8/04/2020	170	87	<1	<1	87	327	176	0.2	14.6	13.0	5.99		<0.01	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.01	12.2	<0.001
BH7	6/08/2020	805	69	<1	<1	69	1,470	114	0.3	45.2	46	0.73		<0.005	0.0057	<0.00005	<0.0002	<0.01	<0.01	<0.0005	19.3	<0.0001
BH7	6/04/2021	123	60	<1	<1	60	228	151	0.2	10.8	10	4.74	-	0.014	<0.00005	<0.00005	0.0009	<0.001	<0.001	<0.0005	22.9	<0.0001
BH7	11/08/2021	819	59	<1	<1	59	1,600	342	0.2	53.4	46	7.41		<0.005	0.0047	0.00005	<0.0002	<0.0010	<0.0010	<0.0005	15.5	<0.0001
BH7	27/04/2022	126	53			53	220	148	0.3	10.3	9.8	2.74		<0.01	1	<0.0001	<0.001			<0.001	14.8	1
BH7	9/08/2022																					

GROUNDWATER

Sample	Date Sampled	Manganese-Dissolved	Mercury-Dissolved	Nickel-Dissolved	Zinc-Dissolved	Silver-Dissolved	MTBE	Benzene	Toluene	Ethylbenzene	m+p-xylene	o-xylene	Total Xylene	Total BTEX	Naphthalene	TRH C6 - C9	TRH C10 - C14	TRH C15 - C28	TRH C29 - C36	C10 - C36 Fraction (sum)	TRH C6 - C10
Biannual Testing Frequency		mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	ug/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR		0.01	0.0001	0.001	0.001	0.001	1	1	1	1	2	1	2	1	5	20	50	100	50	50	20
BH1																					
BH1	16/03/2015	1.69	<0.0001	0.01	0.047			<1	<2	<2	<2	<2			<5	<20	<50	<100	<50		<20
BH1	25/08/2015	15.3	<0.0001	0.276	1.47			<1	<2	<2	<2	<2			<5	<20	<50	<100	<50	<50	<20
BH1	27/04/2016	5.6	<0.00005	0.06	1.6		<1	<1	<1	<1	<2	<1			<1	<10	<50	<100	<100	<250	<10
BH1	10/08/2016	18	<0.00005	0.29	1.9		<1	<1	<1	<1	<2	<1			<1	<10	<50	<100	<100	<250	<10
BH1	27/04/2017	5.57	<0.0001	0.052	0.316																
BH1	22/08/2017	11.4	<0.0001	0.211	1.28																
BH1	11/04/2018	4.4	<0.0001	0.021	0.088			<1	<1	<1	<2	<1			<10	<20	<50	<100	<100	<100	<20
BH1	9/08/2018	15.0	<0.001	0.270	1.600			<1	<1	<1	<2	<1			<10	<20	<50	<100	<100	<100	<20
BH1	2/04/2019	3.9	<0.0001	0.035	0.172	<0.001		<1	<2	<2	<2	<2			<5	<20	<50	<100	<100	<100	<20
BH1	14/08/2019	15.0	<0.0001	0.289	1.630	<0.01		<1	<2	<2	<2	<2			<5	<20	<50	<100	<100	<100	<20
BH1	8/04/2020	4.71	<0.0001	0.074	0.386	0.001		<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<100	<50	<50	<20
BH1	5/08/2020	16.3	<0.00004	0.346	1.530	0.0026		<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<100	<50	<50	<20
BH1	7/04/2021	1.7	<0.00004	0.008	0.040	<0.0001		<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<100	<50	<50	<20
BH1	10/08/2021	13.0	<0.00004	0.227	1.050	0.0012		<1	<2	<2	<2	<2	<2	<1	<5						<20
BH1	27/04/2022	3.9		0.074	0.358																
BH1	9/08/2022																				
BH2																					
BH2	18/03/2015	5.72	<0.0001	<0.01	<0.05			<1	<2	<2	<2	<2			<5	<20	<50	<100	<50		<20
