



VISION
ENVIRONMENT

A Trinity Consultants Company

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COMPLIANCE WATER QUALITY MONITORING FOR PORT OF HAY POINT MAINTENANCE DREDGING

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EXECUTIVE SUMMARY

Maintenance dredging at Port of Hay Point, Queensland was undertaken by NQBP for a 20-day period from 25 August to 14 September 2024. Approximately 166,000 m³ of material was removed by the Trailing Suction Hopper Dredge (TSHD) Brisbane from the departure channel, apron and associated berths and relocated to the Dredge Material Placement Area (DMPA).

Compliance water quality monitoring was undertaken as per the Port of Hay Point Marine Environmental Monitoring Plan (MEMP) and included four-week Pre-dredge (28 July to 25 August) and Post-dredge (14 September to 12 October) monitoring periods. Dredge management was informed by real time surface turbidity data from two trigger sites (Round Top Island and Victor Island) and two control sites (Slade Island and Freshwater Point), for which Intensity Threshold values based on long term ambient data sets, had been calculated.

No cessation of dredging (Management Zone D) was required to occur during the dredge period. Turbidity at the trigger sites of Round Top Island and Victor Island remained within Management Zone A (no actions required) and Management Zone B (investigation), respectively during the Dredge phase. Turbidity at control sites Slade Island and Freshwater Point reached Management Zone C (respond) during the Dredge phase.

Turbidity intensity thresholds were exceeded during the Dredge phase at all four sites on 4 and 5 September. However, these exceedances were related to metocean conditions (south-easterly winds greater than 15 knots and spring tide conditions) rather than activities associated with the maintenance dredge program. Turbidity values higher than the intensity thresholds were also recorded in early October during the Post-dredge phase, during a period of high winds and spring tides.

The State Environmental Authority (P-EA-1000222169) water quality conditions for total suspended solids, or TSS, (converted to turbidity) were not exceeded at any time during the monitoring program.

The monitoring program also included discrete depth profiling of physicochemical parameters, and collection and analysis of water samples at the four sites during all phases of the program. Discrete results were compared to local water quality objectives (WQO). Temperature, pH, electrical conductivity and dissolved oxygen, measured by both continuous loggers and discrete depth-profiling, generally exhibited consistency across the sites and surveys. Of note was the overall increase in water temperature from July to October, due to seasonal warming. Additionally, dissolved oxygen at Freshwater Point tended to be more variable than the other sites, most likely due to its larger inshore biological community undergoing photosynthesis and respiration.

Analysis of total and dissolved nutrient concentrations was undertaken on four occasions across the three dredge phases, while TSS, chlorophyll a, dissolved metals, herbicides and pesticides were analysed during the Pre- and Post-dredge periods only. Concentrations of most analytes remained low and often below laboratory limits of report (LOR).

WQO exceedances were recorded for most nutrients at one or more sites during the Pre-dredge or Dredge surveys. However, exceedances were not recorded in subsequent surveys. TSS concentrations exceeded the stringent WQO in most samples collected during both the

Pre- and Post-dredge surveys, while chlorophyll *a* concentrations exceeded the WQO during the latter survey, likely due to seasonal microalgal population growth due to warmer temperatures.

Overall, water quality conditions at the Port of Hay Point monitored from 28 July to 12 October 2024, did not appear to be impacted by maintenance dredge activities undertaken from 25 August to 14 September. Metocean conditions, such as high winds, spring tides and increasing ambient temperatures, appeared to be more influential on water quality parameters.

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ACRONYMS

ALS	Australian Laboratory Services
APHA	American Public Health Association
AWQG	Australian Water Quality Guidelines
BOM	Bureau of Meteorology
DMPA	Dredge Material Placement Area
EMP	Environmental Management Plan
HSEQ	Health Safety Environment and Quality
IDF	Intensity, duration, frequency
JCU	James Cook University
LMDMP	Long-term Maintenance Dredging Management Plan
LOR	Limits of Reporting
MEMP	Marine Environmental Monitoring Plan
MS	Management System
NTU	Nephelometric Turbidity Units
QA/QC	Quality Assurance/Quality Control
SMART	Self-Monitoring Algorithm in Real Time
RA	Rolling Average
TSHD	Trailing Suction Hopper Dredge
TSS	Total Suspended Solids
VE	Vision Environment ANZ
WQO	Water Quality Objectives

1 INTRODUCTION

The Port of Hay Point is North Queensland Bulk Ports (NQBP) southernmost port, and encompasses two coal terminals, which export over 100 million tonnes of coal per year. To maintain safe navigational depths necessary for the manoeuvring and transit of ships in and around the Port of Hay Point, regular maintenance dredging is required to remove naturally accumulated sediment.

In order manage maintenance dredging, NQBP developed the following plans:

- Port of Hay Point Long-term Maintenance Dredging Management Plan, or LMDMP (NQBP 2024a).
- Port of Hay Point Maintenance Dredging Environmental Monitoring Plan, or EMP (NQBP 2024b).
- Port of Hay Point Marine Environmental Monitoring Plan, or MEMP (NQBP 2024c).

According to the MEMP, NQBP was required to measure continuous water quality (specifically turbidity) at two trigger sites and two control sites before, during and after dredge operations, in addition to supplementary manual water sampling. The monitoring would provide information for both the impact and adaptive tiers of the monitoring program and support the ongoing ambient monitoring program undertaken by Tropwater from James Cook University (JCU). The ambient monitoring program utilises benthic instruments to measure turbidity at the four sites, with data being downloaded regularly.

A review of the nine-year ambient benthic monitoring dataset was undertaken in 2024 to update the calculated turbidity threshold values (including intensity, duration and frequency (IDF)) (PCS 2024). The trigger values are applicable to real time surface turbidity data which could be used to adaptively manage dredge operations in a timely manner to avoid harm to sensitive ecological receptors, such as corals and seagrasses.

Vision Environment ANZ (VE) undertook Pre-dredge monitoring at the sites for a four week period (28 July to 25 August 2024, Table 1). Maintenance dredging commenced at 17:00 on 25 August and was completed at 08:00 on 14 September 2024. Approximately 166,000 m³ of material was removed from the Hay Point berths, apron and departure channel and relocated to the Port of Hay Point Dredge Material Placement Area (DMPA) during the 20-day program. Four weeks of Post-dredge water quality monitoring was undertaken (14 September to 12 October 2024).

Table 1 Monitoring phases during the maintenance dredge monitoring program.

Monitoring Phase	Dates
Pre-dredge	28 July to 25 August 2024
Dredge	17:00 25 August to 08:00 14 September 2024
Post-dredge	08:00 14 September to 12 October 2024

This report presents the results of the 2024 Port of Hay Point maintenance dredge compliance water quality monitoring program undertaken by VE.

2 METHODOLOGY

Figure 1 shows the location of the four water quality monitoring sites, with GPS locations listed in the Appendix (Table A1).

Monitoring was undertaken by VE personnel, who are qualified and experienced in water quality monitoring. Works were undertaken using sampling procedures which have been derived from standard protocols published by worldwide authorities, including:

- Australian and New Zealand Standards for water quality sampling (AS/NZS 1998a, b, c)
- The American Public Health Association Standard Methods for the Examination of Water and Wastewater (APHA 2017)
- Australian and New Zealand Water Quality Guidelines (ANZG 2018, 2021).
- Queensland Water Quality Guidelines (DERM 2009)
- Department of Environment and Science Monitoring and Sampling Manual (DES 2018).

2.1 Continuous Monitoring

The sampling methodology and equipment utilised for continuous monitoring is summarised below.

Activity	Description
Telemetered Monitoring Equipment	<p>At each site, two multi-parameter sondes (YSI EXO3) encased in a copper plated cage, were placed into secured antifouled PVC tubes attached to the base of a modified Special Marker buoy.</p> <p>Telemetry loggers programmed the sondes to record turbidity (NTU), temperature (°C), electrical conductivity (mS/cm), pH and dissolved oxygen (% saturation) every 10 minutes at approximately 0.75 m below the water surface. The central wiper cleaned the sensors prior to each data log.</p> <p>The loggers were attached to solar powered telemetry units installed within the buoy. Parameter data was transferred via telemetry to the VECLOUD database every 10 minutes.</p> <p>Due to poor cellular reception at the Freshwater Point site, satellite telemetry was utilised. Due to transmission package size restrictions, turbidity data only was telemetered, with an extra autonomously logging sonde deployed to collect the additional physicochemical parameters.</p>
Equipment Maintenance	<p>Sondes were calibrated, and log-tested prior to deployment as per VE Health Safety Environment and Quality (HSEQ) Management System (MS) protocols.</p> <p>Sondes were scheduled to be maintained as required based on examination of real time data.</p>
Data Management	<p>Data management was undertaken using VE HSEQ MS protocols.</p> <p>In the VECLOUD database, automated Self-Monitoring Algorithm in Real Time (SMART) processing of the data occurred. SMART is an initial data deconfounding process which is programmed to filter out erroneous raw real time data from multiple instruments, to provide a more accurate and instantly usable real time data set.</p> <p>Following the initial deconfounding, SMART data was manually validated by VE personnel for daily reporting after having undergone QA/QC review.</p>
Turbidity Reporting	<p>Turbidity statistics use the mean data from the dual loggers. As per the MEMP, one- hour rolling average values were also calculated and compared against turbidity threshold values.</p>

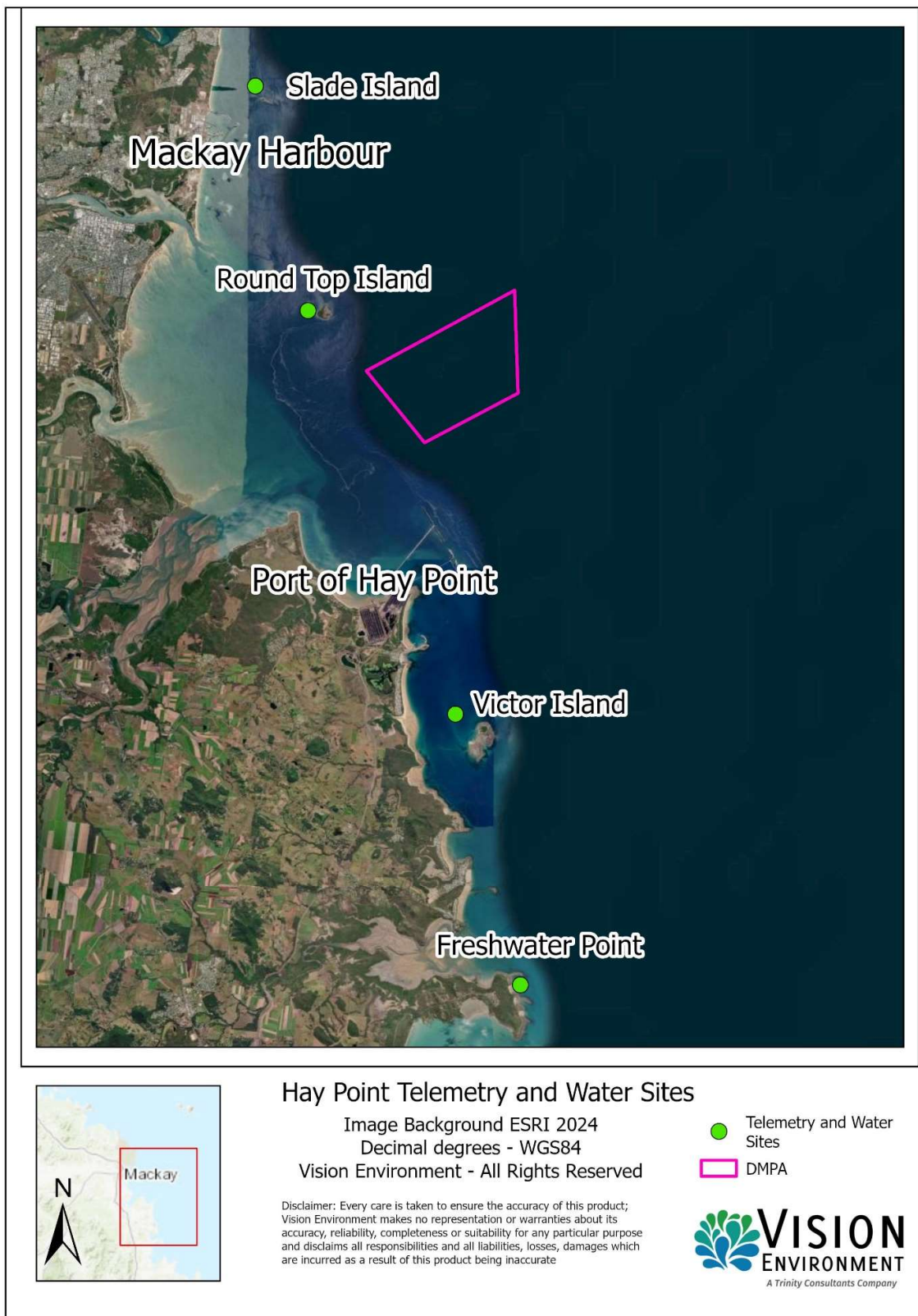


Figure 1 Monitoring sites for the 2024 Port of Hay Point maintenance dredge compliance water monitoring program.

2.2 Discrete Sampling

Discrete water sampling was required to be undertaken during Pre- and Post-dredge phases (full suite of analytes), and weekly during the Dredge phase (nutrient suite only). Monitoring was undertaken on the following dates, with the Dredge phase week 2 monitoring unable to be performed due to adverse weather conditions:

- Pre-dredge: 15/16 July
- Dredge Week 1: 27 August
- Dredge Week 3: 10 September
- Post-dredge: 16/17 October

The sampling methodology is summarised below:

Activity	Description
In-situ Measurements	<p>Measurements of physicochemical parameters (temperature, electrical conductivity, pH, turbidity and dissolved oxygen) was undertaken <i>in situ</i> using a calibrated YSI ProDSS multiparameter water quality meter. Measurements were undertaken at approximately 0.5 m depth intervals at each site.</p> <p>Concurrent light measurements using a LiCor sensor to calculate the vertical light attenuation coefficient (Kd) were also undertaken.</p>
Sample Collection	<p>Water samples were collected at the sub-surface (0.5 m depth) using pre-acid washed Nalgene bottles (triple rinsed in Milli-Q and site water) in a Perspex pole sampler. Powder free gloves were worn to avoid contamination.</p> <p>Samples not requiring filtration were decanted directly into the laboratory provided sample bottles.</p> <p>Samples that required filtration were filtered <i>in situ</i> through a 0.45 µm sterile cellulose acetate membrane syringe filter into their respective laboratory provided sample bottles. Each syringe was pre-rinsed in site water and filters were pre-packaged from the supplier.</p> <p>To extend chlorophyll a holding time, samples were filtered within 24 h of collection and filters were stored frozen.</p> <p>Sample bottles were stored cool prior to being sent for analysis at the NATA accredited Australian Laboratory Services (ALS) within recommended holding periods and using appropriate Chain of Custody procedures.</p>
Sample Analysis	<p>The following analyses were undertaken during the Pre-and Post-dredge surveys:</p> <ul style="list-style-type: none"> • Total Suspended Solids (TSS) • Total nutrients (nitrogen and phosphorus) • Dissolved nutrients (ammonia, nitrogen oxides [NOx], filterable reactive phosphorus [FRP] and total kjeldahl nitrogen [TKN]) • Chlorophyll a • Multiresidue pesticide and herbicide suite • Dissolved metal(loid)s (arsenic, cadmium, copper, lead, mercury, nickel and zinc) <p>Total and dissolved nutrient suites only were analysed during the Dredge phase surveys.</p> <p>The ALS laboratory reports are attached to the end of this report.</p>

Activity	Description
Quality Assurance (QA)	<p>A field replicate was collected at one site during each survey, with a field blank (FB) and trip blank (TB) for testing potential contamination from field procedures and/or sample bottles also collected.</p> <p>Laboratory QA measures include :</p> <ul style="list-style-type: none"> • Laboratory duplicates • Method Blanks • Laboratory Control samples • Matrix Spike samples <p>Results of the QA/QC program are presented in the Appendix.</p>

2.3 Water Quality Threshold Values, Guidelines and Objectives

2.3.1 Continuous Monitoring

As per the MEMP (NQBP 2024c), monitoring sites and turbidity threshold values were established for the 2019 maintenance dredge monitoring program (Vision Environment 2019) based on Intensity, Duration and Frequency (IDF) analyses of the JCU ambient benthic data collected up until 2018 (Royal HaskoningDHV 2018).

A review of the sites and trigger values was undertaken in 2024 to include the additional baseline data from 2019 to 2024, which resulted in lower turbidity intensity threshold and duration values for the 2024 maintenance dredge campaign (PCS 2024). The updated intensity thresholds considered prevailing wind direction, seasonality and an altered dredge period timeframe (20 days). If and when the cumulative duration increased and reached either the average duration (90th percentile duration) or maximum duration, then a series of Management Zones would be initiated (NQBP 2024c).

To allow surface turbidity data to represent benthic turbidity data during the dredge compliance monitoring, the established MEMP benthic trigger values required a correlation factor to be applied to convert to surface trigger values. Site specific correlation factors were originally developed in 2019 from comparing surface and benthic data and further validated in 2024 (PCS 2018, 2019a, b, 2024). The revised turbidity intensity threshold values are outlined in Table 2 and were applicable to the real-time one-hour rolling average for turbidity at Round Top Island and Victor Island sites during dredging.

Table 2 Dry season benthic and surface turbidity thresholds for the trigger and control sites (PCS 2024).

Location	Status	Dry Season Benthic Turbidity Intensity Threshold (NTU)	Dry Season Surface Turbidity Intensity Threshold (NTU)
Slade Island	Control	31	6
Round Top Island	Trigger	12	6
Victor Island	Trigger	25	9
Freshwater Point	Control	43	13

Management Zones were developed for specified durations of time that the turbidity intensity thresholds were exceeded at the trigger sites (Table 3). These ranged from Management Zone

A (normal operations), through two higher levels to Management Zone D, when dredge operations would cease. Management Zones B and C involved various levels of investigation to determine if the intensity exceedances were naturally derived (weather related) or due to dredge operations (NQBP 2024c). Wind direction was also taken into account during intensity and duration exceedances in respect to the weight of evidence placed on respective trigger and control sites (NQBP 2024c).

Table 3 Intensity thresholds and allowable duration for respective management zones for surface turbidity, based on a 20-day dredge period (PCS 2024).

Site	Intensity Threshold (NTU)	Management Zone A (Hours)	Management Zone B (Hours)	Management Zone C (Hours)	Management Zone D (Hours)
Round Top Island	6	<14	14 – 55	55 – 114	>114
Victor Island	9	<14	14 - 45	45 - 128	>128

As per the State Environmental Authority (P-EA-100222169) water quality conditions, Total Suspended Solids (TSS) calculated on a six-hour rolling mean at the four sites was also not permitted to exceed 100 mg/L during the Dredge phase. The trigger value was converted to a six-hour rolling mean of turbidity (Table 4) and compared to real time surface data during dredging.

Table 4 State Environmental Authority compliance values for turbidity at each site (converted from 100 mg/L TSS).

Location	State Compliance Value (NTU)
Slade Island (control)	83.3
Round Top Island (trigger)	73.5
Victor Island (trigger)	68
Freshwater Point (control)	125

2.3.2 Discrete Sampling

Depth profiled physicochemical parameters, nutrients and chlorophyll *a*, were compared to local Water Quality Objectives (WQO) developed by the Department of Environment and Science (2022). Slade Island (zone MD2341), and Round Top and Victor Islands (open coastal waters landward of the plume line) have been designated as 'Moderately Disturbed', while Freshwater Point (zone SD2382) has been designated as 'Slightly Disturbed' (DES 2022).

Dissolved metal concentrations were compared to the 95% species protection trigger level Australian Water Quality Guidelines or AWQG (ANZG 2018). Organics (pesticides and herbicides) were also compared to WQO, where available (King et al. 2017a, King et al. 2017b, ANZG 2018).

3 RESULTS AND DISCUSSION

3.1 Dredge Volumes

The Trailing Suction Hopper Dredge (TSHD) “Brisbane” operated from 17:00 on 25 August to 08:00 on 14 September 2024. Due to adverse weather conditions the “Brisbane” went to anchor from approximately 19:30 on 3 September to 07:30 on 5 September and did not operate during this timeframe (NQBP, pers. comm.). Approximately 166,000 m³ of material was dredged across the berth pockets, apron and departure channel and relocated to the Port of Hay Point DMPA.

3.2 Metocean Conditions

During the monitoring period (28 July to 12 October), Hay Point wind speed and wind gusts were highest on 4 September (22 kts and 34 kts, respectively). Average daily wind speeds over 15 kts were recorded on three days of the 20-day Dredge phase, in addition to four days during the Pre- and Post-dredge phases. The predominant wind direction during the monitoring period was found to be from the easterly to southerly quadrant (Figure 2).

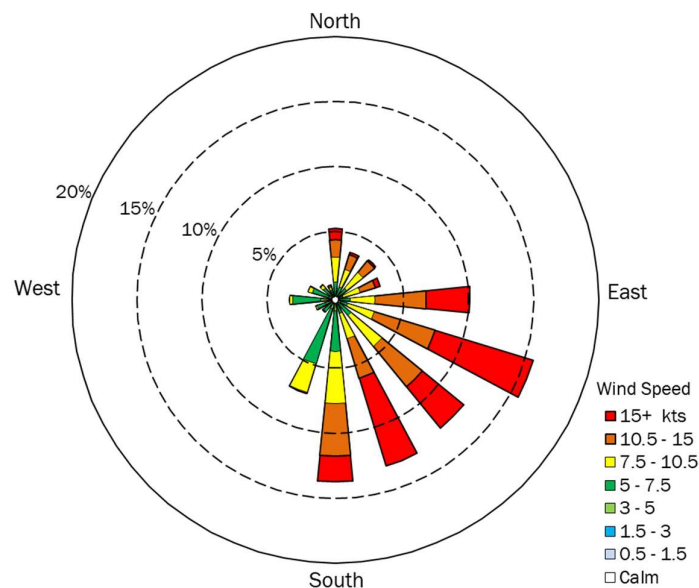


Figure 2 Windrose of 30-minute measured wind speed (knots) from Hay Point station (033317) during the maintenance dredge monitoring program from 28 July 2024 to 12 October 2024.

Approximately 60 mm of rainfall was recorded by the Mackay BOM station 033119 (BOM 2024) during the 28 July to 12 October monitoring period. Approximate rainfall totals of 41 mm, 9 mm and 10 mm, respectively, were recorded during the Pre-dredge, Dredge and Post-dredge phases.

Flows from the Pioneer River and Sandy Creek were highest (13.9 m³/s and 0.4 m³/s, respectively) during the Pre-dredge period following rainfall in mid-August. Baseflow WQO were applicable during all water quality surveys. Spring tides associated with the full and new moons occurred on 4 and 20 August (5.20 m and 6.46 m tidal ranges), 3 and 18 September (5.04 and 6.47 m tidal ranges), and 3 October (4.75 m tidal range).

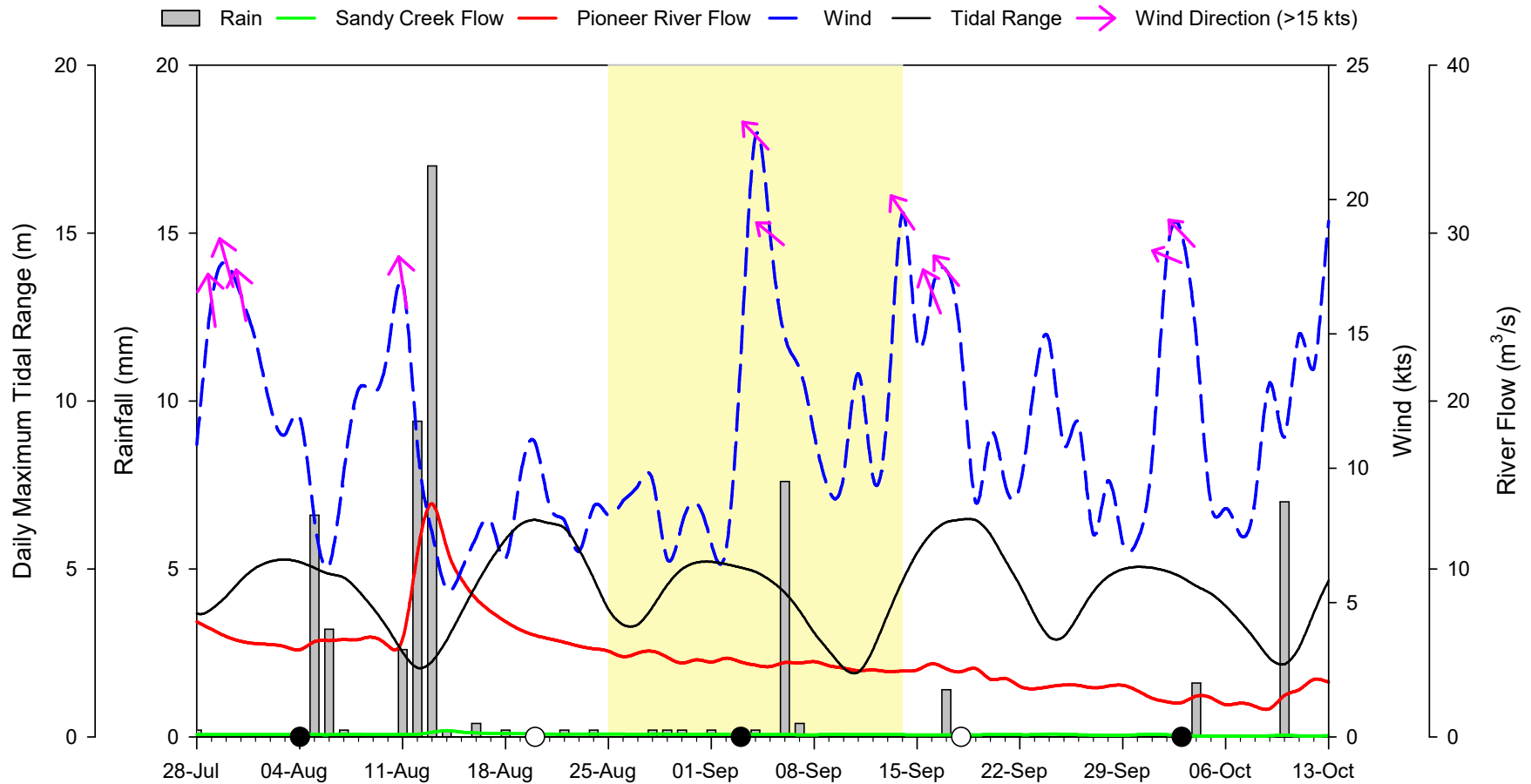


Figure 3 Wind speed, rainfall, river flow, lunar phases and maximum tidal range during the 2024 maintenance dredge monitoring program. Clear and solid circles indicate full and new moons, respectively, indicating spring tide periods. Yellow shaded period indicates Dredge phase.

3.3 Continuous Turbidity

Table 5 lists the turbidity statistics for the three dredge phases, in addition to the turbidity threshold exceedance durations. In summary:

- Trigger site Round Top Island remained within Management Zone A. The turbidity intensity threshold (6 NTU) was exceeded for a total of 6 h, less than the Zone A maximum allowable hours of 14 h.
- Trigger site Victor Island reached Management Zone B. The turbidity intensity threshold (9 NTU) was exceeded for a total of 16 h, within the allowable hours for Zone B (14 to 45 h).
- Control sites Slade Island (6 NTU, 86 h intensity exceedance) and Freshwater Point (13 NTU, 64 h intensity exceedance) reached Management Zone C.
- Management Zone D (cease dredge operations) was not reached at any site during the dredging period.

Table 5 Sub-surface continuous turbidity statistics during the 2024 maintenance dredge phases. *N* = 4134, 2418 to 2827 and 3088 to 4127 for Pre-dredge (Pre), Dredge and Post-dredge (Post) respectively. ¹Values gained from PCS (PCS 2024).

Site	Dredge phase	Statistic	Turbidity (NTU)	Turbidity 1 hr RA (NTU)	Turbidity Intensity Threshold (NTU) ¹	Duration of Exceedance (Hours/Zone) ¹
Slade Island (Control)	Pre	Mean \pm se	1.4 \pm 0.0	1.4 \pm 0.0	-	-
		Range	<1 – 6	<1 – 4	-	-
	Dredge	Mean \pm se	5.0 \pm 0.1	5.0 \pm 0.1	6	86/C
		Range	1.3 – 24	1.3 – 16	-	-
	Post	Mean \pm se	3.0 \pm 0.0	3.0 \pm 0.0	-	-
		Range	1.3 – 9	1.4 – 7	-	-
Round Top Island (Trigger)	Pre	Mean \pm se	1.5 \pm 0.0	1.5 \pm 0.0	-	-
		Range	<1 – 6	<1 – 3	-	-
	Dredge	Mean \pm se	1.9 \pm 0.0	1.9 \pm 0.0	6	6/A
		Range	<1 – 10	1 – 8	-	-
	Post	Mean \pm se	2.0 \pm 0.0	2.0 \pm 0.0	-	-
		Range	<1 – 12	1 – 5	-	-
Victor Island (Trigger)	Pre	Mean \pm se	1.7 \pm 0.0	1.7 \pm 0.0	-	-
		Range	<1 – 4	1 – 3	-	-
	Dredge	Mean \pm se	2.9 \pm 0.0	2.9 \pm 0.0	9	16/B
		Range	<1 – 20	<1 – 16	-	-
	Post	Mean \pm se	2.8 \pm 0.0	2.8 \pm 0.0	-	-
		Range	<1 – 14	<1 – 9	-	-
Freshwater Point (Control)	Pre	Mean \pm se	1.1 \pm 0.0	1.1 \pm 0.0	-	-
		Range	<1 – 7	<1 – 6	-	-
	Dredge	Mean \pm se	3.8 \pm 0.1	3.8 \pm 0.1	13	64/C
		Range	<1 – 37	<1 – 34	-	-
	Post	Mean \pm se	4.6 \pm 0.1	4.6 \pm 0.1	-	-
		Range	1 – 28	1 – 25	-	-

During the dredge phase, turbidity above the intensity thresholds was experienced at all sites on 4 and 5 September, coinciding with consistent south easterly winds > 15 kts and spring tide conditions. High winds and larger tidal ranges can cause increased suspension of benthic sediments into the water column, resulting in higher turbidity. During this period of adverse weather conditions and resulting high turbidity, the dredge ceased operations. Highest turbidity during this period was evident at the most southerly site, Freshwater Point (37 NTU), followed by Slade Island (24 NTU) and Victor Island (20 NTU). Round Top Island is slightly more protected from south easterly winds and peaked at 10 NTU.

Mean turbidity values across the sites and varying dredge phases ranged from 1.1 to 5.0 NTU. Lowest mean turbidity values (< 2 NTU) were recorded during the Pre-dredge phase. Post-dredge mean turbidity (2.0 to 4.6 NTU) was generally below the intensity thresholds, although some short-term turbidity peaks were observed at all sites during periods of high winds and/or spring tides. This was particularly evident at Freshwater Point and Victor Island on 2 and 3 October (Figures 4 and 5).

Regarding State Environmental Authority water quality conditions, the six-hour rolling average of turbidity (converted from TSS) did not exceed the trigger values at any of the four sites during the Dredge phase (Table 6).

Table 6 Surface turbidity six-hour rolling average values during the Dredge phase in comparison with state compliance values.

Location	Surface turbidity 6 h rolling average range (NTU)	State Compliance Value (NTU)
Slade Island (control)	2 - 14	83.3
Round Top Island (trigger)	1 - 7	73.5
Victor Island (trigger)	<1 - 12	68
Freshwater Point (control)	<1 - 26	125

3.4 Additional Parameters

Additional parameters measured continuously during the monitoring included temperature, pH, electrical conductivity and dissolved oxygen (Figures 6 and 7, Table 7).

At all sites, minor diurnal temperature fluctuations were evident. Overall, water temperatures increased between 3.2 to 4.0°C during the monitoring program due to seasonal warming. Mean pH ranged from 8.1 to 8.2 across the sites and was consistent over the entire monitoring period. Conductivity values increased by ~ 1 to 2 mS/cm at each site during the course of the monitoring program, most likely due to the limited rainfall and resultant river flow during this time.

While diurnal fluctuations in dissolved oxygen were recorded at all sites, mean values remained consistent across the monitoring program, ranging from 101 to 104% saturation. The largest diurnal fluctuations were evident at Freshwater Point, which is the site located closest to the shoreline, and therefore most likely to be exposed to higher loads of organic matter via its benthic communities. Larger biological communities undergoing photosynthesis and respiration are likely to have resulted in the greater variation in dissolved oxygen levels.

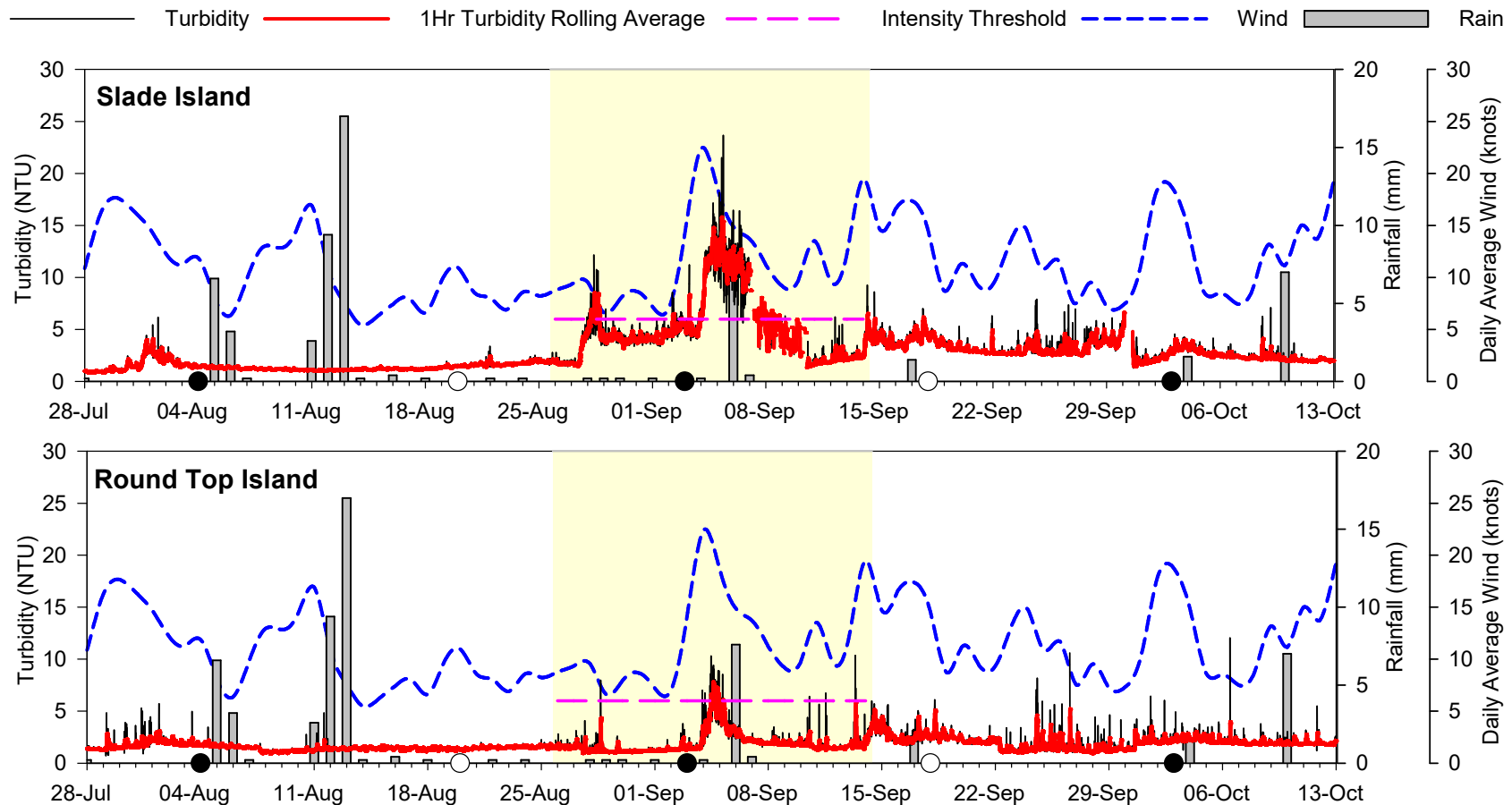


Figure 4 Turbidity at monitoring sites Slade Island and Round Top Island from 28 July to 12 October 2024. Yellow shaded area indicates Dredge phase. Clear and solid circles indicate full and new moons, respectively, indicating spring tide periods. Pink line indicates Dry Season surface turbidity Intensity Threshold applicable during the Dredge phase only. Note Slade Island had limited data from 7 to 10 and 30 September due to fouling of the unit which was rectified with a sonde exchange.