BH2	26/08/2015	21.4	<0.0001	<0.01	<0.05			<1	<2	<2	<2	<2			<5	<20	<50	<100	<50	<50	<20
BH2	27/04/2016	95	<0.00005	0.018	1.9		<1	<1	<1	<1	<2	<1			<1	<10	170	880	150	1200	<10
BH2	10/08/2016	27	<0.00005	0.006	0.03		<1	<1	<1	<1	<2	<1			<1	<10	<50	190	<100	265	<10
BH2	26/04/2017	97.3	<0.0001	0.034	0.058																
BH2	22/08/2017	36.4	<0.0001	0.017	<0.050																
BH2	11/04/2018	22	<0.0001	0.008	0.035			<1	<1	<1	<2	<1			<10	<20	<50	<100	<100	<100	<20
BH2	8/08/2018	42.0	<0.001	0.017	<0.05			<1	<1	<1	<2	<1			<10	<20	<50	<100	<100	<100	<20
BH2	2/04/2019	31.7	<0.0001	0.025	<0.05	<0.01		<1	<2	<2	<2	<2			<5	<20	<50	<100	<100	<100	<20
BH2	13/08/2019	39.5	<0.0001	0.016	<0.05	<0.01		<1	<2	<2	<2	<2			5	<20	<50	<100	<100	<100	<20
BH2	7/04/2020	35.0	<0.0001	0.018	<0.050	<0.010		<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<100	<50	<50	<20
BH2	6/08/2020	29.50	<0.00004	0.007	<0.005	0.000		<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	140	<50	140	<20
BH2	7/04/2021	84.60	<0.00004	0.013	0.007	<0.0001		<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	140	<50	140	<20
BH2	11/08/2021	27	<0.00004	0.008	<0.005	<0.0001		<1	<2	<2	<2	<2	<2	<1	<5						<20
BH2	26/04/2022	34.3		0.017	<0.050																
BH2	9/08/2022																				
BH3																					
BH3	18/03/2015	0.129	<0.0001	0.011	0.034			<1	<2	<2	<2	<2			<5	<20	<50	<100	<50		<20
BH3	25/08/2015	0.134	<0.0001	0.022	0.082			<1	<2	<2	<2	<2			<5	<20	<50	<100	<50	<50	<20
BH3	27/04/2016	0.39	<0.00005	0.008	0.51		<1	<1	<1	<1	<2	<1			<1	<10	<50	<100	<100	<250	<10
BH3	10/08/2016	0.15	<0.00005	0.007	0.033		<1	<1	<1	<1	<2	<1			<1	<10	<50	<100	<100	<250	<10
BH3	26/04/2017	0.065	<0.0001	0.001	<0.005																
BH3	22/08/2017	0.05	<0.0001	<0.001	<0.005																
BH3	11/04/2018	0.17	<0.0001	<0.001	<0.005			<1	<1	<1	<2	<1			<10	<20	<50	<100	<100	<100	<20
BH3	8/08/2018	0.2	<0.0001	<0.001	0.007			<1	<1	<1	<2	<1			<10	<20	<50	<100	<100	<100	<20
BH3	2/04/2019	0.1	<0.0001	0.001	<0.005	<0.001		<1	<2	<2	<2	<2			<5	<20	<50	<100	<100	<100	<20
BH3	13/08/2019	0.2	<0.0001	0.004	<0.005	<0.001		<1	<2	<2	<2	<2			<5	<20	<50	<100	<100	<100	<20
BH3	7/04/2020	0.068	<0.0001	<0.001	0.007	<0.001		<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<100	<50	<50	<20
BH3	6/08/2020	0.12	<0.00004	0.002	0.009	<0.0001		<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<100	<50	<50	<20
BH3	7/04/2021	0.12	<0.00004	0.001	0.007	<0.0001		<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	140	<50	140	<20
BH3	10/08/2021	0.192	<0.00004	<0.0005	0.002	<0.0001		<1	<2	<2	<2	<2	<2	<1	<5						<20