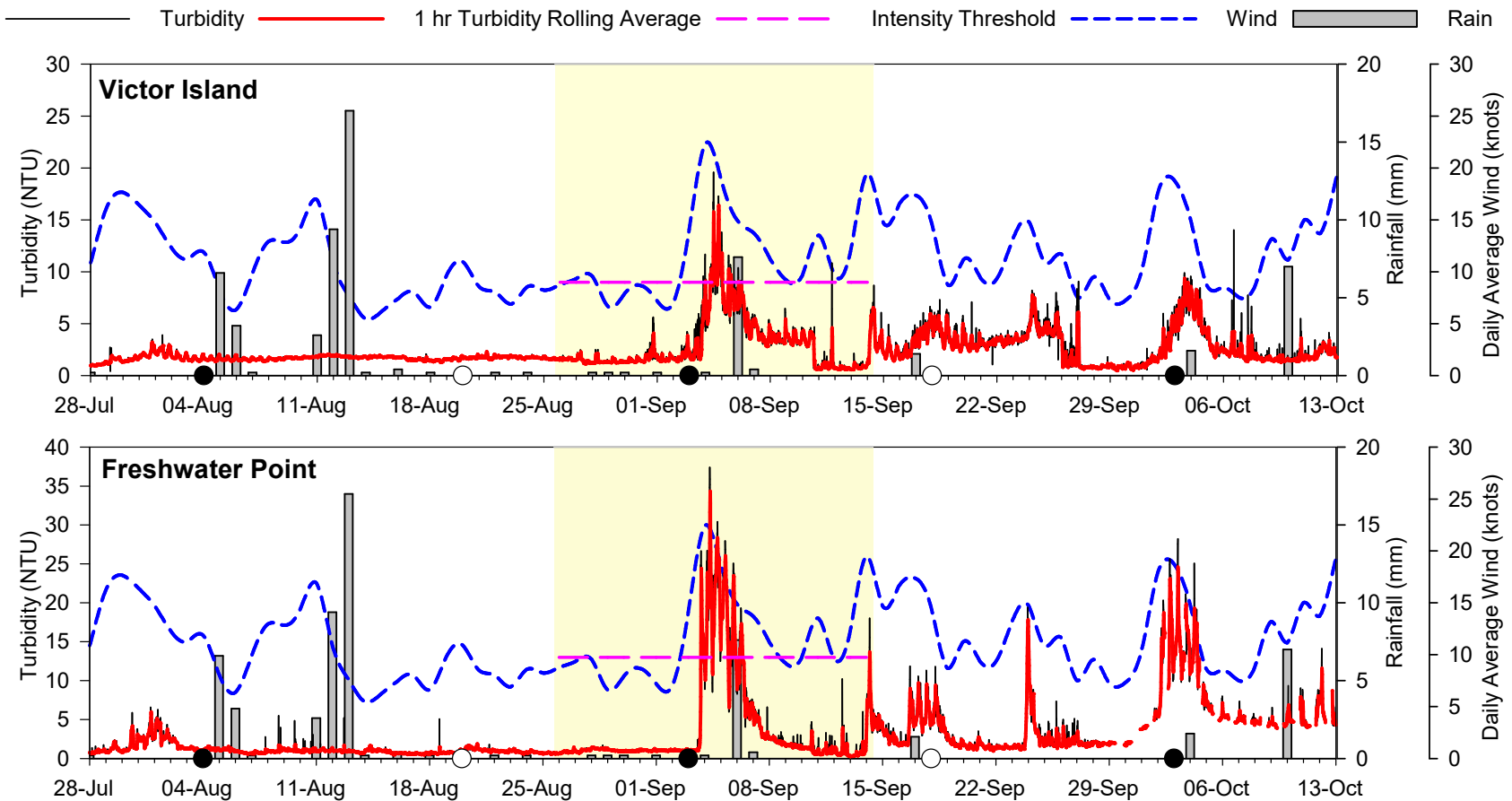


Figure 5 Turbidity at monitoring sites Victor Island and Freshwater Point from 28 July to 12 October 2024. Yellow shaded area indicates Dredge phase. Clear and solid circles indicate full and new moons, respectively, indicating spring tide periods. Pink line indicates Dry Season surface turbidity Intensity Threshold applicable during the dredge phase only. Note Freshwater Point provided intermittent data from 29 September to 12 October.

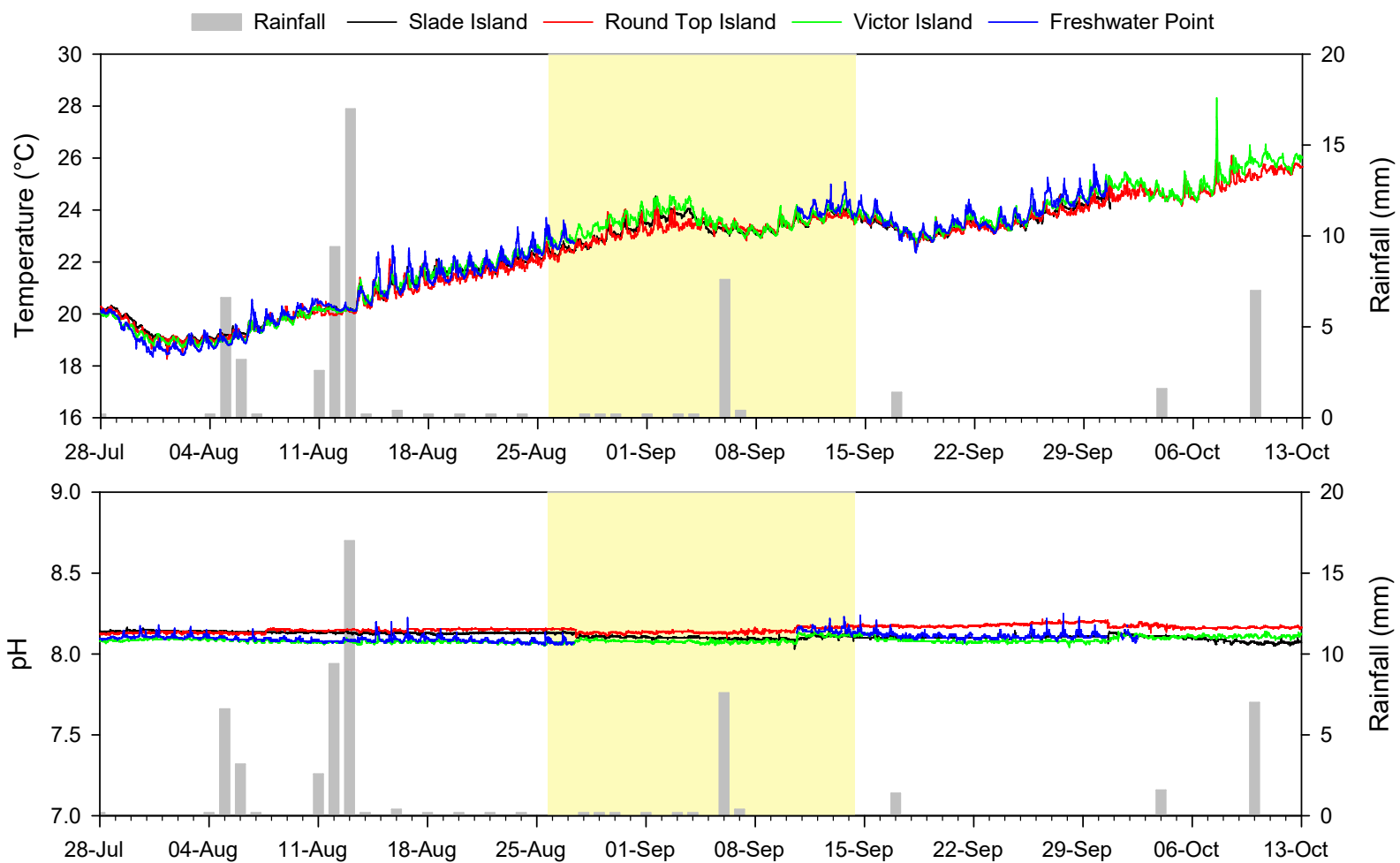


Figure 6 Temperature and pH at monitoring sites from 28 July to 12 October 2024.

Yellow shaded area indicates Dredge phase. Note, Freshwater Point has missing data from 27 August to 10 September and 30 September to 12 October due to hood malfunction.

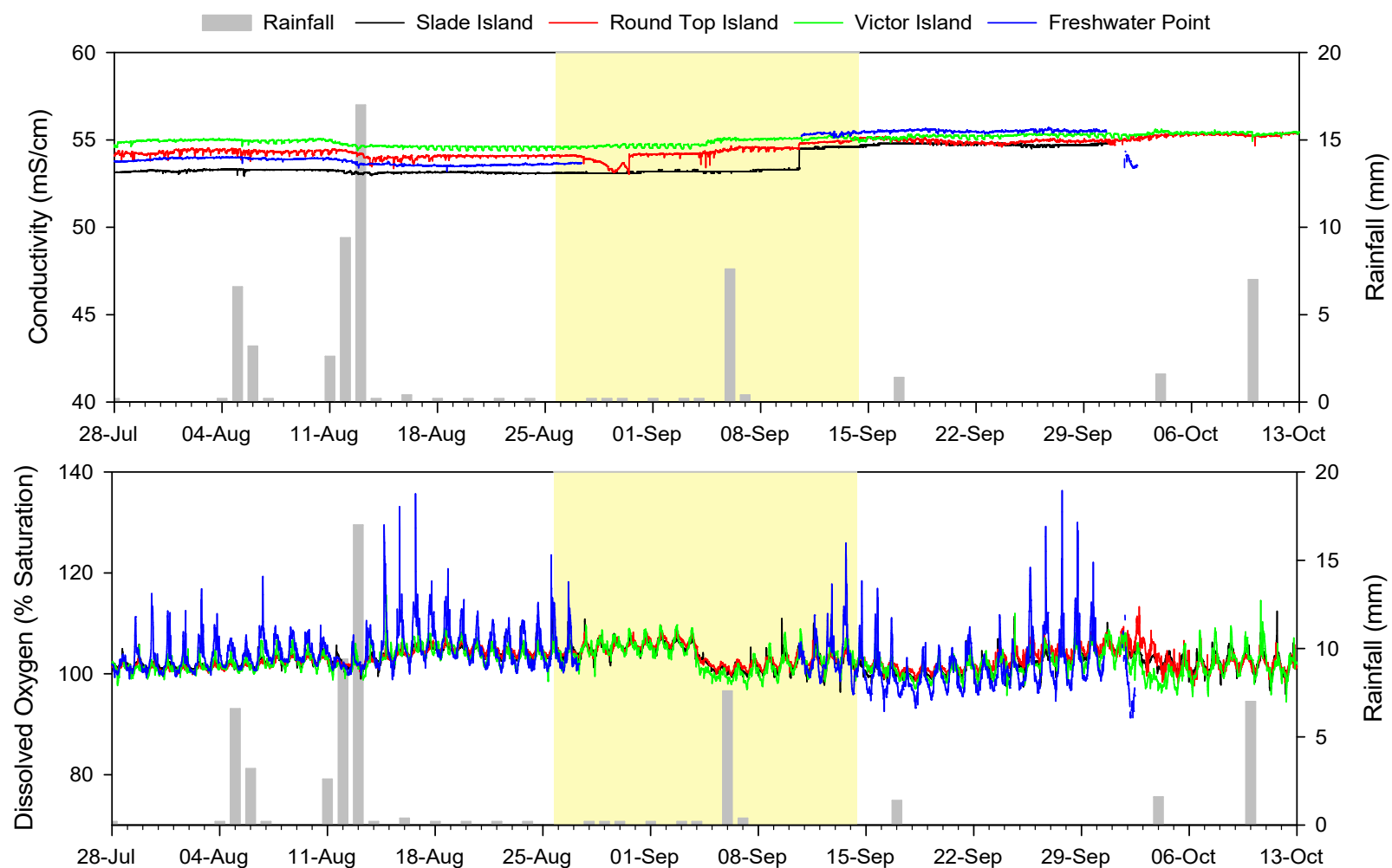


Figure 7 Conductivity and dissolved oxygen at monitoring sites from 28 July to 12 October 2024.

Yellow shaded area indicates Dredge phase. Note, Freshwater Point has missing data from 27 August to 10 September and 30 September to 12 October due to hood malfunction.

Table 7 Sub-surface continuous temperature, pH, conductivity and dissolved oxygen statistics during the 2024 maintenance dredge phases.*Values are means \pm se (n = 768 to 4134).*

Parameter	Dredge Phase	Slade Island	Round Top Island	Victor Island	Freshwater Point
Temperature (°C)	Pre	20.4 \pm 0.0	20.3 \pm 0.0	20.4 \pm 0.0	20.4 \pm 0.0
	Dredge	23.3 \pm 0.0	23.3 \pm 0.0	23.6 \pm 0.0	23.7 \pm 0.0
	Post	23.6 \pm 0.0	24.2 \pm 0.0	24.4 \pm 0.0	23.8 \pm 0.0
pH	Pre	8.1 \pm 0.0	8.1 \pm 0.0	8.1 \pm 0.0	8.1 \pm 0.0
	Dredge	8.1 \pm 0.0	8.1 \pm 0.0	8.1 \pm 0.0	8.1 \pm 0.0
	Post	8.1 \pm 0.0	8.2 \pm 0.0	8.1 \pm 0.0	8.1 \pm 0.0
Conductivity (mS/cm)	Pre	53.2 \pm 0.0	54.2 \pm 0.0	54.8 \pm 0.0	53.8 \pm 0.0
	Dredge	53.5 \pm 0.0	54.3 \pm 0.0	54.9 \pm 0.0	54.8 \pm 0.0
	Post	54.7 \pm 0.0	55.1 \pm 0.0	55.3 \pm 0.0	55.4 \pm 0.0
Dissolved oxygen (% saturation)	Pre	103 \pm 0	103 \pm 0	103 \pm 0	104 \pm 0
	Dredge	104 \pm 0	104 \pm 0	103 \pm 0	104 \pm 0
	Post	102 \pm 0	103 \pm 0	102 \pm 0	101 \pm 0

3.5 Discrete Depth Profiling

Depth-profiling of physicochemical parameters was carried out on four occasions across the three dredging phases. Discrete results paralleled those recorded by the continuous loggers (Table 8).

All parameters remained consistent across the sites during each survey, but did vary slightly between surveys. Mean water temperatures increased by $\sim 4.5^{\circ}\text{C}$ between 16 July and 16 October 2024, due to seasonal warming. Mean pH ranged from 8.1 to 8.3 across the surveys, within the recommended WQO range of 8.1 to 8.4. Conductivity was higher during the October survey than during the July and August surveys, similar to the temporal pattern exhibited by the continuous loggers. Temperature, pH and conductivity remained consistent through the water column at all sites during each survey.

Dissolved oxygen at all sites during all surveys remained within the recommended WQO range of 95 to 105% saturation, apart from the Post-dredge survey at Freshwater Point, where oxygen levels were slightly lower (94% saturation). Dissolved oxygen decreased by $\sim 5\%$ from the surface to the benthos at Freshwater Point during this survey, while oxygen profiles at other sites remained consistent with depth.

Mean turbidity across the sites remained ≤ 1.5 NTU, below the applicable WQO. Turbidity remained consistent with depth, although increased slightly at some sites at the benthos due to disturbance of sediments during sampling. Light attenuation (K_d , the rate at which light or PAR diminishes with depth through the water column) remained low, paralleling the turbidity values recorded, indicating clear waters.

Table 8 Discrete physicochemical statistics from depth profiling of the water column during Pre-dredge (15/16 July), Dredge (27 August and 10 September) and Post-dredge (16/17 September) surveys.

Values are means \pm se ($n = 25$ to 45). Field values highlighted when outside the WQO recommended range as per DES (2022). * Invalid data gained due to malfunctioning sensor.

Parameter ($\mu\text{g/L}$)	Dredge Phase	Turbidity (NTU)	Temperature ($^{\circ}\text{C}$)	Conductivity (mS/cm)	Dissolved Oxygen (% sat.)	pH	Light Attenuation (Kd)
Slade Island	Pre 16 Jul	<1	20.7 ± 0.0	54.7 ± 0.0	101 ± 0	8.1 ± 0.0	0.1 ± 0.0
	Dredge 27 Aug	<1	22.5 ± 0.0	54.7 ± 0.0	105 ± 0	8.1 ± 0.0	0.1 ± 0.0
	Dredge 10 Sept	<1	23.0 ± 0.0	*	102 ± 0	8.2 ± 0.0	0.1 ± 0.0
	Post 16 Oct	<1	25.2 ± 0.0	57.7 ± 0.0	99 ± 0	8.3 ± 0.0	*
WQO MD2341		8	-	-	95 – 105	8.1 – 8.4	-
Round Top Island	Pre 16 Jul	<1	20.6 ± 0.0	54.5 ± 0.0	101 ± 0	8.1 ± 0.0	0.1 ± 0.0
	Dredge 27 Aug	<1	22.5 ± 0.0	54.7 ± 0.0	105 ± 0	8.1 ± 0.0	0.2 ± 0.0
	Dredge 10 Sept	<1	23.0 ± 0.0	*	102 ± 0	8.2 ± 0.0	0.2 ± 0.0
	Post 16 Oct	<1	25.0 ± 0.0	57.4 ± 0.0	100 ± 0	8.3 ± 0.0	*
Victor Island	Pre 15 Jul	<1	20.6 ± 0.0	55.1 ± 0.0	101 ± 0	8.1 ± 0.0	0.1 ± 0.1
	Dredge 27 Aug	<1	22.7 ± 0.0	54.9 ± 0.0	104 ± 0	8.1 ± 0.0	0.2 ± 0.0
	Dredge 10 Sept	<1	23.1 ± 0.0	*	103 ± 0	8.2 ± 0.0	0.3 ± 0.0
	Post 17 Oct	1.5 ± 0.1	25.2 ± 0.0	58.0 ± 0.0	98 ± 0	8.2 ± 0.0	*
Freshwater Point	Pre 15 Jul	<1	20.6 ± 0.0	55.1 ± 0.0	104 ± 0	8.2 ± 0.0	0.3 ± 0.1
	Dredge 27 Aug	<1	22.8 ± 0.0	55.0 ± 0.0	102 ± 0	8.1 ± 0.0	0.2 ± 0.0
	Dredge 10 Sept	<1	23.5 ± 0.0	*	103 ± 0	8.2 ± 0.0	0.2 ± 0.0
	Post 17 Oct	1.5 ± 0.1	25.1 ± 0.0	58.1 ± 0.0	94 ± 0	8.1 ± 0.0	*
WQO SD2382 and OC MD waters		2	-	-	95 – 105	8.1 – 8.4	-

3.6 Water Analysis

Collection and analysis of water samples was carried out concurrently with depth-profiling. Nutrient analysis of water samples was carried out during all four surveys (Table 9), while analysis of TSS, chlorophyll *a*, dissolved metals, herbicides and pesticides was carried out during the Pre-and Post-dredge surveys only (Tables 10 and 11).

3.6.1 Nutrients

Nutrient concentrations generally remained low and often below laboratory limits of reporting (LOR). Total phosphorus (P) remained below LOR (<5 µg/L), while filterable reactive phosphorus (FRP) was detected only during the Pre-dredge survey at two sites. Total nitrogen (N) and total kjeldahl nitrogen (TKN) were recorded at similar concentrations, indicating that nitrogen was generally in an organic and not readily bioavailable form. Ammonia was detected at one site only during the Pre-dredge survey, while nitrogen oxide (NOx) concentrations were detected at all sites during the Pre-dredge survey, but not during subsequent surveys.

Table 9 Nutrient concentrations during Pre-dredge (15/16 July), Dredge (27 August and 10 September) and Post-dredge (16/17 October) surveys.

N = 1. Nutrient concentrations highlighted when above WQO (DES 2022).

Site	Dredge Phase	Parameter (µg/L)					
		Total P	FRP	Total N	TKN	Ammonia	NOx
Slade Island	Pre 16 Jul	<5	2	70	70	<5	3
	Dredge 27 Aug	<5	<1	80	80	<5	<2
	Dredge 10 Sept	<5	<1	110	110	<5	<2
	Post 16 Oct	<5	<1	80	80	<5	<2
Round Top Island	Pre 16 Jul	<5	<1	70	60	7	5
	Dredge 27 Aug	<5	<1	90	90	<5	<2
	Dredge 10 Sept	<5	<1	140	140	<5	<2
	Post 16 Oct	<5	<1	80	80	<5	<2
Victor Island	Pre 15 Jul	<5	3	90	80	<5	5
	Dredge 27 Aug	<5	<1	70	70	<5	<2
	Dredge 10 Sept	<5	<1	120	120	<5	<2
	Post 17 Oct	<5	<1	140	140	<5	<2
Freshwater Point	Pre 15 Jul	<5	<1	80	80	<5	5
	Dredge 27 Aug	<5	<1	80	80	<5	<2
	Dredge 10 Sept	<5	<1	140	140	<5	<2
	Post- 17 Oct	<5	<1	80	80	<5	<2
WQO		12	2	90	-	2	1

Concentrations of all nutrients except total P were found to be higher than the WQO in one or more samples across the surveys. Of note were the WQO exceedances of total N at all four sites during a Dredge survey (10 September), and WQO exceedances of NOx at all four sites

during the Pre-dredge survey. Exceedances were short-lived, and not recorded in subsequent surveys.

3.6.2 TSS, Chlorophyll and Dissolved Metals

TSS ranged from < 1 to 6 mg/L across the sites and surveys, exceeding the stringent WQO (1.6 mg/L) in most samples. Chlorophyll concentrations were lower during the Pre-dredge survey (0.1 to 0.2 µg/L) than the Post-dredge survey (0.7 to 1.6 µg/L), where WQO (0.32 µg/L) exceedances were recorded at each site. Higher chlorophyll during the latter survey is likely to be in response to microalgal population increases due to seasonal warming (Popovich and Marcovecchio 2008).

Concentrations of dissolved cadmium, copper, lead, mercury, nickel and zinc remained below LOR during both Pre- and Post-dredge surveys. Dissolved arsenic was detected in each sample and ranged from 1.2 to 1.6 µg/L, with no distinct spatial or temporal patterns evident. No WQO are available for arsenic in marine waters.

Table 10 TSS, Chlorophyll *a* and dissolved metal concentrations during Pre-dredge (15/16 July) and Post-dredge (16/17 October) surveys.

N = 1. Concentrations highlighted when above WQO (ANZG 2018, DES 2022).

Site	Dredge Phase	TSS (mg/L)	Chl. <i>a</i> (µg/L)	Dissolved Metal (µg/L)						
				As	Cd	Cu	Pb	Hg	Ni	Zn
Slade Island	Pre	3	0.2	1.4	<0.2	<1	<0.2	<0.2	<0.5	<5
	Post	2	0.7	1.4	<0.2	<1	<0.2	<0.04	<0.5	<5
Round Top Island	Pre	2	0.1	1.2	<0.2	<1	<0.2	<0.2	<0.5	<5
	Post	<1	1.6	1.5	<0.2	<1	<0.2	<0.04	<0.5	<5
Victor Island	Pre	1	0.1	1.4	<0.2	<1	<0.2	<0.2	<0.5	<5
	Post	3	1.6	1.4	<0.2	<1	<0.2	<0.04	<0.5	<5
Freshwater Point	Pre	6	0.1	1.4	<0.2	<1	<0.2	<0.2	<0.5	<5
	Post	3	1.0	1.6	<0.2	<1	<0.2	<0.04	<0.5	<5
WQO		1.6	0.32	-	5.5	1.3	4.4	0.4	70	8

3.6.3 Herbicides and Pesticides

A screening for 22 multiresidue herbicide and pesticides indicated that most concentrations were below LOR. During the Pre-dredge survey, three compounds (atrazine, diuron and hexazinone) were detected at Slade Island and Round Top Island, with atrazine also detected at Freshwater Point. Concentrations remained well below the applicable WQO, and no herbicides or pesticides were detected in the subsequent Post-dredge survey.

Table 11 Multiresidue herbicide and pesticide concentrations during Pre-dredge (15/16 July) and Post-dredge (16/17 October) surveys.
N = 1. Concentrations highlighted when above WQO (King et al. 2017a, King et al. 2017b, ANZG 2018)

Compound (µg/L)	Slade Island		Round Top Island		Victor Island		Freshwater Point		WQO
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	
Ametryn	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.61
Atrazine	0.0003	<0.0002	0.0007	<0.0002	<0.0002	<0.0002	0.0002	<0.0002	13
Chlorpyrifos	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.009
Cyanazine	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	-
Diazinon	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.01
Difenoconazole	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	-
Diuron	0.0003	<0.0002	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.2
Flusilazole	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	-
Hexaconazole	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	-
Hexazinone	0.0004	<0.0002	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	2.5
Malathion	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.05
Penconazole	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	-
Pendimethalin	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Pirimiphos-methyl	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	-
Prometryn	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.52
Propazine	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	4.6
Propiconazole	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	8.2
Simazine	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	3.2
Tebuconazole	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	-
Terbuthylazine	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.97
Terbutryn	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.26
Thiobencarb	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	-

4 CONCLUSIONS

A summary of the results of the water quality monitoring for the Port of Hay Point maintenance dredge are as follows:

- Turbidity at the trigger sites of Round Top Island and Victor Island remained within Management Zone A and Management Zone B, respectively during the Dredge phase. While turbidity intensity thresholds (6 NTU and 9 NTU, respectively) were exceeded, the exceedance periods remained low (6h and 16 h, respectively). No cessation of dredge operations due to increased turbidity was required.
- Turbidity at control sites Slade Island and Freshwater Point reached Management Zone C during the Dredge phase. Turbidity intensity thresholds (6 NTU and 13 NTU, respectively) were exceeded for 86h and 64 h, respectively. The majority of these exceedance hours occurred while the dredge was at anchor. No cessation of dredge operations due to increased turbidity was required.
- Turbidity intensity thresholds were generally exceeded on 4 and 5 September during periods of south-easterly winds greater than 15 knots and spring tide conditions. As the dredge was not operational during this period, exceedances can be attributed to metocean conditions rather than activities associated with the maintenance dredging.
- The State Environmental Authority water quality conditions for TSS (converted to turbidity) were not exceeded at any time.
- Other physicochemical parameters of temperature, pH, electrical conductivity and dissolved oxygen generally exhibited consistency across the sites. Of note was the overall increase in water temperature from July to October, due to seasonal warming. Additionally, dissolved oxygen at Freshwater Point tended to be more variable than the other sites, most likely due to its larger biological community undergoing photosynthetic and respiratory activities.
- Nutrient concentrations in water samples collected during four surveys generally remained low and often below laboratory LOR. WQO exceedances were recorded for all nutrients except total P in one or more samples across the Pre-dredge or Dredge surveys. However, exceedances were short-lived, and not recorded in subsequent surveys.
- TSS concentrations exceeded the stringent WQO in most samples collected in the Pre- and Post dredge surveys. Chlorophyll *a* concentrations exceeded the WQO during the Post-dredge survey, likely due to seasonal microalgal population growth due to warmer temperatures.
- Dissolved metals, herbicides and pesticides were generally below laboratory LOR. When detected, concentrations were well below WQO.

Overall, water quality conditions at the Port of Hay Point did not appear to be impacted by maintenance dredge activities. Water quality appeared to be more impacted by metocean conditions such as wind, tides and seasonality.

5 REFERENCES

- ANZG. 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra, Australia.
- ANZG. 2021. Toxicant default guideline values for aquatic ecosystem protection: Zinc in marine water. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra, Australia.
- APHA. 2017. Standard Methods for the Examination of Water and Wastewater. 21st edition. American Public Health Association, Washington, USA.
- AS/NZS. 1998a. 5667.1:1998 Water Quality - Sampling. Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples. Joint Standards Australia/Standards New Zealand, Canberra, Australia.
- AS/NZS. 1998b. 5667.4:1998 Water Quality - Sampling. Part 4: Guidance on sampling from lakes, natural and man-made. Joint Standards Australia/Standards New Zealand, Canberra, Australia.
- AS/NZS. 1998c. 5667.6:1998 Water Quality - Sampling. Part 6: Guidance on sampling of rivers and streams. Joint Standards Australia/Standards New Zealand, Canberra, Australia.
- BOM. 2024. Climate statistics for Australian locations. Bureau of Meteorology, Commonwealth of Australia, Canberra, Australia.
- DERM. 2009. Queensland Water Quality Guidelines, Version 3. ISBN 978-0-9806986-0-2, Department of Environment and Resource Management, Brisbane, Australia.
- DES. 2018. Monitoring and Sampling Manual: Environmental Protection (Water) Policy 2009. Department of Environment and Science, Brisbane, Australia.
- DES. 2022. Pioneer River and Plane Creek Basins Environmental Values and Water Quality Objectives. Department of Environment and Science, Brisbane, Australia.
- King, O. C., R. A. Smith, R. M. Mann, and M. S. J. Warne. 2017a. Proposed aquatic ecosystem protection guideline values for pesticides commonly used in the Great Barrier Reef catchment area: Part 1 (amended) -2,4-D, Ametryn, Diuron, Glyphosate, Hexazinone, Imazapic, Imidacloprid, Isoxaflutole, Metolachlor, Metribuzin, Metsulfuron-methyl, Simazine, Tebuthiuron. Department of Environment and Science, Brisbane, Queensland, Australia.
- King, O. C., R. A. Smith, M. S. J. Warne, J. S. Frangos, and M. R.M. 2017b. Proposed aquatic ecosystem protection guideline values for pesticides commonly used in the Great Barrier Reef catchment area: Part 2 - Bromacil, Chlorothalonil, Fipronil, Fluometuron, Fluroxypyr, Haloxyfop, MCPA, Pendimethalin, Prometryn, Propazine, Propiconazole, Terbutryn, Triclopyr and Terbutylazine. Department of Environment and Science, Brisbane, Queensland, Australia.
- NQBP. 2024a. Port of Hay Point: Long Term Maintenance Dredging Management Plan 2018-2043. North Queensland Bulk Ports Corporation Mackay, Queensland.
- NQBP. 2024b. Port of Hay Point: Maintenance Dredging Environmental Management Plan North Queensland Bulk Ports Corporation Mackay, Queensland.

- NQBP. 2024c. Port of Hay Point: Marine Environmental Monitoring Plan. North Queensland Bulk Ports Corporation Mackay, Queensland.
- PCS. 2018. Technical Note: Hay Point Turbidity Monitoring. Port and Coastal Solutions, Burleigh Heads, Australia.
- PCS. 2019a. Technical Note: Port of Hay Point 2019 Maintenance Dredging: Sediment Plume Validation. Port and Coastal Solutions, Burleigh Heads, Australia.
- PCS. 2019b. Technical Note: Port of Hay Point 2019 Maintenance Dredging: Turbidity Analysis Note 3. Port and Coastal Solutions, Burleigh Heads, Australia.
- PCS. 2024. Technical Note: Port of Hay Point, 2024 Environmental Thresholds Update. Port and Coastal Solutions, Burleigh Heads, Australia.
- Popovich, C. A., and J. E. Marcovecchio. 2008. Spatial and temporal variability of phytoplankton and environmental actors in a temperate estuary of South America (Atlantic coast, Argentina). *Continental Shelf Research* **28**:236-244.
- Royal HaskoningDHV. 2018. Port of Hay Point: Environmental Thresholds. Haskoning Australia Pty Ltd, Burleigh Heads, Australia.
- Vision Environment. 2019. Hay Point Maintenance Dredge Water Quality Monitoring Report for North Queensland Bulk Ports. Gladstone, Australia.

6 APPENDIX

6.1 Monitoring Sites

Table A1. GPS location of water quality monitoring sites (WGS84).

Site	GPS location
Slade Island	-21.0927° S, 149.2411° E
Round Top Island	-21.1731° S, 149.2600° E
Victor Island	-21.1731° S, 149.3128° E
Freshwater Point	-21.4148° S, 149.3360° E

6.2 Quality Assurance

Achievement of the quality objectives of precision, accuracy, representativeness, comparability and completeness is summarised below. The accuracy and precision of laboratory QC results are measured by percentage recovery and relative percentage difference (RPD). Definitions and acceptance targets for these measures are detailed in the laboratory reports.

Quality Indicators	Task	Acceptability
Field	Appropriate sampling methods undertaken	Yes
	Experienced sampling personnel	Yes
	Equipment calibrated	Yes
	Required sites sampled	Yes
	Appropriate decontamination procedures	Yes
	Collection of field replicate (1 in 10 samples)	Yes
	Collection of Field Blank (FB) and Trip Blank (TB)	Yes
	Appropriate Documentation	Yes
	FB results < LOR	Yes, except detectable concentrations of nitrate and dissolved zinc during Pre-dredge survey.
	TB results < LOR	Yes
Laboratory	Samples analysed at NATA accredited laboratory	Yes
	Samples analysed within holding periods	Yes, except nutrients exceeding analysis timeframe for 1-6 days for all surveys.
	Method Blanks < LOR	Yes
	Laboratory duplicate samples within recommended RPD%	Yes
	Laboratory control samples within recommended recovery rates	Yes, except pendimethalin exceeding the upper limit.

6.3 Depth Profiling

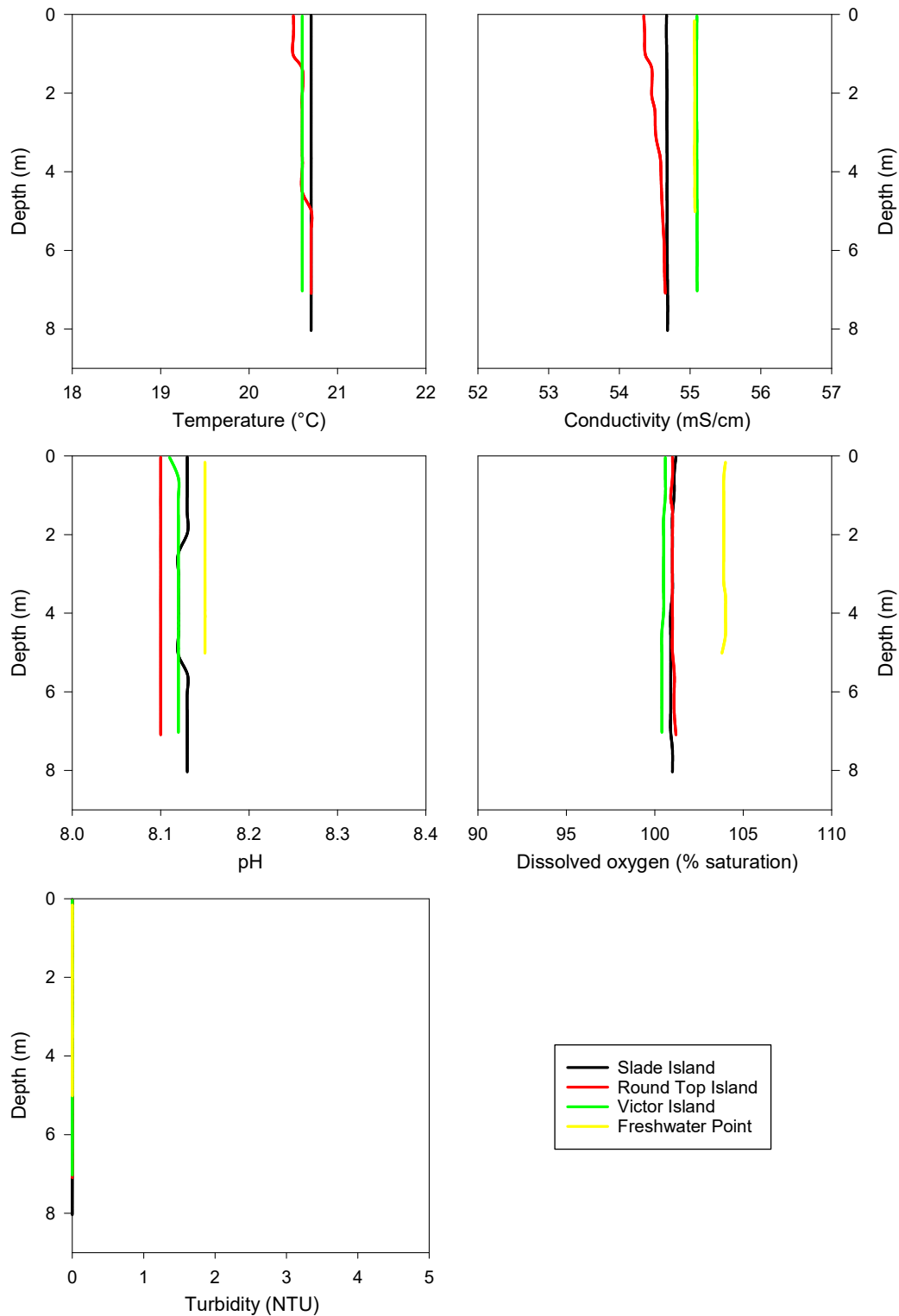


Figure A1 Depth-profiled physicochemical parameters at water quality monitoring sites during 15 and 16 July 2024 Pre-dredge phase.

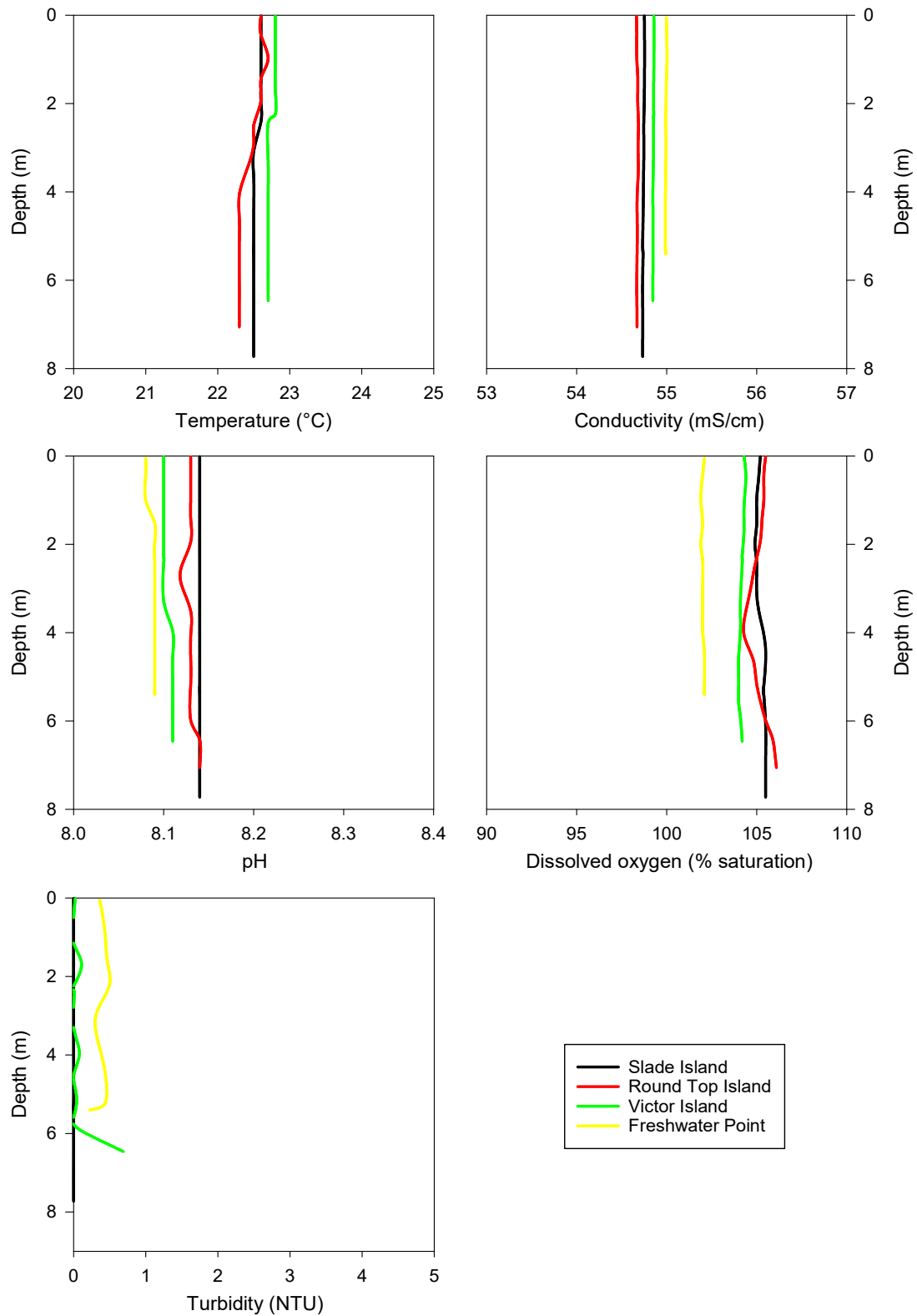


Figure A2 Depth-profiled physicochemical parameters at water quality monitoring sites during 27 August 2024 Dredge phase.