BH3	26/04/2022	0.253		0.004	<0.005																
BH3	9/08/2022																				
BH4																					
BH4	18/03/2015	0.194	<0.0001	<0.001	0.012			<1	<2	<2	<2	<2			<5	<20	<50	<100	<50		<20
BH4	25/08/2015	0.247	<0.0001	0.002	0.006			<1	<2	<2	<2	<2			<5	<20	<50	<100	<50	<50	<20
BH4	27/04/2016	0.27	<0.00005	0.002	0.22		<1	<1	<1	<1	<2	<1			<1	<10	<50	<100	<100	<250	<10
BH4	10/08/2016	0.31	<0.00005	0.002	0.01		<1	<1	<1	<1	<2	<1			<1	<10	<50	<100	<100	<250	<10
BH4	26/04/2017	0.223	<0.0001	0.002	0.015																
BH4	21/08/2017	0.26	<0.0001	0.003	0.008																
BH4	10/04/2018	0.27	<0.0001	0.002	<0.005			<1	<1	<1	<2	<1			<10	<20	<50	<100	<100	<100	<20
BH4	9/08/2018	0.3	<0.0001	0.004	0.011			<1	<1	<1	<2	<1			<10	<20	<50	<100	<100	<100	<20
BH4	2/04/2019	0.0	<0.0001	0.001	<0.005	<0.001		<1	<2	<2	<2	<2			<5	<20	<50	<100	<100	<100	<20
BH4	14/08/2019	0.2	<0.0001	0.003	0.301	<0.001		<1	<2	<2	<2	<2			<5	<20	<50	<100	<100	<100	<20
BH4	7/04/2020	0.206	<0.0001	0.003	0.018	<0.001		<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<100	<50	<50	<20
BH4	6/08/2020	0.25	<0.00004	0.008	0.134	<0.0001		<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<100	<50	<50	<20
BH4	7/04/2021	0.22	<0.00004	0.004	0.029	<0.0001		<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	140	<50	140	<20
BH4	11/08/2021	0.21	<0.00004	0.0041	0.032	<0.0001		<1	<2	<2	<2	<2	<2	<1	<5						<20
BH4	26/04/2022	0.183		0.019	0.030																
BH4	9/08/2022																				
BH5																					
BH5	16/03/2015	0.225	<0.0001	<0.001	<0.005			<1	<2	<2	<2	<2			<5	<20	<50	<100	<50		<20
BH5	26/08/2015	3.96	<0.0001	0.002	0.008			<1	<2	<2	<2	<2			<5	<20	<50	<100	<50	<50	<20
BH5	27/04/2016	5	<0.00005	0.032	0.62		<1	<1	<1	<1	<2	<1			<1	<10	<50	<100	<100	<250	<10
BH5	10/08/2016	10	<0.00005	0.056	0.072		<1	<1	<1	<1	<2	<1			<1	<10	<50	<100	<100	<250	<10
BH5	27/04/2017	9.94	<0.0001	0.011	0.009																
BH5	21/08/2017	1.68	<0.0001	<0.001	<0.005																
BH5	11/04/2018	6.5	<0.0001	0.010	< 0.005			<1	<1	<1	<2	<1			<10	<20	<50	<100	<100	<100	<20
BH5	8/08/2018	3.9	<0.0001	0.007	0.008			<1	<1	<1	<2	<1			<10	<20	<50	<100	<100	<100	<20
BH5	3/04/2019	6.4	<0.0001	0.045	<0.001	0.046		<1	<2	<2	<2	<2			<5	<20	<50	<100	<100	<100	<20
BH5	14/08/2019	3.2	<0.0001	0.008	0.008	<0.001		<1	<2	<2	<2	<2			<5	<20	<50	<100	<100	<100	<20
BH5	8/04/2020	7.43	<0.0001	0.060	0.083	<0.001		<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<100	<50	<50	<20
BH5	6/08/2020	7.63	<0.00004	0.093	0.184	<0.0001		<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<100	<50	<50	<20
BH5	6/04/2021	14.50	<0.00004	0.254	0.187	<0.0001		<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	140	<50	140	<20
BH5	11/08/2021	8.5	<0.00004	0.1	0.2	<0.0001		<1	<2	<2	<2	<2	<2	<1	<5						<20
BH5	27/04/2022	6.1		0.066	0.071																
BH5	9/08/2022																				
BH6																					
BH6	18/03/2015	7.38	<0.0001	0.004	0.019			<1	<2	<2	<2	<2			<5	<20	<50	<100	<50		<20
BH6	25/08/2015	3.09	<0.0001	0.008	0.021			<1	<2	<2	<2	<2			<5	<20	<50	<100	<50	<50	<20
BH6	27/04/2016	4.4	<0.00005	0.009	2.1		<1	<1	<1	<1	<2	<1			<1	<10	<50	<100	<100	<250	<10
BH6	10/08/2016	5	<0.00005	0.017	0.039		<1	<1	<1	<1	<2	<1			<1	<10	<50	<100	<100	<250	<10
BH6	27/04/2017	10.2	<0.0001	0.004	0.008																
BH6	21/08/2017	4.7	<0.0001	0.013	0.027																
BH6	10/04/2018	7.5	<0.0001	0.006	<0.005			<1	<1	<1	<2	<1			<10	<20	<50	<100	<100	<100	<20
BH6	8/08/2018	7.2	<0.0001	0.012	0.028			<1	<1	<1	<2	<1			<10	<20	<50	<100	<100	<100	<20
BH6	3/04/2019	6.9	<0.0001	0.003	<0.001	0.006		<1	<2	<2	<2	<2			<5	<20	<50	<100	<100	<100	<20
BH6	14/08/2019	6	<0.0001	0.008	0.016	<0.001		<1	<2	<2	<2	<2			<5	<20	<50	<100	<100	<100	<20
BH6	7/04/2020	7.14	<0.0001	0.003	0.007	<0.001		<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<100	<50	<50	<20
BH6	5/08/2020	3.72	<0.00004	0.008	0.038	<0.0001		<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<100	<50	<50	<20
BH6	6/04/2021	10.20	<0.00004	0.004	0.010	<0.0001		<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	140	<50	140	<20
BH6	11/08/2021	4.18	<0.00004	0.0067	0.014	<0.0001		<1	<2	<2	<2	<2	<2	<1	<5						<20
BH6	27/04/2022	2.69		0.015	0.028																
BH6	9/08/2022																				
BH7																					
BH7	16/03/2015	68.7	<0.0001	0.004	0.008			<1	<2	<2	<2	<2			<5	<20	<50	<100	<50		<20
BH7	26/08/2015	76.3	<0.0001	0.011	0.024			<1	<2	<2	<2	<2			<5	<20	<50	<100	<50	<50	<20
BH7	27/04/2016	58	<0.00005	0.006	0.79		<1	<1	<1	<1	<2	<1			<1	<10	<50	<100	<100	<250	<10
BH7	10/08/2016	65	<0.00005	0.007	0.013		<1	<1	<1	<1	<2	<1			<1	<10	<50	<100	<100	<250	<10
BH7	27/04/2017	39.2	<0.0001	0.002	<0.005																
BH7	21/08/2017	57.9	<0.0001	0.006	0.014																
BH7	10/04/2018	39	<0.0001	0.002	<0.005			<1	<1	<1	<2	<1			<10	<20	<50	<100	<100	<100	<20
BH7	8/08/2018	62	<0.0001	0.007	0.010			<1	<1	<1	<2	<1			<10	<20	<50	<100	<100	<100	<20
BH7	3/04/2019	32	<0.0001	0.002	<0.001	<0.005		<1	<2	<2	<2	<2			<5	<20	<50	<100	<100	<100	<20
BH7	13/08/2019	50	<0.0001	0.010	0.010	<0.001		<1	<2	<2	<2	<2			<5	<20	<50	<100	<100	<100	<20
BH7	8/04/2020	29.8	<0.0001	0.002	<0.005	<0.001		<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<100	<50	<50	<20