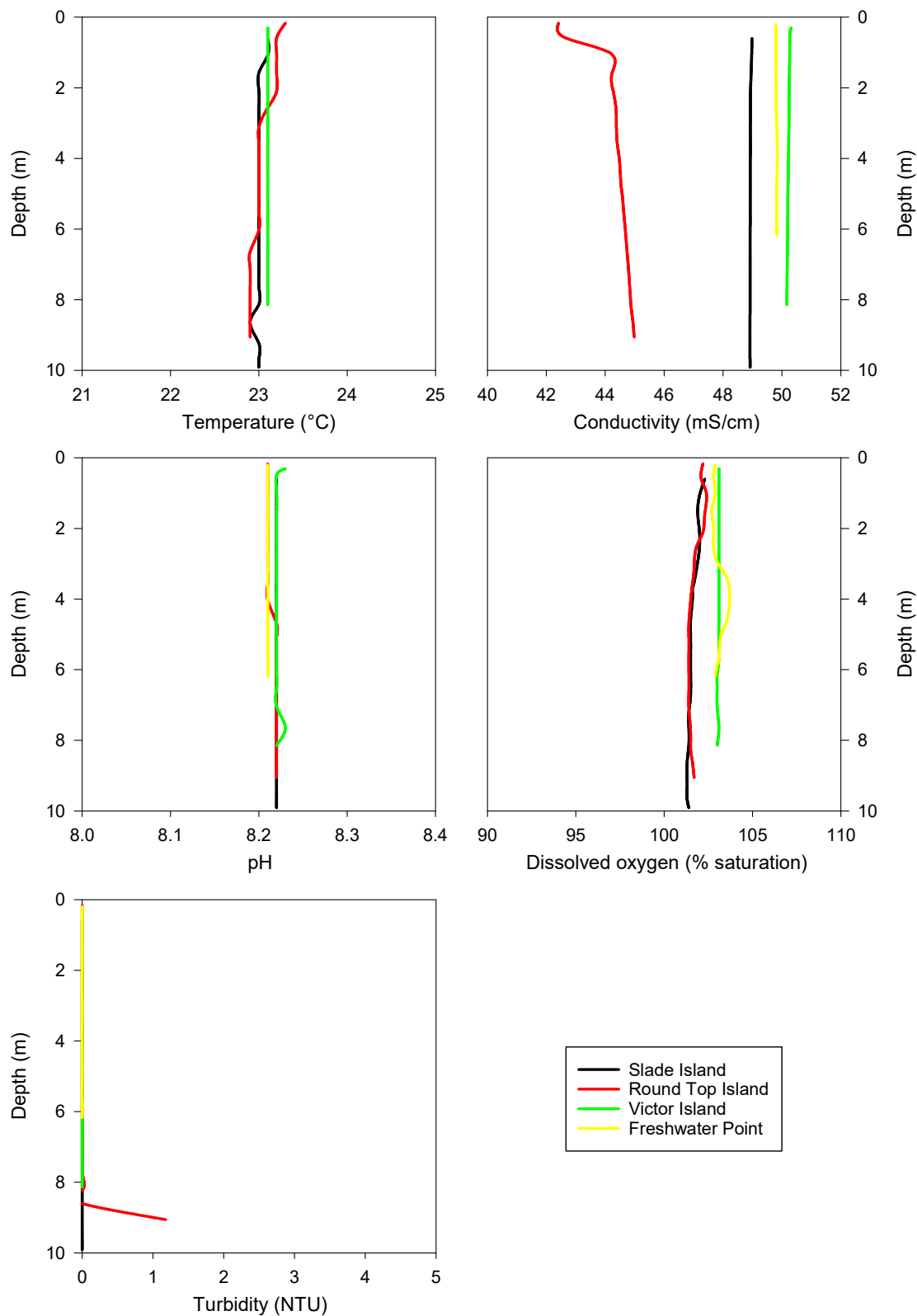


Figure A3 Depth-profiled physicochemical parameters at water quality monitoring sites during 10 September 2024 Dredge phase.

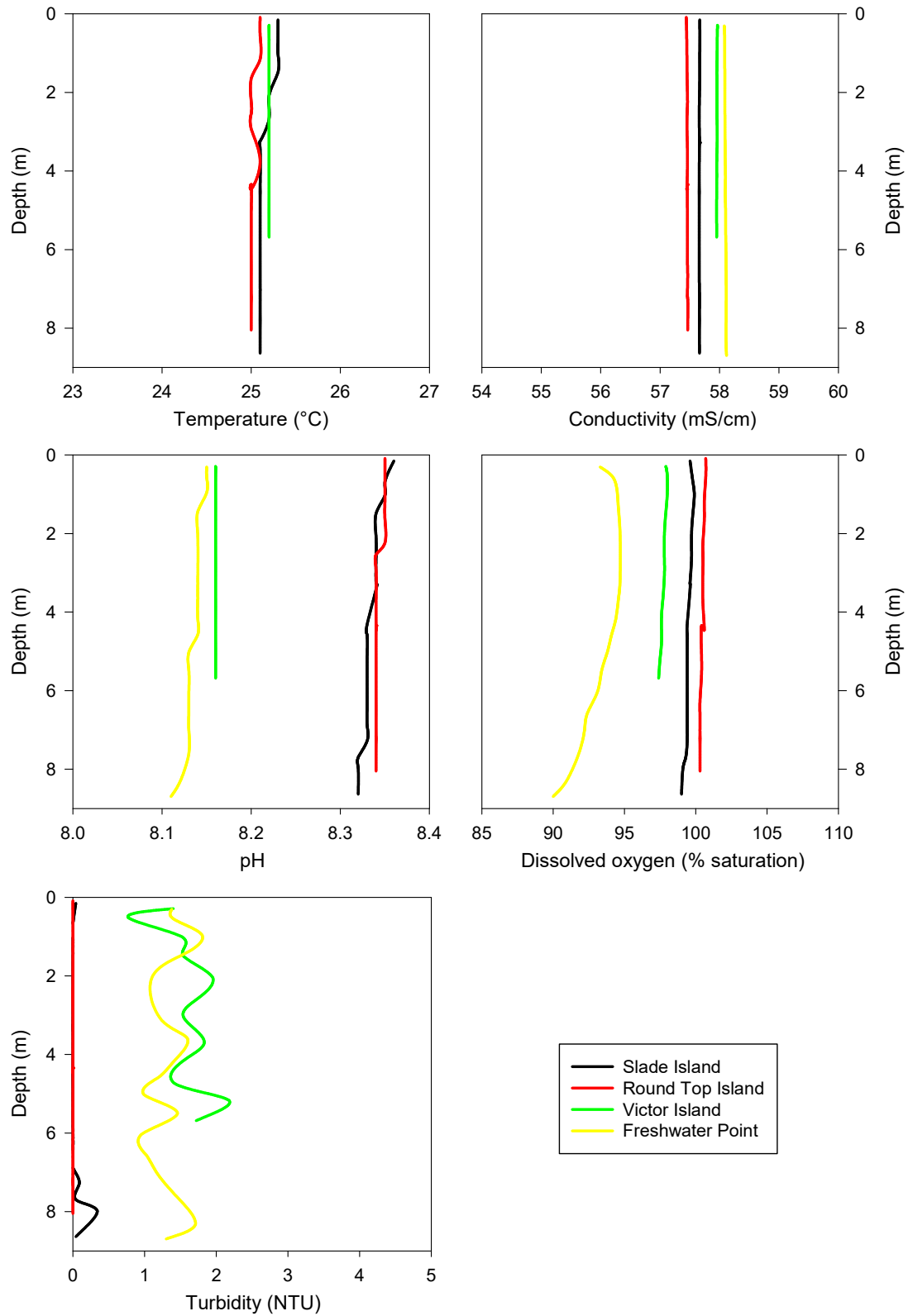


Figure A4 Depth-profiled physicochemical parameters at water quality monitoring sites during 16 and 17 October 2024 Post-dredge phase.



CERTIFICATE OF ANALYSIS

Work Order : **EB2424144**
Client : **VISION ENVIRONMENT ANZ**
Contact : FELICITY MELVILLE
Address : OFFICE 3 165 AUCKLAND STREET
GLADSTONE 4680
Telephone : ----
Project : NQBP Hay Point
Order number : -
C-O-C number : 69994
Sampler : CARYS HANNING, MARK JENSEN
Site : Hay Point
Quote number : EB24VISANZ0002 Hay Point Dredge
No. of samples received : 7
No. of samples analysed : 7

Page : 1 of 8
Laboratory : Environmental Division Brisbane
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Address : 2 Byth Street Stafford QLD Australia 4053
Telephone : +61 7 4978 7944
Date Samples Received : 17-Jul-2024 08:50
Date Analysis Commenced : 18-Jul-2024
Issue Date : 25-Jul-2024 19:04



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Beatriz Llarinas	Senior Chemist - Inorganics	Brisbane Inorganics, Stafford, QLD
Dave Gitsham	Metals Instrument Chemist	Brisbane Inorganics, Stafford, QLD
Don Sirimanne	Senior Biologist - Water	Microbiology / Biology, Hume, ACT
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- EP234-LL (Pesticides) will be conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EK271A-CM: Samples for Ultra-Trace Reactive Phosphorus by FIA should be frozen upon sampling. If not, low-level results (below 0.01 mg/L) may bias low.
- Unless otherwise stated, analytical work for this work order will be conducted by ALS Brisbane.
- **1L filtered volume from client was taken in to calculation of chlorophyll a**
- EG035F-LL (Low-Level Dissolved Mercury by FIMS): Limit of reporting raised for some samples due to matrix interference.
- EG093: Samples containing high levels of sulfate may precipitate barium under the acidic conditions of this method and may therefore bias results low.



Analytical Results

Sub-Matrix: MARINE WATER
 (Matrix: WATER)

Sample ID

				SI	RI	VI-A	VI-B	FP
Sampling date / time				16-Jul-2024 10:50	16-Jul-2024 09:40	15-Jul-2024 09:00	15-Jul-2024 09:00	15-Jul-2024 10:25
Compound	CAS Number	LOR	Unit	EB2424144-001	EB2424144-002	EB2424144-003	EB2424144-004	EB2424144-005
				Result	Result	Result	Result	Result
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	1	mg/L	3	2	1	4	6
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS								
Arsenic	7440-38-2	0.5	µg/L	1.4	1.4	1.4	1.3	1.2
Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Copper	7440-50-8	1	µg/L	<1	<1	<1	<1	<1
Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Zinc	7440-66-6	5	µg/L	<5	<5	<5	<5	<5
EK255A: Ammonia								
Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.007	<0.005	<0.005	<0.005
EK257A: Nitrite								
Nitrite as N	14797-65-0	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
EK258A: Nitrate								
Nitrate as N	14797-55-8	0.002	mg/L	0.003	0.005	0.005	0.004	0.005
EK259A: Nitrite and Nitrate (NOx)								
Nitrite + Nitrate as N	----	0.002	mg/L	0.003	0.005	0.005	0.004	0.005
EK261A: Total Kjeldahl Nitrogen								
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	0.07	0.06	0.08	0.08	0.08
EK262A: Total Nitrogen								
Total Nitrogen as N	----	0.01	mg/L	0.07	0.07	0.09	0.08	0.08
EK267A: Total Phosphorus (Persulfate Digestion)								
Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
EK271A: Reactive Phosphorus								
Reactive Phosphorus as P	14265-44-2	0.001	mg/L	0.002	<0.001	0.003	<0.001	<0.001
EP234A: OP Pesticides								
Chlorpyrifos	2921-88-2	0.001	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001



Analytical Results

Sub-Matrix: MARINE WATER
 (Matrix: WATER)

Sample ID

Sub-Matrix: MARINE WATER (Matrix: WATER)				Sample ID	SI	RI	VI-A	VI-B	FP
Sampling date / time				16-Jul-2024 10:50	16-Jul-2024 09:40	15-Jul-2024 09:00	15-Jul-2024 09:00	15-Jul-2024 10:25	
Compound	CAS Number	LOR	Unit	EB2424144-001	EB2424144-002	EB2424144-003	EB2424144-004	EB2424144-005	
				Result	Result	Result	Result	Result	
EP234A: OP Pesticides - Continued									
Malathion	121-75-5	0.001	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
Diazinon	333-41-5	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Pirimiphos-methyl	29232-93-7	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
EP234B: Thiocarbamates and Carbamates									
Thiobencarb	28249-77-6	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
EP234C: Dinitroanilines									
Pendimethalin	40487-42-1	0.001	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001	
EP234D: Triazinone Herbicides									
Hexazinone	51235-04-2	0.0002	µg/L	0.0004	0.0004	<0.0002	<0.0002	<0.0002	
EP234E: Conazole and Aminopyrimidine Fungicides									
Propiconazole	60207-90-1	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Hexaconazole	79983-71-4	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Difenoconazole	119446-68-3	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Tebuconazole	107534-96-3	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Flusilazole	85509-19-9	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Penconazole	66246-88-6	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
EP234F: Phenylurea, Thizdiazolurea, Uracil and Sulfonylurea Herbicides									
Diuron	330-54-1	0.0002	µg/L	0.0003	0.0004	<0.0002	<0.0002	<0.0002	
EP234H: Triazine Herbicides									
Ametryn	834-12-8	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Atrazine	1912-24-9	0.0002	µg/L	0.0003	0.0007	<0.0002	0.0002	0.0002	
Cyanazine	21725-46-2	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Prometryn	7287-19-6	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Propazine	139-40-2	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Simazine	122-34-9	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Terbuthylazine	5915-41-3	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Terbutryn	886-50-0	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	



Analytical Results

Sub-Matrix: MARINE WATER (Matrix: WATER)				Sample ID	SI	RI	VI-A	VI-B	FP
Sampling date / time					16-Jul-2024 10:50	16-Jul-2024 09:40	15-Jul-2024 09:00	15-Jul-2024 09:00	15-Jul-2024 10:25
Compound	CAS Number	LOR	Unit	EB2424144-001	EB2424144-002	EB2424144-003	EB2424144-004	EB2424144-005	
				Result	Result	Result	Result	Result	
EP008CA: Chlorophyll a									
Chlorophyll a	----	0.02	µg/L	0.15	0.10	0.07	0.08	0.09	

Page : 6 of 8
 Work Order : EB2424144
 Client : VISION ENVIRONMENT ANZ
 Project : NQBP Hay Point



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID				FB	TB	----	----	----
Sampling date / time				15-Jul-2024 11:30	15-Jul-2024 09:01	----	----	----
Compound	CAS Number	LOR	Unit	EB2424144-006	EB2424144-007	-----	-----	-----
				Result	Result	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	1	mg/L	<1	<1	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	----	----	----
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS								
Arsenic	7440-38-2	0.2	µg/L	<0.2	<0.2	----	----	----
Cadmium	7440-43-9	0.05	µg/L	<0.05	<0.05	----	----	----
Copper	7440-50-8	0.5	µg/L	<0.5	<0.5	----	----	----
Lead	7439-92-1	0.1	µg/L	<0.1	<0.1	----	----	----
Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	----	----	----
Zinc	7440-66-6	1	µg/L	5	<1	----	----	----
EK255A: Ammonia								
Ammonia as N	7664-41-7	0.005	mg/L	<0.005	<0.005	----	----	----
EK257A: Nitrite								
Nitrite as N	14797-65-0	0.002	mg/L	<0.002	<0.002	----	----	----
EK258A: Nitrate								
Nitrate as N	14797-55-8	0.002	mg/L	0.005	<0.002	----	----	----
EK259A: Nitrite and Nitrate (NOx)								
Nitrite + Nitrate as N	----	0.002	mg/L	0.005	<0.002	----	----	----
EK261A: Total Kjeldahl Nitrogen								
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	<0.01	<0.01	----	----	----
EK262A: Total Nitrogen								
Total Nitrogen as N	----	0.01	mg/L	<0.01	<0.01	----	----	----
EK267A: Total Phosphorus (Persulfate Digestion)								
Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	----	----	----
EK271A: Reactive Phosphorus								
Reactive Phosphorus as P	14265-44-2	0.001	mg/L	<0.001	<0.001	----	----	----
EP234A: OP Pesticides								
Chlorpyrifos	2921-88-2	0.001	µg/L	<0.001	<0.001	----	----	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				FB	TB	----	----	----
Sampling date / time				15-Jul-2024 11:30	15-Jul-2024 09:01	----	----	----
Compound	CAS Number	LOR	Unit	EB2424144-006	EB2424144-007	-----	-----	-----
				Result	Result	----	----	----
EP234A: OP Pesticides - Continued								
Malathion	121-75-5	0.001	µg/L	<0.001	<0.001	----	----	----
Diazinon	333-41-5	0.0002	µg/L	<0.0002	<0.0002	----	----	----
Pirimiphos-methyl	29232-93-7	0.0002	µg/L	<0.0002	<0.0002	----	----	----
EP234B: Thiocarbamates and Carbamates								
Thiobencarb	28249-77-6	0.0002	µg/L	<0.0002	<0.0002	----	----	----
EP234C: Dinitroanilines								
Pendimethalin	40487-42-1	0.001	µg/L	<0.001	<0.001	----	----	----
EP234D: Triazinone Herbicides								
Hexazinone	51235-04-2	0.0002	µg/L	<0.0002	<0.0002	----	----	----
EP234E: Conazole and Aminopyrimidine Fungicides								
Propiconazole	60207-90-1	0.0002	µg/L	<0.0002	<0.0002	----	----	----
Hexaconazole	79983-71-4	0.0002	µg/L	<0.0002	<0.0002	----	----	----
Difenoconazole	119446-68-3	0.0002	µg/L	<0.0002	<0.0002	----	----	----
Tebuconazole	107534-96-3	0.0002	µg/L	<0.0002	<0.0002	----	----	----
Flusilazole	85509-19-9	0.0002	µg/L	<0.0002	<0.0002	----	----	----
Penconazole	66246-88-6	0.0002	µg/L	<0.0002	<0.0002	----	----	----
EP234F: Phenylurea, Thizdiazolurea, Uracil and Sulfonylurea Herbicides								
Diuron	330-54-1	0.0002	µg/L	<0.0002	<0.0002	----	----	----
EP234H: Triazine Herbicides								
Ametryn	834-12-8	0.0002	µg/L	<0.0002	<0.0002	----	----	----
Atrazine	1912-24-9	0.0002	µg/L	<0.0002	<0.0002	----	----	----
Cyanazine	21725-46-2	0.0002	µg/L	<0.0002	<0.0002	----	----	----
Prometryn	7287-19-6	0.0002	µg/L	<0.0002	<0.0002	----	----	----
Propazine	139-40-2	0.0002	µg/L	<0.0002	<0.0002	----	----	----
Simazine	122-34-9	0.0002	µg/L	<0.0002	<0.0002	----	----	----
Terbuthylazine	5915-41-3	0.0002	µg/L	<0.0002	<0.0002	----	----	----
Terbutryn	886-50-0	0.0002	µg/L	<0.0002	<0.0002	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	FB	TB	----	----	----
Sampling date / time					15-Jul-2024 11:30	15-Jul-2024 09:01	----	----	----
Compound	CAS Number	LOR	Unit		EB2424144-006	EB2424144-007	-----	-----	-----
				Result	Result		----	----	----
EP008CA: Chlorophyll a									
Chlorophyll a	----	0.02	µg/L		<0.02	<0.02	----	----	----

Inter-Laboratory Testing

Analysis conducted by ALS Canberra, NATA accreditation no. 992.

(WATER) EP008CA: Chlorophyll a

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry / Biology).

(WATER) EP234E: Conazole and Aminopyrimidine Fungicides

(WATER) EP234F: Phenylurea, Thizdiazolurea, Uracil and Sulfonylurea Herbicides

(WATER) EP234D: Triazinone Herbicides

(WATER) EP234H: Triazine Herbicides

(WATER) EP234C: Dinitroanilines

(WATER) EP234B: Thiocarbamates and Carbamates

(WATER) EP234A: OP Pesticides



QUALITY CONTROL REPORT

Work Order	: EB2424144	Page	: 1 of 6
Client	: VISION ENVIRONMENT ANZ	Laboratory	: Environmental Division Brisbane
Contact	: FELICITY MELVILLE	Contact	: Kelly Schafer
Address	: OFFICE 3 165 AUCKLAND STREET GLADSTONE 4680	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 4978 7944
Project	: NQBP Hay Point	Date Samples Received	: 17-Jul-2024
Order number	: -	Date Analysis Commenced	: 18-Jul-2024
C-O-C number	: 69994	Issue Date	: 25-Jul-2024
Sampler	: CARYS HANNING, MARK JENSEN		
Site	: Hay Point		
Quote number	: EB24VISANZ0002 Hay Point Dredge		
No. of samples received	: 7		
No. of samples analysed	: 7		



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Beatriz Llarinas	Senior Chemist - Inorganics	Brisbane Inorganics, Stafford, QLD
Dave Gitsham	Metals Instrument Chemist	Brisbane Inorganics, Stafford, QLD
Don Sirimanne	Senior Biologist - Water	Microbiology / Biology, Hume, ACT
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC
 * = The final LOR has been raised due to dilution or other sample specific cause; adjusted LOR is shown in brackets. The duplicate ranges for Acceptable RPD% are applied to the final LOR where applicable.

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP008CA: Chlorophyll a (QC Lot: 5941527)									
CA2404471-001	Anonymous	EP008: Chlorophyll a	----	0.02	µg/L	2.16	2.19	1.0	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 5935329)									
EB2424243-001	Anonymous	EA025LL: Suspended Solids (SS)	----	1	mg/L	4	5	0.0	No Limit
EB2424067-001	Anonymous	EA025LL: Suspended Solids (SS)	----	1	mg/L	<1	<1	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 5932430)									
EB2424144-001	SI	EG035F-LL: Mercury	7439-97-6	0.00004 (0.00020)*	mg/L	<0.00020	<0.00020	0.0	No Limit
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 5932738)									
EB2424144-001	SI	EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Arsenic	7440-38-2	0.5	µg/L	1.4	1.4	0.0	No Limit
		EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Copper	7440-50-8	1	µg/L	<1	<1	0.0	No Limit
		EG093A-F: Zinc	7440-66-6	5	µg/L	<5	<5	0.0	No Limit
		EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.0002 mg/L	<0.2	0.0	No Limit
EB2424243-003	Anonymous	EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.0002 mg/L	<0.2	0.0	No Limit
		EG093A-F: Arsenic	7440-38-2	0.5	µg/L	0.0014 mg/L	1.3	0.0	No Limit
		EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.0005 mg/L	<0.5	0.0	No Limit
		EG093A-F: Copper	7440-50-8	1	µg/L	<0.001 mg/L	<1	0.0	No Limit
		EG093A-F: Zinc	7440-66-6	5	µg/L	<0.005 mg/L	<5	0.0	No Limit
		EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.0002 mg/L	<0.2	0.0	No Limit
		EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.0002 mg/L	<0.2	0.0	No Limit

Page : 3 of 6
 Work Order : EB2424144
 Client : VISION ENVIRONMENT ANZ
 Project : NQBP Hay Point



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 5940156)									
EB2424144-006	FB	EG094A-F: Cadmium	7440-43-9	0.05	µg/L	<0.05	0.06	26.1	No Limit
		EG094A-F: Lead	7439-92-1	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG094A-F: Arsenic	7440-38-2	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG094A-F: Copper	7440-50-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG094A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG094A-F: Zinc	7440-66-6	1	µg/L	5	5	0.0	No Limit
EK255A: Ammonia (QC Lot: 5932034)									
EB2424144-001	SI	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	<0.005	0.0	No Limit
EB2424290-053	Anonymous	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	<0.005	0.0	No Limit
EK257A: Nitrite (QC Lot: 5932031)									
EB2424144-001	SI	EK257A-CM: Nitrite as N	14797-65-0	0.002	mg/L	<0.002	<0.002	0.0	No Limit
EB2424290-053	Anonymous	EK257A-CM: Nitrite as N	14797-65-0	0.002	mg/L	<0.002	<0.002	0.0	No Limit
EK259A: Nitrite and Nitrate (NOx) (QC Lot: 5932032)									
EB2424144-001	SI	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	0.003	0.002	0.0	No Limit
EB2424290-053	Anonymous	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	0.010	0.011	0.0	No Limit
EK262A: Total Nitrogen (QC Lot: 5932040)									
EB2424057-001	Anonymous	EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	0.53	0.53	0.0	0% - 20%
EB2424290-041	Anonymous	EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	0.05	0.06	0.0	No Limit
EK267A: Total Phosphorus (Persulfate Digestion) (QC Lot: 5932039)									
EB2424057-001	Anonymous	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	0.0	No Limit
EB2424290-041	Anonymous	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	0.007	0.007	0.0	No Limit
EK271A: Reactive Phosphorus (QC Lot: 5932033)									
EB2424144-001	SI	EK271A-CM: Reactive Phosphorus as P	14265-44-2	0.001	mg/L	0.002	0.001	0.0	No Limit
EB2424290-053	Anonymous	EK271A-CM: Reactive Phosphorus as P	14265-44-2	0.001	mg/L	0.004	0.004	0.0	No Limit



Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP008CA: Chlorophyll a (QCLot: 5941527)								
EP008: Chlorophyll a	----	0.02	µg/L	<0.02	200 µg/L	96.2	85.0	113
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 5935329)								
EA025LL: Suspended Solids (SS)	----	1	mg/L	<1	150 mg/L	110	82.0	120
				<1	875 mg/L	114	85.0	115
EG035F: Dissolved Mercury by FIMS (QCLot: 5932430)								
EG035F-LL: Mercury	7439-97-6	0.00004	mg/L	<0.00004	0.002 mg/L	92.8	85.0	118
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 5932738)								
EG093A-F: Arsenic	7440-38-2	0.5	µg/L	<0.5	10 µg/L	95.5	87.0	116
EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	10 µg/L	94.7	88.0	114
EG093A-F: Copper	7440-50-8	1	µg/L	<1	10 µg/L	93.2	81.0	117
EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	10 µg/L	97.0	80.0	117
EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	10 µg/L	88.8	87.0	117
EG093A-F: Zinc	7440-66-6	5	µg/L	<5	100 µg/L	88.7	81.0	120
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 5940156)								
EG094A-F: Arsenic	7440-38-2	0.2	µg/L	<0.2	10 µg/L	94.9	80.0	120
EG094A-F: Cadmium	7440-43-9	0.05	µg/L	<0.05	10 µg/L	96.1	80.0	120
EG094A-F: Copper	7440-50-8	0.5	µg/L	<0.5	10 µg/L	94.6	80.0	120
EG094A-F: Lead	7439-92-1	0.1	µg/L	<0.1	10 µg/L	90.8	80.0	120
EG094A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	10 µg/L	94.2	80.0	120
EG094A-F: Zinc	7440-66-6	1	µg/L	<1	10 µg/L	117	80.0	120
EK255A: Ammonia (QCLot: 5932034)								
EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.1 mg/L	110	80.0	120
EK257A: Nitrite (QCLot: 5932031)								
EK257A-CM: Nitrite as N	14797-65-0	0.002	mg/L	<0.002	0.1 mg/L	93.3	84.0	119
EK259A: Nitrite and Nitrate (NOx) (QCLot: 5932032)								
EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	0.1 mg/L	94.1	80.0	120
EK262A: Total Nitrogen (QCLot: 5932040)								
EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	<0.01	1 mg/L	91.4	80.0	120
EK267A: Total Phosphorus (Persulfate Digestion) (QCLot: 5932039)								
EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	<0.005	0.42 mg/L	115	80.0	120



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EK271A: Reactive Phosphorus (QCLot: 5932033)								
EK271A-CM: Reactive Phosphorus as P	14265-44-2	0.001	mg/L	<0.001	0.1 mg/L	103	81.0	120
EP234A: OP Pesticides (QCLot: 5933892)								
EP234-LL: Chlorpyrifos	2921-88-2	0.001	µg/L	<0.001	0.004 µg/L	105	72.0	134
EP234-LL: Malathion	121-75-5	0.001	µg/L	<0.001	0.004 µg/L	100	63.0	123
EP234-LL: Diazinon	333-41-5	0.0002	µg/L	<0.0002	0.002 µg/L	101	62.0	140
EP234-LL: Pirimiphos-methyl	29232-93-7	0.0002	µg/L	<0.0002	0.002 µg/L	96.1	47.0	97.0
EP234B: Thiocarbamates and Carbamates (QCLot: 5933892)								
EP234-LL: Thiobencarb	28249-77-6	0.0002	µg/L	<0.0002	0.002 µg/L	94.8	41.0	101
EP234C: Dinitroanilines (QCLot: 5933892)								
EP234-LL: Pendimethalin	40487-42-1	0.001	µg/L	<0.001	0.01 µg/L	# 96.9	36.0	86.0
EP234D: Triazinone Herbicides (QCLot: 5933892)								
EP234-LL: Hexazinone	51235-04-2	0.0002	µg/L	<0.0002	0.004 µg/L	94.6	74.0	126
EP234E: Conazole and Aminopyrimidine Fungicides (QCLot: 5933892)								
EP234-LL: Propiconazole	60207-90-1	0.0002	µg/L	<0.0002	0.01 µg/L	97.7	58.0	118
EP234-LL: Hexaconazole	79983-71-4	0.0002	µg/L	<0.0002	0.004 µg/L	97.7	49.0	109
EP234-LL: Difenoconazole	119446-68-3	0.0002	µg/L	<0.0002	0.004 µg/L	84.6	46.0	106
EP234-LL: Tebuconazole	107534-96-3	0.0002	µg/L	<0.0002	0.002 µg/L	98.2	53.0	113
EP234-LL: Flusilazole	85509-19-9	0.0002	µg/L	<0.0002	0.004 µg/L	101	52.0	112
EP234-LL: Penconazole	66246-88-6	0.0002	µg/L	<0.0002	0.002 µg/L	99.2	56.0	116
EP234F: Phenylurea, Thizdiazolurea, Uracil and Sulfonylurea Herbicides (QCLot: 5933892)								
EP234-LL: Diuron	330-54-1	0.0002	µg/L	<0.0002	0.004 µg/L	94.8	71.0	135
EP234H: Triazine Herbicides (QCLot: 5933892)								
EP234-LL: Ametryn	834-12-8	0.0002	µg/L	<0.0002	0.002 µg/L	99.4	59.0	119
EP234-LL: Atrazine	1912-24-9	0.0002	µg/L	<0.0002	0.002 µg/L	94.0	78.0	124
EP234-LL: Cyanazine	21725-46-2	0.0002	µg/L	<0.0002	0.004 µg/L	92.3	58.0	118
EP234-LL: Prometryn	7287-19-6	0.0002	µg/L	<0.0002	0.002 µg/L	98.2	62.0	122
EP234-LL: Propazine	139-40-2	0.0002	µg/L	<0.0002	0.002 µg/L	101	57.0	117
EP234-LL: Simazine	122-34-9	0.0002	µg/L	<0.0002	0.004 µg/L	93.3	70.0	126
EP234-LL: Terbutylazine	5915-41-3	0.0002	µg/L	<0.0002	0.002 µg/L	106	54.0	114
EP234-LL: Terbutryn	886-50-0	0.0002	µg/L	<0.0002	0.002 µg/L	99.9	56.0	116

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG035F: Dissolved Mercury by FIMS (QCLot: 5932430)							
EB2424144-002	RI	EG035F-LL: Mercury	7439-97-6	0.01 mg/L	85.3	70.0	130
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 5932738)							
EB2424144-002	RI	EG093A-F: Arsenic	7440-38-2	500 µg/L	91.4	70.0	130
		EG093A-F: Cadmium	7440-43-9	125 µg/L	89.1	70.0	130
		EG093A-F: Copper	7440-50-8	500 µg/L	86.4	70.0	130
		EG093A-F: Lead	7439-92-1	500 µg/L	96.7	70.0	130
		EG093A-F: Nickel	7440-02-0	500 µg/L	86.4	70.0	130
		EG093A-F: Zinc	7440-66-6	500 µg/L	83.6	70.0	130
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 5940156)							
EB2424144-007	TB	EG094A-F: Arsenic	7440-38-2	500 µg/L	92.2	70.0	130
		EG094A-F: Cadmium	7440-43-9	125 µg/L	95.7	70.0	130
		EG094A-F: Copper	7440-50-8	500 µg/L	95.9	70.0	130
		EG094A-F: Lead	7439-92-1	500 µg/L	95.7	70.0	130
		EG094A-F: Nickel	7440-02-0	500 µg/L	94.8	70.0	130
		EG094A-F: Zinc	7440-66-6	500 µg/L	94.3	70.0	130
EK255A: Ammonia (QCLot: 5932034)							
EB2424144-002	RI	EK255A-CM: Ammonia as N	7664-41-7	0.1 mg/L	109	70.0	130
EK257A: Nitrite (QCLot: 5932031)							
EB2424059-001	Anonymous	EK257A-CM: Nitrite as N	14797-65-0	0.2 mg/L	93.8	70.0	130
EK259A: Nitrite and Nitrate (NOx) (QCLot: 5932032)							
EB2424144-002	RI	EK259A-CM: Nitrite + Nitrate as N	----	0.1 mg/L	87.9	70.0	130
EK262A: Total Nitrogen (QCLot: 5932040)							
EB2424144-001	SI	EK262PA-CM: Total Nitrogen as N	----	0.5 mg/L	85.3	70.0	130
EK267A: Total Phosphorus (Persulfate Digestion) (QCLot: 5932039)							
EB2424144-001	SI	EK267PA-CM: Total Phosphorus as P	----	0.5 mg/L	99.1	70.0	130
EK271A: Reactive Phosphorus (QCLot: 5932033)							
EB2424144-002	RI	EK271A-CM: Reactive Phosphorus as P	14265-44-2	0.1 mg/L	95.7	70.0	130



CERTIFICATE OF ANALYSIS

Work Order : **EB2429361**
Client : **VISION ENVIRONMENT ANZ**
Contact : FELICITY MELVILLE
Address : OFFICE 3 165 AUCKLAND STREET
GLADSTONE 4680
Telephone : ---
Project : NQBP Hay Point
Order number :
C-O-C number : 71912
Sampler : MELANIE ALPEN
Site : Hay Pt
Quote number : EB24VISANZ0002 Hay Point Dredge
No. of samples received : 7
No. of samples analysed : 7

Page : 1 of 4
Laboratory : Environmental Division Brisbane
Contact : Kelly Schafer
Address : 2 Byth Street Stafford QLD Australia 4053
Telephone : +61 7 4978 7944
Date Samples Received : 28-Aug-2024 09:00
Date Analysis Commenced : 28-Aug-2024
Issue Date : 02-Sep-2024 17:43



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Beatriz Llarinas	Senior Chemist - Inorganics	Brisbane Inorganics, Stafford, QLD
Mark Hallas	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EK271A-CM: Samples for Ultra-Trace Reactive Phosphorus by FIA should be frozen upon sampling. If not, low-level results (below 0.01 mg/L) may bias low.