BH7	6/08/2020	36.10	<0.00004	0.005	0.005	<0.0001		<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<100	<50	<50	<20
BH7	6/04/2021	30.20	<0.00004	0.001	0.002	<0.0001		<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	140	<50	140	<20
BH7	11/08/2021	34.80	<0.00004	0.005	0.007	<0.0001		<1	<2	<2	<2	<2	<2	<1	<5						<20
BH7	27/04/2022	20.7		0.004	<0.005																
BH7	9/08/2022																				

GROUNDWATER

Sample	Date Sampled	TRH C6-C10 less BTEX (F1)	TRH >C10 - C16	TRH >C10- C16 less N (F2)	TRH >C16 - C34	TRH >C34 - C40	C10 - C40 Fraction (sum)	E. Coli	Enterococci
Biannual Testing Frequency		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	cfu/100 ml	org/100ml
LOR		20	50	50	100	100	100	2	2
BH1									
BH1	16/03/2015	<20	<100	<100	<100	<100			
BH1	25/08/2015	<20	<100	<100	<100	<100			
BH1	27/04/2016	<10	<50	<50	<100	<100			
BH1	10/08/2016	<10	<50	<50	<100	<100			
BH1	27/04/2017								
BH1	22/08/2017								
BH1	11/04/2018	<20	<50	<50	<100	<100			
BH1	9/08/2018	<20	<50	<50	<100	<100			
BH1	2/04/2019	<20	<50	<50	<100	<100		<2	2
BH1	14/08/2019	<20	<50	<50	<100	<100		<10	<10
BH1	8/04/2020	<20	<100	<100	<100	<100	<100	<2	<2
BH1	5/08/2020	<20	<100	<100	<100	<100	<100	ND	ND
BH1	7/04/2021	<20	<100	<100	<100	<100	<100	<10	<10
BH1	10/08/2021	<20	<100	<100	<100	<100	<100	<10	<10
BH1	27/04/2022								30
BH1	9/08/2022								
BH2									
BH2	18/03/2015	<20	<100	<100	<100	<100			
BH2	26/08/2015	<20	<100	<100	<100	<100			
BH2	27/04/2016	<10	290	290	880	100			
BH2	10/08/2016	<10	58	58	190	<100			
BH2	26/04/2017								
BH2	22/08/2017								
BH2	11/04/2018	<20	<50	<50	<100	<100			
BH2	8/08/2018	<20	<50	<50	<100	<100			
BH2	2/04/2019	<20	<50	<50	<100	<100		<2	<2
BH2	13/08/2019	<20	<50	<50	<100	<100		<2	<2
BH2	7/04/2020	<20	<100	<100	<100	<100	<100	<2	<2
BH2	6/08/2020	<20	<100	<100	120	<100	120	<2	<2
BH2	7/04/2021	<20	<100	<100	120	<100	120	<10	<10
BH2	11/08/2021	<20	<100	<100	<100	<100	<100	<50	<10
BH2	26/04/2022								594
BH2	9/08/2022								
BH3									
BH3	18/03/2015	<20	<100	<100	<100	<100			
BH3	25/08/2015	<20	<100	<100	<100	<100			
BH3	27/04/2016	<10	<50	<50	<100	<100			
BH3	10/08/2016	<10	<50	<50	<100	<100			
BH3	26/04/2017								
BH3	22/08/2017								
BH3	11/04/2018	<20	<50	<50	<100	<100			
BH3	8/08/2018	<20	<50	<50	<100	<100			
BH3	2/04/2019	<20	<50	<50	<100	<100		22	<10
BH3	13/08/2019	<20	<50	<50	<100	<100		<2	<10
BH3	7/04/2020	<20	<100	<100	<100	<100	<100	1	20
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BH3	26/04/2022								14136
BH3	9/08/2022								