Analytical Results

Sub-Matrix: SEAWATER
 (Matrix: WATER)

Sample ID				RI	SI -A	SI-B	VI	FP
Sampling date / time				27-Aug-2024 12:00	27-Aug-2024 13:30	27-Aug-2024 14:36	27-Aug-2024 10:00	27-Aug-2024 08:50
Compound	CAS Number	LOR	Unit	EB2429361-001	EB2429361-002	EB2429361-003	EB2429361-004	EB2429361-005
				Result	Result	Result	Result	Result
EK255A: Ammonia								
Ammonia as N	7664-41-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
EK257A: Nitrite								
Nitrite as N	14797-65-0	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
EK258A: Nitrate								
Nitrate as N	14797-55-8	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
EK259A: Nitrite and Nitrate (NOx)								
Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
EK261A: Total Kjeldahl Nitrogen								
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	0.09	0.08	0.07	0.07	0.08
EK262A: Total Nitrogen								
Total Nitrogen as N	----	0.01	mg/L	0.09	0.08	0.07	0.07	0.08
EK267A: Total Phosphorus (Persulfate Digestion)								
Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
EK271A: Reactive Phosphorus								
Reactive Phosphorus as P	14265-44-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001

Page : 4 of 4
 Work Order : EB2429361
 Client : VISION ENVIRONMENT ANZ
 Project : NQBP Hay Point



Analytical Results

Sub-Matrix: SEAWATER
 (Matrix: WATER)

				Sample ID	FB	TB	----	----	----
				Sampling date / time	27-Aug-2024 13:34	26-Aug-2024 06:35	----	----	----
Compound	CAS Number	LOR	Unit	EB2429361-006	EB2429361-007	-----	-----	-----	-----
				Result	Result	----	----	----	----
EK255A: Ammonia									
Ammonia as N	7664-41-7	0.005	mg/L	<0.005	<0.005	----	----	----	----
EK257A: Nitrite									
Nitrite as N	14797-65-0	0.002	mg/L	<0.002	<0.002	----	----	----	----
EK258A: Nitrate									
Nitrate as N	14797-55-8	0.002	mg/L	<0.002	<0.002	----	----	----	----
EK259A: Nitrite and Nitrate (NOx)									
Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	<0.002	----	----	----	----
EK261A: Total Kjeldahl Nitrogen									
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	<0.01	<0.01	----	----	----	----
EK262A: Total Nitrogen									
Total Nitrogen as N	----	0.01	mg/L	<0.01	<0.01	----	----	----	----
EK267A: Total Phosphorus (Persulfate Digestion)									
Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	----	----	----	----
EK271A: Reactive Phosphorus									
Reactive Phosphorus as P	14265-44-2	0.001	mg/L	<0.001	<0.001	----	----	----	----



QUALITY CONTROL REPORT

Work Order	: EB2429361	Page	: 1 of 4
Client	: VISION ENVIRONMENT ANZ	Laboratory	: Environmental Division Brisbane
Contact	: FELICITY MELVILLE	Contact	: Kelly Schafer
Address	: OFFICE 3 165 AUCKLAND STREET GLADSTONE 4680	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 4978 7944
Project	: NQBP Hay Point	Date Samples Received	: 28-Aug-2024
Order number	:	Date Analysis Commenced	: 28-Aug-2024
C-O-C number	: 71912	Issue Date	: 02-Sep-2024
Sampler	: MELANIE ALPEN		
Site	: Hay Pt		
Quote number	: EB24VISANZ0002 Hay Point Dredge		
No. of samples received	: 7		
No. of samples analysed	: 7		



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Beatriz Llarinas	Senior Chemist - Inorganics	Brisbane Inorganics, Stafford, QLD
Mark Hallas	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EK255A: Ammonia (QC Lot: 6018848)									
EB2429361-001	RI	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	<0.005	0.0	No Limit
EK257A: Nitrite (QC Lot: 6018846)									
EB2429361-001	RI	EK257A-CM: Nitrite as N	14797-65-0	0.002	mg/L	<0.002	<0.002	0.0	No Limit
EK259A: Nitrite and Nitrate (NOx) (QC Lot: 6018845)									
EB2429361-001	RI	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
EK262A: Total Nitrogen (QC Lot: 6018838)									
EB2429361-001	RI	EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	0.09	0.08	0.0	No Limit
EK267A: Total Phosphorus (Persulfate Digestion) (QC Lot: 6018837)									
EB2429361-001	RI	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	0.0	No Limit
EK271A: Reactive Phosphorus (QC Lot: 6018847)									
EB2429361-001	RI	EK271A-CM: Reactive Phosphorus as P	14265-44-2	0.001	mg/L	<0.001	0.002	80.2	No Limit



Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EK255A: Ammonia (QCLot: 6018848)								
EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.1 mg/L	98.7	80.0	120
EK257A: Nitrite (QCLot: 6018846)								
EK257A-CM: Nitrite as N	14797-65-0	0.002	mg/L	<0.002	0.1 mg/L	102	84.0	119
EK259A: Nitrite and Nitrate (NOx) (QCLot: 6018845)								
EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	0.1 mg/L	100	80.0	120
EK262A: Total Nitrogen (QCLot: 6018838)								
EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	<0.01	1 mg/L	96.8	80.0	120
EK267A: Total Phosphorus (Persulfate Digestion) (QCLot: 6018837)								
EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	<0.005	0.42 mg/L	114	80.0	120
EK271A: Reactive Phosphorus (QCLot: 6018847)								
EK271A-CM: Reactive Phosphorus as P	14265-44-2	0.001	mg/L	<0.001	0.1 mg/L	81.0	81.0	120

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK255A: Ammonia (QCLot: 6018848)							
EB2429361-002	SI -A	EK255A-CM: Ammonia as N	7664-41-7	0.1 mg/L	89.0	70.0	130
EK257A: Nitrite (QCLot: 6018846)							
EB2429361-003	SI-B	EK257A-CM: Nitrite as N	14797-65-0	0.1 mg/L	101	70.0	130
EK259A: Nitrite and Nitrate (NOx) (QCLot: 6018845)							
EB2429361-002	SI -A	EK259A-CM: Nitrite + Nitrate as N	----	0.1 mg/L	101	70.0	130
EK262A: Total Nitrogen (QCLot: 6018838)							
EB2429361-002	SI -A	EK262PA-CM: Total Nitrogen as N	----	0.5 mg/L	92.7	70.0	130
EK267A: Total Phosphorus (Persulfate Digestion) (QCLot: 6018837)							
EB2429361-002	SI -A	EK267PA-CM: Total Phosphorus as P	----	0.5 mg/L	91.0	70.0	130
EK271A: Reactive Phosphorus (QCLot: 6018847)							
EB2429361-002	SI -A	EK271A-CM: Reactive Phosphorus as P	14265-44-2	0.1 mg/L	74.4	70.0	130





CERTIFICATE OF ANALYSIS

Work Order : **EB2431218**
Client : **VISION ENVIRONMENT ANZ**
Contact : FELICITY MELVILLE
Address : OFFICE 3 165 AUCKLAND STREET
GLADSTONE 4680
Telephone : ----
Project : NQBP Hay Point
Order number : ----
C-O-C number : ----
Sampler : CARYS HANNING, Ralph Alquezar
Site : ----
Quote number : EB24VISANZ0002 Hay Point Dredge
No. of samples received : 7
No. of samples analysed : 7

Page : 1 of 4
Laboratory : Environmental Division Brisbane
Contact : Kelly Schafer
Address : 2 Byth Street Stafford QLD Australia 4053
Telephone : +61 7 4978 7944
Date Samples Received : 12-Sep-2024 09:30
Date Analysis Commenced : 13-Sep-2024
Issue Date : 19-Sep-2024 11:22



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories

Position

Accreditation Category

Kim McCabe

Senior Inorganic Chemist

Brisbane Inorganics, Stafford, QLD



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EK271A-CM: Samples for Ultra-Trace Reactive Phosphorus by FIA should be frozen upon sampling. If not, low-level results (below 0.01 mg/L) may bias low.

Page : 3 of 4
 Work Order : EB2431218
 Client : VISION ENVIRONMENT ANZ
 Project : NQBP Hay Point



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

				Sample ID	SI	RTI-A	RTI-B	VI	FWP
				Sampling date / time	10-Sep-2024 12:30	10-Sep-2024 11:45	10-Sep-2024 11:45	10-Sep-2024 16:25	10-Sep-2024 15:40
Compound	CAS Number	LOR	Unit		EB2431218-001	EB2431218-002	EB2431218-003	EB2431218-004	EB2431218-005
					Result	Result	Result	Result	Result
EK255A: Ammonia									
Ammonia as N	7664-41-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
EK257A: Nitrite									
Nitrite as N	14797-65-0	0.002	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002
EK258A: Nitrate									
Nitrate as N	14797-55-8	0.002	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002
EK259A: Nitrite and Nitrate (NOx)									
Nitrite + Nitrate as N	----	0.002	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002
EK261A: Total Kjeldahl Nitrogen									
Total Kjeldahl Nitrogen as N	----	0.01	mg/L		0.11	0.14	0.20	0.12	0.14
EK262A: Total Nitrogen									
Total Nitrogen as N	----	0.01	mg/L		0.11	0.14	0.20	0.12	0.14
EK267A: Total Phosphorus (Persulfate Digestion)									
Total Phosphorus as P	----	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
EK271A: Reactive Phosphorus									
Reactive Phosphorus as P	14265-44-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001

Page : 4 of 4
 Work Order : EB2431218
 Client : VISION ENVIRONMENT ANZ
 Project : NQBP Hay Point



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

				Sample ID	FB	TB	----	----	----
				Sampling date / time	10-Sep-2024 17:00	09-Sep-2024 00:00	----	----	----
Compound	CAS Number	LOR	Unit		EB2431218-006	EB2431218-007	-----	-----	-----
					Result	Result	----	----	----
EK255A: Ammonia									
Ammonia as N	7664-41-7	0.005	mg/L		<0.005	<0.005	----	----	----
EK257A: Nitrite									
Nitrite as N	14797-65-0	0.002	mg/L		<0.002	<0.002	----	----	----
EK258A: Nitrate									
Nitrate as N	14797-55-8	0.002	mg/L		<0.002	<0.002	----	----	----
EK259A: Nitrite and Nitrate (NOx)									
Nitrite + Nitrate as N	----	0.002	mg/L		<0.002	<0.002	----	----	----
EK261A: Total Kjeldahl Nitrogen									
Total Kjeldahl Nitrogen as N	----	0.01	mg/L		<0.01	<0.01	----	----	----
EK262A: Total Nitrogen									
Total Nitrogen as N	----	0.01	mg/L		<0.01	<0.01	----	----	----
EK267A: Total Phosphorus (Persulfate Digestion)									
Total Phosphorus as P	----	0.005	mg/L		<0.005	<0.005	----	----	----
EK271A: Reactive Phosphorus									
Reactive Phosphorus as P	14265-44-2	0.001	mg/L		<0.001	<0.001	----	----	----



QUALITY CONTROL REPORT

Work Order	: EB2431218	Page	: 1 of 4
Client	: VISION ENVIRONMENT ANZ	Laboratory	: Environmental Division Brisbane
Contact	: FELICITY MELVILLE	Contact	: Kelly Schafer
Address	: OFFICE 3 165 AUCKLAND STREET GLADSTONE 4680	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 4978 7944
Project	: NQBP Hay Point	Date Samples Received	: 12-Sep-2024
Order number	: ----	Date Analysis Commenced	: 13-Sep-2024
C-O-C number	: ----	Issue Date	: 19-Sep-2024
Sampler	: CARYS HANNING, Ralph Alquezar		
Site	: ----		
Quote number	: EB24VISANZ0002 Hay Point Dredge		
No. of samples received	: 7		
No. of samples analysed	: 7		



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EK255A: Ammonia (QC Lot: 6054318)									
EB2431218-001	SI	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	<0.005	0.0	No Limit
EK257A: Nitrite (QC Lot: 6054316)									
EB2431218-001	SI	EK257A-CM: Nitrite as N	14797-65-0	0.002	mg/L	<0.002	<0.002	0.0	No Limit
EK259A: Nitrite and Nitrate (NOx) (QC Lot: 6054315)									
EB2431218-001	SI	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
EK262A: Total Nitrogen (QC Lot: 6054321)									
EB2431218-001	SI	EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	0.11	0.12	0.0	0% - 50%
EK267A: Total Phosphorus (Persulfate Digestion) (QC Lot: 6054320)									
EB2431218-001	SI	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	0.0	No Limit
EK271A: Reactive Phosphorus (QC Lot: 6054317)									
EB2431218-001	SI	EK271A-CM: Reactive Phosphorus as P	14265-44-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit



Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
Method: Compound		CAS Number	LOR	Unit	Result	Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)
							LCS	Low High
EK255A: Ammonia (QCLot: 6054318)								
EK255A-CM: Ammonia as N		7664-41-7	0.005	mg/L	<0.005	0.1 mg/L	95.6	80.0 120
EK257A: Nitrite (QCLot: 6054316)								
EK257A-CM: Nitrite as N		14797-65-0	0.002	mg/L	<0.002	0.1 mg/L	104	84.0 119
EK259A: Nitrite and Nitrate (NOx) (QCLot: 6054315)								
EK259A-CM: Nitrite + Nitrate as N		----	0.002	mg/L	<0.002	0.1 mg/L	105	80.0 120
EK262A: Total Nitrogen (QCLot: 6054321)								
EK262PA-CM: Total Nitrogen as N		----	0.01	mg/L	<0.01	1 mg/L	96.5	80.0 120
EK267A: Total Phosphorus (Persulfate Digestion) (QCLot: 6054320)								
EK267PA-CM: Total Phosphorus as P		----	0.005	mg/L	<0.005	0.42 mg/L	112	80.0 120
EK271A: Reactive Phosphorus (QCLot: 6054317)								
EK271A-CM: Reactive Phosphorus as P		14265-44-2	0.001	mg/L	<0.001	0.1 mg/L	101	81.0 120

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: WATER				Matrix Spike (MS) Report			
Laboratory sample ID		Sample ID	Method: Compound	CAS Number	Spike Concentration	SpikeRecovery(%)	Acceptable Limits (%)
						MS	Low High
EK255A: Ammonia (QCLot: 6054318)							
EB2431218-002	RTI-A		EK255A-CM: Ammonia as N	7664-41-7	0.1 mg/L	94.2	70.0 130
EK257A: Nitrite (QCLot: 6054316)							
EB2431218-003	RTI-B		EK257A-CM: Nitrite as N	14797-65-0	0.2 mg/L	98.8	70.0 130
EK259A: Nitrite and Nitrate (NOx) (QCLot: 6054315)							
EB2431218-002	RTI-A		EK259A-CM: Nitrite + Nitrate as N	----	0.1 mg/L	99.0	70.0 130
EK262A: Total Nitrogen (QCLot: 6054321)							
EB2431218-002	RTI-A		EK262PA-CM: Total Nitrogen as N	----	0.5 mg/L	108	70.0 130
EK267A: Total Phosphorus (Persulfate Digestion) (QCLot: 6054320)							
EB2431218-002	RTI-A		EK267PA-CM: Total Phosphorus as P	----	0.5 mg/L	115	70.0 130
EK271A: Reactive Phosphorus (QCLot: 6054317)							
EB2431218-002	RTI-A		EK271A-CM: Reactive Phosphorus as P	14265-44-2	0.1 mg/L	102	70.0 130





CERTIFICATE OF ANALYSIS

Work Order : **EB2435834**
Client : **VISION ENVIRONMENT ANZ**
Contact : FELICITY MELVILLE
Address : OFFICE 3 165 AUCKLAND STREET
GLADSTONE 4680
Telephone : ----
Project : NQBP Hay Point
Order number :
C-O-C number : 73915
Sampler : Anna Skillington, CARYS HANNING
Site : Hay point
Quote number : EB24VISANZ0002 Hay Point Dredge
No. of samples received : 7
No. of samples analysed : 7

Page : 1 of 8
Laboratory : Environmental Division Brisbane
Contact : Kelly Schafer
Address : 2 Byth Street Stafford QLD Australia 4053
Telephone : +61 7 4978 7944
Date Samples Received : 22-Oct-2024 10:10
Date Analysis Commenced : 22-Oct-2024
Issue Date : 04-Nov-2024 08:37



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Beatriz Llarinas	Senior Chemist - Inorganics	Brisbane Inorganics, Stafford, QLD
Don Sirimanne	Senior Biologist - Water	Microbiology / Biology, Hume, ACT
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- EK271A-CM: Samples for Ultra-Trace Reactive Phosphorus by FIA should be frozen upon sampling. If not, low-level results (below 0.01 mg/L) may bias low.
- **Specialty Organics analysis is conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- EG093: Samples containing high levels of sulfate may precipitate barium under the acidic conditions of this method and may therefore bias results low.

Page : 3 of 8
 Work Order : EB2435834
 Client : VISION ENVIRONMENT ANZ
 Project : NQBP Hay Point



Analytical Results

Sub-Matrix: FRESH WATER
 (Matrix: WATER)

Sample ID				FB	TB	----	----	----
Sampling date / time				17-Oct-2024 08:40	15-Oct-2024 15:00	----	----	----
Compound	CAS Number	LOR	Unit	EB2435834-006	EB2435834-007	-----	-----	-----
				Result	Result	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	1	mg/L	<1	<1	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	----	----	----
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS								
Arsenic	7440-38-2	0.2	µg/L	<0.2	<0.2	----	----	----
Cadmium	7440-43-9	0.05	µg/L	<0.05	<0.05	----	----	----
Copper	7440-50-8	0.5	µg/L	<0.5	<0.5	----	----	----
Lead	7439-92-1	0.1	µg/L	<0.1	<0.1	----	----	----
Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	----	----	----
Zinc	7440-66-6	1	µg/L	<1	<1	----	----	----
EK255A: Ammonia								
Ammonia as N	7664-41-7	0.005	mg/L	<0.005	<0.005	----	----	----
EK257A: Nitrite								
Nitrite as N	14797-65-0	0.002	mg/L	<0.002	<0.002	----	----	----
EK258A: Nitrate								
Nitrate as N	14797-55-8	0.002	mg/L	<0.002	<0.002	----	----	----
EK259A: Nitrite and Nitrate (NOx)								
Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	<0.002	----	----	----
EK261A: Total Kjeldahl Nitrogen								
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	<0.01	0.09	----	----	----
EK262A: Total Nitrogen								
Total Nitrogen as N	----	0.01	mg/L	<0.01	0.09	----	----	----
EK267A: Total Phosphorus (Persulfate Digestion)								
Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	----	----	----
EK271A: Reactive Phosphorus								
Reactive Phosphorus as P	14265-44-2	0.001	mg/L	<0.001	<0.001	----	----	----
EP234A: OP Pesticides								
Chlorpyrifos	2921-88-2	0.001	µg/L	<0.001	<0.001	----	----	----

Page : 4 of 8
 Work Order : EB2435834
 Client : VISION ENVIRONMENT ANZ
 Project : NQBP Hay Point



Analytical Results

Sub-Matrix: FRESH WATER
 (Matrix: WATER)

				Sample ID	FB	TB	----	----	----
				Sampling date / time	17-Oct-2024 08:40	15-Oct-2024 15:00	----	----	----
Compound	CAS Number	LOR	Unit		EB2435834-006	EB2435834-007	-----	-----	-----
					Result	Result	----	----	----
EP234A: OP Pesticides - Continued									
Malathion	121-75-5	0.001	µg/L		<0.001	<0.001	----	----	----
Diazinon	333-41-5	0.0002	µg/L		<0.0002	<0.0002	----	----	----
Pirimiphos-methyl	29232-93-7	0.0002	µg/L		<0.0002	<0.0002	----	----	----
EP234B: Thiocarbamates and Carbamates									
Thiobencarb	28249-77-6	0.0002	µg/L		<0.0002	<0.0002	----	----	----
EP234C: Dinitroanilines									
Pendimethalin	40487-42-1	0.001	µg/L		<0.001	<0.001	----	----	----
EP234D: Triazinone Herbicides									
Hexazinone	51235-04-2	0.0002	µg/L		<0.0002	<0.0002	----	----	----
EP234E: Conazole and Aminopyrimidine Fungicides									
Propiconazole	60207-90-1	0.0002	µg/L		<0.0002	<0.0002	----	----	----
Hexaconazole	79983-71-4	0.0002	µg/L		<0.0002	<0.0002	----	----	----
Difenoconazole	119446-68-3	0.0002	µg/L		<0.0002	<0.0002	----	----	----
Tebuconazole	107534-96-3	0.0002	µg/L		<0.0002	<0.0002	----	----	----
Flusilazole	85509-19-9	0.0002	µg/L		<0.0002	<0.0002	----	----	----
Penconazole	66246-88-6	0.0002	µg/L		<0.0002	<0.0002	----	----	----
EP234F: Phenylurea, Thizdiazolurea, Uracil and Sulfonylurea Herbicides									
Diuron	330-54-1	0.0002	µg/L		<0.0002	<0.0002	----	----	----
EP234H: Triazine Herbicides									
Ametryn	834-12-8	0.0002	µg/L		<0.0002	<0.0002	----	----	----
Atrazine	1912-24-9	0.0002	µg/L		<0.0002	<0.0002	----	----	----
Cyanazine	21725-46-2	0.0002	µg/L		<0.0002	<0.0002	----	----	----
Prometryn	7287-19-6	0.0002	µg/L		<0.0002	<0.0002	----	----	----
Propazine	139-40-2	0.0002	µg/L		<0.0002	<0.0002	----	----	----
Simazine	122-34-9	0.0002	µg/L		<0.0002	<0.0002	----	----	----
Terbuthylazine	5915-41-3	0.0002	µg/L		<0.0002	<0.0002	----	----	----
Terbutryn	886-50-0	0.0002	µg/L		<0.0002	<0.0002	----	----	----



Analytical Results

Sub-Matrix: FRESH WATER (Matrix: WATER)				Sample ID	FB	TB	----	----	----
Sampling date / time					17-Oct-2024 08:40	15-Oct-2024 15:00	----	----	----
Compound	CAS Number	LOR	Unit	EB2435834-006	EB2435834-007	-----	-----	-----	
				Result	Result	----	----	----	
EP008CA: Chlorophyll a									
Chlorophyll a	----	0.02	µg/L	<0.02	<0.02	----	----	----	



Analytical Results

Sub-Matrix: MARINE WATER
 (Matrix: WATER)

Sample ID

				SI	VI	RTI	FWP-A	FWP-B
Sampling date / time				16-Oct-2024 12:50	17-Oct-2024 06:35	16-Oct-2024 12:00	17-Oct-2024 08:20	17-Oct-2024 08:30
Compound	CAS Number	LOR	Unit	EB2435834-001	EB2435834-002	EB2435834-003	EB2435834-004	EB2435834-005
				Result	Result	Result	Result	Result
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	1	mg/L	2	3	<1	4	3
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	<0.00004	<0.00004	<0.00004
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS								
Arsenic	7440-38-2	0.5	µg/L	1.4	1.4	1.6	1.4	1.5
Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Copper	7440-50-8	1	µg/L	<1	<1	<1	<1	<1
Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Zinc	7440-66-6	5	µg/L	<5	<5	<5	<5	<5
EK255A: Ammonia								
Ammonia as N	7664-41-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
EK257A: Nitrite								
Nitrite as N	14797-65-0	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
EK258A: Nitrate								
Nitrate as N	14797-55-8	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
EK259A: Nitrite and Nitrate (NOx)								
Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
EK261A: Total Kjeldahl Nitrogen								
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	0.08	0.14	0.08	0.11	0.08
EK262A: Total Nitrogen								
Total Nitrogen as N	----	0.01	mg/L	0.08	0.14	0.08	0.11	0.08
EK267A: Total Phosphorus (Persulfate Digestion)								
Total Phosphorus as P	----	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
EK271A: Reactive Phosphorus								
Reactive Phosphorus as P	14265-44-2	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
EP234A: OP Pesticides								
Chlorpyrifos	2921-88-2	0.001	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001



Analytical Results

Sub-Matrix: MARINE WATER
 (Matrix: WATER)

Sample ID

				SI	VI	RTI	FWP-A	FWP-B
Sampling date / time				16-Oct-2024 12:50	17-Oct-2024 06:35	16-Oct-2024 12:00	17-Oct-2024 08:20	17-Oct-2024 08:30
Compound	CAS Number	LOR	Unit	EB2435834-001	EB2435834-002	EB2435834-003	EB2435834-004	EB2435834-005
				Result	Result	Result	Result	Result
EP234A: OP Pesticides - Continued								
Malathion	121-75-5	0.001	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Diazinon	333-41-5	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Pirimiphos-methyl	29232-93-7	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP234B: Thiocarbamates and Carbamates								
Thiobencarb	28249-77-6	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP234C: Dinitroanilines								
Pendimethalin	40487-42-1	0.001	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
EP234D: Triazinone Herbicides								
Hexazinone	51235-04-2	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP234E: Conazole and Aminopyrimidine Fungicides								
Propiconazole	60207-90-1	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Hexaconazole	79983-71-4	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Difenoconazole	119446-68-3	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Tebuconazole	107534-96-3	0.0002	µg/L	<0.0002	<0.0002	<0.0002	0.0343	<0.0002
Flusilazole	85509-19-9	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Penconazole	66246-88-6	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP234F: Phenylurea, Thizdiazolurea, Uracil and Sulfonylurea Herbicides								
Diuron	330-54-1	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP234H: Triazine Herbicides								
Ametryn	834-12-8	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Atrazine	1912-24-9	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Cyanazine	21725-46-2	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Prometryn	7287-19-6	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Propazine	139-40-2	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Simazine	122-34-9	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Terbuthylazine	5915-41-3	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Terbutryn	886-50-0	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002



Analytical Results

Sub-Matrix: MARINE WATER (Matrix: WATER)				Sample ID	SI	VI	RTI	FWP-A	FWP-B
Sampling date / time					16-Oct-2024 12:50	17-Oct-2024 06:35	16-Oct-2024 12:00	17-Oct-2024 08:20	17-Oct-2024 08:30
Compound	CAS Number	LOR	Unit	EB2435834-001	EB2435834-002	EB2435834-003	EB2435834-004	EB2435834-005	
				Result	Result	Result	Result	Result	
EP008CA: Chlorophyll a									
Chlorophyll a	----	0.02	µg/L	0.74	1.58	1.58	0.98	1.04	

Inter-Laboratory Testing

Analysis conducted by ALS Canberra, NATA accreditation no. 992.

(WATER) EP008CA: Chlorophyll a

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry / Biology).

(WATER) EP234E: Conazole and Aminopyrimidine Fungicides

(WATER) EP234F: Phenylurea, Thizdiazolurea, Uracil and Sulfonylurea Herbicides

(WATER) EP234D: Triazinone Herbicides

(WATER) EP234H: Triazine Herbicides

(WATER) EP234C: Dinitroanilines

(WATER) EP234B: Thiocarbamates and Carbamates

(WATER) EP234A: OP Pesticides



QUALITY CONTROL REPORT

Work Order	: EB2435834	Page	: 1 of 6
Client	: VISION ENVIRONMENT ANZ	Laboratory	: Environmental Division Brisbane
Contact	: FELICITY MELVILLE	Contact	: Kelly Schafer
Address	: OFFICE 3 165 AUCKLAND STREET GLADSTONE 4680	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: ----	Telephone	: +61 7 4978 7944
Project	: NQBP Hay Point	Date Samples Received	: 22-Oct-2024
Order number	:	Date Analysis Commenced	: 22-Oct-2024
C-O-C number	: 73915	Issue Date	: 04-Nov-2024
Sampler	: Anna Skillington, CARYS HANNING		
Site	: Hay point		
Quote number	: EB24VISANZ0002 Hay Point Dredge		
No. of samples received	: 7		
No. of samples analysed	: 7		



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Beatriz Llarinas	Senior Chemist - Inorganics	Brisbane Inorganics, Stafford, QLD
Don Sirimanne	Senior Biologist - Water	Microbiology / Biology, Hume, ACT
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot

CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

RPD = Relative Percentage Difference

= Indicates failed QC

* = The final LOR has been raised due to dilution or other sample specific cause; adjusted LOR is shown in brackets. The duplicate ranges for Acceptable RPD% are applied to the final LOR where applicable.

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP008CA: Chlorophyll a (QC Lot: 6151252)									
CA2406883-003	Anonymous	EP008: Chlorophyll a	----	0.02	µg/L	7.56	7.51	0.7	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 6137071)									
EB2435834-001	SI	EA025LL: Suspended Solids (SS)	----	1	mg/L	2	2	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 6138140)									
EB2435834-001	SI	EG035F-LL: Mercury	7439-97-6	0.00004	mg/L	<0.00004	<0.00004	0.0	No Limit
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QC Lot: 6142139)									
EB2435834-001	SI	EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Arsenic	7440-38-2	0.5	µg/L	1.4	1.4	0.0	No Limit
		EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Copper	7440-50-8	1	µg/L	<1	<1	0.0	No Limit
		EG093A-F: Zinc	7440-66-6	5	µg/L	<5	<5	0.0	No Limit
EB2436541-005	Anonymous	EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG093A-F: Arsenic	7440-38-2	0.5	µg/L	1.2	1.3	0.0	No Limit
		EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG093A-F: Copper	7440-50-8	1	µg/L	<1	<1	0.0	No Limit
		EG093A-F: Zinc	7440-66-6	5	µg/L	<5	<5	0.0	No Limit
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 6152625)									
EB2435834-006	FB	EG094A-F: Cadmium	7440-43-9	0.05	µg/L	<0.05	<0.05	0.0	No Limit

Page : 3 of 6
 Work Order : EB2435834
 Client : VISION ENVIRONMENT ANZ
 Project : NQBP Hay Point



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 6152625) - continued									
EB2435834-006	FB	EG094A-F: Lead	7439-92-1	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EG094A-F: Arsenic	7440-38-2	0.2	µg/L	<0.2	<0.2	0.0	No Limit
		EG094A-F: Copper	7440-50-8	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG094A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	<0.5	0.0	No Limit
		EG094A-F: Zinc	7440-66-6	1	µg/L	<1	<1	0.0	No Limit
EK255A: Ammonia (QC Lot: 6137134)									
EB2435834-001	SI	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.008	42.9	No Limit
EK257A: Nitrite (QC Lot: 6137132)									
EB2435834-001	SI	EK257A-CM: Nitrite as N	14797-65-0	0.002	mg/L	<0.002	<0.002	0.0	No Limit
EK259A: Nitrite and Nitrate (NOx) (QC Lot: 6137131)									
EB2435834-001	SI	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
EK262A: Total Nitrogen (QC Lot: 6136978)									
EB2435791-001	Anonymous	EK262PA-CM: Total Nitrogen as N	----	0.01 (0.02)*	mg/L	0.51	0.51	0.0	0% - 20%
EB2435961-002	Anonymous	EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	0.60	0.58	3.0	0% - 20%
EK267A: Total Phosphorus (Persulfate Digestion) (QC Lot: 6136977)									
EB2435791-001	Anonymous	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	0.067	0.065	2.7	0% - 50%
EB2435961-002	Anonymous	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	0.013	0.010	30.8	No Limit
EK271A: Reactive Phosphorus (QC Lot: 6137133)									
EB2435834-001	SI	EK271A-CM: Reactive Phosphorus as P	14265-44-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit



Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EP008CA: Chlorophyll a (QCLot: 6151252)								
EP008: Chlorophyll a	----	0.02	µg/L	<0.02	200 µg/L	98.6	85.0	113
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 6137071)								
EA025LL: Suspended Solids (SS)	----	1	mg/L	<1	150 mg/L	105	82.0	120
				<1	875 mg/L	94.4	85.0	115
EG035F: Dissolved Mercury by FIMS (QCLot: 6138140)								
EG035F-LL: Mercury	7439-97-6	0.00004	mg/L	<0.00004	0.002 mg/L	96.5	85.0	118
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 6142139)								
EG093A-F: Arsenic	7440-38-2	0.5	µg/L	<0.5	10 µg/L	99.4	87.0	116
EG093A-F: Cadmium	7440-43-9	0.2	µg/L	<0.2	10 µg/L	101	88.0	114
EG093A-F: Copper	7440-50-8	1	µg/L	<1	10 µg/L	98.3	81.0	117
EG093A-F: Lead	7439-92-1	0.2	µg/L	<0.2	10 µg/L	96.1	80.0	117
EG093A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	10 µg/L	95.0	87.0	117
EG093A-F: Zinc	7440-66-6	5	µg/L	<5	10 µg/L	96.8	81.0	120
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 6152625)								
EG094A-F: Arsenic	7440-38-2	0.2	µg/L	<0.2	10 µg/L	99.9	80.0	120
EG094A-F: Cadmium	7440-43-9	0.05	µg/L	<0.05	10 µg/L	99.5	80.0	120
EG094A-F: Copper	7440-50-8	0.5	µg/L	<0.5	10 µg/L	102	80.0	120
EG094A-F: Lead	7439-92-1	0.1	µg/L	<0.1	10 µg/L	97.2	80.0	120
EG094A-F: Nickel	7440-02-0	0.5	µg/L	<0.5	10 µg/L	100	80.0	120
EG094A-F: Zinc	7440-66-6	1	µg/L	<1	10 µg/L	105	80.0	120
EK255A: Ammonia (QCLot: 6137134)								
EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.1 mg/L	101	80.0	120
EK257A: Nitrite (QCLot: 6137132)								
EK257A-CM: Nitrite as N	14797-65-0	0.002	mg/L	<0.002	0.1 mg/L	105	84.0	119
EK259A: Nitrite and Nitrate (NOx) (QCLot: 6137131)								
EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	0.1 mg/L	108	80.0	120
EK262A: Total Nitrogen (QCLot: 6136978)								
EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	<0.01	1 mg/L	98.5	80.0	120
EK267A: Total Phosphorus (Persulfate Digestion) (QCLot: 6136977)								
EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	<0.005	0.42 mg/L	105	80.0	120



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result			Low	High
EK271A: Reactive Phosphorus (QCLot: 6137133)								
EK271A-CM: Reactive Phosphorus as P	14265-44-2	0.001	mg/L	<0.001	0.1 mg/L	106	81.0	120
EP234A: OP Pesticides (QCLot: 6140802)								
EP234-LL: Chlorpyrifos	2921-88-2	0.001	µg/L	<0.001	0.004 µg/L	87.9	72.0	134
EP234-LL: Malathion	121-75-5	0.001	µg/L	<0.001	0.004 µg/L	100	63.0	123
EP234-LL: Diazinon	333-41-5	0.0002	µg/L	<0.0002	0.002 µg/L	76.0	62.0	140
EP234-LL: Pirimiphos-methyl	29232-93-7	0.0002	µg/L	<0.0002	0.002 µg/L	67.3	47.0	97.0
EP234B: Thiocarbamates and Carbamates (QCLot: 6140802)								
EP234-LL: Thiobencarb	28249-77-6	0.0002	µg/L	<0.0002	0.002 µg/L	58.7	41.0	101
EP234C: Dinitroanilines (QCLot: 6140802)								
EP234-LL: Pendimethalin	40487-42-1	0.001	µg/L	<0.001	0.01 µg/L	79.4	36.0	86.0
EP234D: Triazinone Herbicides (QCLot: 6140802)								
EP234-LL: Hexazinone	51235-04-2	0.0002	µg/L	<0.0002	0.004 µg/L	102	74.0	126
EP234E: Conazole and Aminopyrimidine Fungicides (QCLot: 6140802)								
EP234-LL: Propiconazole	60207-90-1	0.0002	µg/L	<0.0002	0.01 µg/L	100	58.0	118
EP234-LL: Hexaconazole	79983-71-4	0.0002	µg/L	<0.0002	0.004 µg/L	81.0	49.0	109
EP234-LL: Difenoconazole	119446-68-3	0.0002	µg/L	<0.0002	0.004 µg/L	84.0	46.0	106
EP234-LL: Tebuconazole	107534-96-3	0.0002	µg/L	<0.0002	0.002 µg/L	101	53.0	113
EP234-LL: Flusilazole	85509-19-9	0.0002	µg/L	<0.0002	0.004 µg/L	94.4	52.0	112
EP234-LL: Penconazole	66246-88-6	0.0002	µg/L	<0.0002	0.002 µg/L	72.6	56.0	116
EP234F: Phenylurea, Thidiazolurea, Uracil and Sulfonylurea Herbicides (QCLot: 6140802)								
EP234-LL: Diuron	330-54-1	0.0002	µg/L	<0.0002	0.004 µg/L	104	71.0	135
EP234H: Triazine Herbicides (QCLot: 6140802)								
EP234-LL: Ametryn	834-12-8	0.0002	µg/L	<0.0002	0.002 µg/L	104	59.0	119
EP234-LL: Atrazine	1912-24-9	0.0002	µg/L	<0.0002	0.002 µg/L	79.1	78.0	124
EP234-LL: Cyanazine	21725-46-2	0.0002	µg/L	<0.0002	0.004 µg/L	108	58.0	118
EP234-LL: Prometryn	7287-19-6	0.0002	µg/L	<0.0002	0.002 µg/L	88.6	62.0	122
EP234-LL: Propazine	139-40-2	0.0002	µg/L	<0.0002	0.002 µg/L	86.2	57.0	117
EP234-LL: Simazine	122-34-9	0.0002	µg/L	<0.0002	0.004 µg/L	78.1	70.0	126
EP234-LL: Terbutylazine	5915-41-3	0.0002	µg/L	<0.0002	0.002 µg/L	66.2	54.0	114
EP234-LL: Terbutryn	886-50-0	0.0002	µg/L	<0.0002	0.002 µg/L	98.0	56.0	116

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG035F: Dissolved Mercury by FIMS (QCLot: 6138140)							
EB2435834-002	VI	EG035F-LL: Mercury	7439-97-6	0.002 mg/L	78.4	70.0	130
EG093F: Dissolved Metals in Saline Water by ORC-ICPMS (QCLot: 6142139)							
EB2435834-002	VI	EG093A-F: Arsenic	7440-38-2	500 µg/L	104	70.0	130
		EG093A-F: Cadmium	7440-43-9	125 µg/L	97.7	70.0	130
		EG093A-F: Copper	7440-50-8	500 µg/L	104	70.0	130
		EG093A-F: Lead	7439-92-1	500 µg/L	101	70.0	130
		EG093A-F: Nickel	7440-02-0	500 µg/L	101	70.0	130
		EG093A-F: Zinc	7440-66-6	500 µg/L	98.9	70.0	130
EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 6152625)							
EB2435834-007	TB	EG094A-F: Arsenic	7440-38-2	500 µg/L	103	70.0	130
		EG094A-F: Cadmium	7440-43-9	125 µg/L	104	70.0	130
		EG094A-F: Copper	7440-50-8	500 µg/L	103	70.0	130
		EG094A-F: Lead	7439-92-1	500 µg/L	108	70.0	130
		EG094A-F: Nickel	7440-02-0	500 µg/L	105	70.0	130
		EG094A-F: Zinc	7440-66-6	500 µg/L	109	70.0	130
EK255A: Ammonia (QCLot: 6137134)							
EB2435834-002	VI	EK255A-CM: Ammonia as N	7664-41-7	0.1 mg/L	97.6	70.0	130
EK257A: Nitrite (QCLot: 6137132)							
EB2435834-003	RTI	EK257A-CM: Nitrite as N	14797-65-0	0.2 mg/L	119	70.0	130
EK259A: Nitrite and Nitrate (NOx) (QCLot: 6137131)							
EB2435834-002	VI	EK259A-CM: Nitrite + Nitrate as N	----	0.1 mg/L	105	70.0	130
EK262A: Total Nitrogen (QCLot: 6136978)							
EB2435791-004	Anonymous	EK262PA-CM: Total Nitrogen as N	----	0.5 mg/L	98.6	70.0	130
EK267A: Total Phosphorus (Persulfate Digestion) (QCLot: 6136977)							
EB2435791-004	Anonymous	EK267PA-CM: Total Phosphorus as P	----	0.5 mg/L	102	70.0	130
EK271A: Reactive Phosphorus (QCLot: 6137133)							
EB2435834-002	VI	EK271A-CM: Reactive Phosphorus as P	14265-44-2	0.1 mg/L	91.0	70.0	130