BH4									
BH4	18/03/2015	<20	<100	<100	<100	<100			
BH4	25/08/2015	<20	<100	<100	<100	<100			
BH4	27/04/2016	<10	<50	<50	<100	<100			
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BH4	26/04/2017								
BH4	21/08/2017								
BH4	10/04/2018	<20	<50	<50	<100	<100			
BH4	9/08/2018	<20	<50	<50	<100	<100			
BH4	2/04/2019	<20	<50	<50	<100	<100		<2	<2
BH4	14/08/2019	<20	<50	<50	<100	<100		<100	<100
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BH4	6/08/2020	<20	<100	<100	<100	<100	<100	<2	~10
BH4	7/04/2021	<20	<100	<100	120	<100	120	<10	<10
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BH4	26/04/2022								<10
BH4	9/08/2022								
BH5									
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BH5	26/08/2015	<20	<100	<100	<100	<100			
BH5	27/04/2016	<10	<50	<50	<100	<100			
BH5	10/08/2016	<10	<50	<50	<100	<100			
BH5	27/04/2017								
BH5	21/08/2017								
BH5	11/04/2018	<20	<50	<50	<100	<100			
BH5	8/08/2018	<20	<50	<50	<100	<100			
BH5	3/04/2019	<20	<50	<50	<100	<100		<2	2
BH5	14/08/2019	<20	<50	<50	<100	<100		<10	<10
BH5	8/04/2020	<20	<100	<100	<100	<100	<100	13	<2
BH5	6/08/2020	<20	<100	<100	<100	<100	<100	<1	<1
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BH5	11/08/2021	<20	<100	<100	<100	<100	<100	<10	<10
BH5	27/04/2022								880
BH5	9/08/2022								
BH6									
BH6	18/03/2015	<20	<100	<100	<100	<100			
BH6	25/08/2015	<20	<100	<100	<100	<100			
BH6	27/04/2016	<10	<50	<50	<100	<100			
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BH6	27/04/2017								
BH6	21/08/2017								
BH6	10/04/2018	<20	<50	<50	<100	<100			
BH6	8/08/2018	<20	<50	<50	<100	<100			
BH6	3/04/2019	<20	<50	<50	<100	<100		<2	<2
BH6	14/08/2019	<20	<50	<50	<100	<100		<10	<10
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BH6	5/08/2020	<20	<100	<100	<100	<100	<100	ND	ND
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BH6	27/04/2022								<10
BH6	9/08/2022								
BH7									
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BH7	26/08/2015	<20	<100	<100	<100	<100			
BH7	27/04/2016	<10	<50	<50	<100	<100			
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BH7	27/04/2017								
BH7	21/08/2017								
BH7	10/04/2018	<20	<50	<50	<100	<100			
BH7	8/08/2018	<20	<50	<50	<100	<100			
BH7	3/04/2019	<20	<50	<50	<100	<100		<2	<2
BH7	13/08/2019	<20	<50	<50	<100	<100		<2	<2
BH7	8/04/2020	<20	<100	<100	<100	<100	<100	<2	<2
BH7	6/08/2020	<20	<100	<100	<100	<100	<100	<2	<2
BH7	6/04/2021	<20	<100	<100	120	<100	120	<10	<10
BH7	11/08/2021	<20	<100	<100	<100	<100	<100	<10	<10
BH7	27/04/2022								10
BH7	9/08/2022								