Quarterly Environmental Monitoring Report (QEMR)
Q3 June 2024

Address: **Dunmore Recycling & Waste Depot**
44 Buckleys Road,
Dunmore, NSW, 2529

Project No.: **ENRS0033**

Date: **July 2024**

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Executive Summary

Environment & Natural Resource Solutions (ENRS Pty Ltd) were commissioned as independent environmental consultants by ALS Environmental (Wollongong) on behalf of Shellharbour City Council (SCC) to prepare the Quarterly Environmental Monitoring Report (AEMR) for the Dunmore Recycling and Waste Depot (herein referred to as the Site).

This (QEMR) summarises the results of field testing and laboratory analysis conducted by ALS for the third quarter of the 2023-2024 monitoring period, and provides the necessary data assessment and analysis to meet requirements of the Site's Environment Protection Licence/s (EPL's); No.5984 and No.12903.

The Site was established in 1945 and has been managed by Shellharbour City Council (SSC) since 1983. The Site accepts putrescible and non-putrescible waste within its managed landfill cell. Recycling activities conducted at the site include Resource Recovery Centre, Revolve Centre and Food Organics and garden Organics (FOGO) processing.

In late 2020 to July 2021 Shellharbour City Council moved away from sole reliance on traditional onsite leachate management techniques through initiating a secondary leachate treatment option in which leachate was transported from site for processing at a contractor facility.

In early 2021 Shellharbour City Council constructed a new Leachate Treatment Plant (LTP) on site, which was commissioned in July/August 2021. The LTP is comprised of three primary biological treatment units, including an anoxic reactor, nitrifying reactor, and sequencing batch reactor. The treated stream meets Sydney Water requirements for discharge into Sydney Water sewer, under a trade waste agreement. On average the LTP discharges 60kL/day of treated water, equating to approximately 22ML of leachate removal from site per annum.

Waste regulation in NSW is administered by the EPA under the Protection of the Environment Operations (POEO) Act (1997); the Waste Avoidance and Resource Recovery Act (2001).

The Site operates under the conditions of two (2) EPLs:

- EPL No. 5984. Landfill activities. Consisting of; extractive activities, waste disposal and composting.
- EPL No. 12903. Resource recovery activities. Consisting of; composting and waste storage within the FOGO Facilities and Resource Recovery Centre.

A copy of the relevant EPL sections outlining the sampling requirements is provided in Appendix A (EPL No. 5984). ENRS note that EPL No. 12903 does not specify sample points.

The objectives of this AEMR are to:

- Meet the environmental monitoring requirements of Sites EPLs; No. 5984 and 12903;
- Assess and analyse the environmental monitoring data for the Site against NSW EPA endorsed criteria;
- Identify trends of the environmental monitoring data over the reporting period;
- Identify any on-site or off-site impacts associated with operation of the Site;
- Advise SCC if the current environmental monitoring program is providing adequate information to identify potential environmental impacts from existing operations (if any) and provide recommendations on improvement to the monitoring program if required; and
- Document monitoring results in a Quarterly Environmental Monitoring Report.

Based on the findings obtained during the June 2024 Q3 monitoring program the following conclusions and recommendations are provided:

- Shallow groundwater flow is expected to mimic topography with low hydraulic gradients flowing towards the south and southeast towards Rocklow Creek. The nearest sensitive receptors are likely to include; recreational users of the Minnamurra River estuary environs; down gradient stakeholders; and downgradient alluvial aquifers, swamps, Rocklow Creek, Minnamurra River and Groundwater Dependent Ecosystems near discharge zones;
- Groundwater throughout the monitoring period reported exceedances of the assessment criteria for; ammonia, heavy metals, nitrate and salinity (EC) within groundwater bores. These exceedances were considered to be consistent with historical values;
- Offsite sample locations within Rocklow Creek reported concentrations of analytes below the SAC;
- Surface gas methane monitoring reported satisfactory results all within the adopted assessment criteria;
- Methane levels of enclosed structures on or withing 250m of deposited waste or leachate storage were tested and found to be below the acceptable threshold for 1% (volume/volume) in all cases;
- Dust deposition gauges generally recorded satisfactory results below the guidelines provided in AS3580.10.1, with the exception of DDG4. The cause should be reviewed by the client. Monitoring should continue in accordance with EPL 5984 requirements;
- Based on the data reviewed for the June 2024 Q3 monitoring period, contaminants associated with the landfill cell, leachate dam/s and general site uses were present within groundwater and consistent with the historical data;
- Flare temperatures were below the required KPI of 760 degrees Celsius throughout the quarter. The reader is referred to the LGI Flare Reports provided in **Appendix G**;
- Should any change in Site conditions or incident occur which causes a potential environmental impact, a suitable environmental professional should be engaged to further assess the Site and consider requirements for any additional monitoring; and
- This report must be read in conjunction with the attached Statement of Limitations.

Table of Contents

List of Tables

List of Figures

Appendices

1 Introduction

Environment & Natural Resource Solutions (ENRS Pty Ltd) were commissioned as independent environmental consultants by ALS Environmental (Wollongong) on behalf of Shellharbour City Council (SCC) to prepare the Quarterly Environmental Monitoring Report (AEMR) for the Dunmore Recycling and Waste Depot (herein referred to as the Site).

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1.1 Project Background

1.1.1 Site History

The Site was established in 1945 and has been managed by Shellharbour City Council (SSC) since 1983. The Site accepts putrescible and non-putrescible waste within its managed landfill cell. Recycling activities conducted at the site include Resource Recovery Centre, Revolve Centre and Food Organics and garden Organics (FOGO) processing.

In late 2020 to July 2021 Shellharbour City Council moved away from sole reliance on traditional onsite leachate management techniques through initiating a secondary leachate treatment option in which leachate was transported from site for processing at a contractor facility.

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1.2 EPL Requirements

Waste regulation in NSW is administered by the EPA under the Protection of the Environment Operations (POEO) Act (1997); the Waste Avoidance and Resource Recovery Act (2001).

The Site operates under the conditions of two (2) EPLs:

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1.3 Objectives

The objectives of this AEMR are to:

- Meet the environmental monitoring requirements of Sites EPLs; No. 5984 and 12903;
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- Identify trends of the environmental monitoring data over the reporting period;
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- Document monitoring results in a Quarterly Environmental Monitoring Report.

1.4 Scope of Work

The scope of work for this QEMR comprised the collation, assessment and reporting of Site data made available to ENRS from the June 2024 monitoring event in regard to the following tasks:

- Review previous reports and document the hydrogeological setting;
- Tabulate results of all monitoring data for both water and dust samples, collected and provided by ALS as required by the EPLs for the respective reporting period.
- Analysis and interpretation of all monitoring data (water, dust and landfill surface gas);
- Review all quarterly environmental monitoring reports from the 2020 reporting period and available data from the last three (3) years;
- Identification of any deficiencies in environmental performance identified by the monitoring data, trends or environmental incidents, and identification of remedial actions taken or proposed to be taken to address these deficiencies; and
- Recommendations on improving the environmental performance of the facility including improvement to the monitoring program.

2 Site Identification

2.1 Site Identification

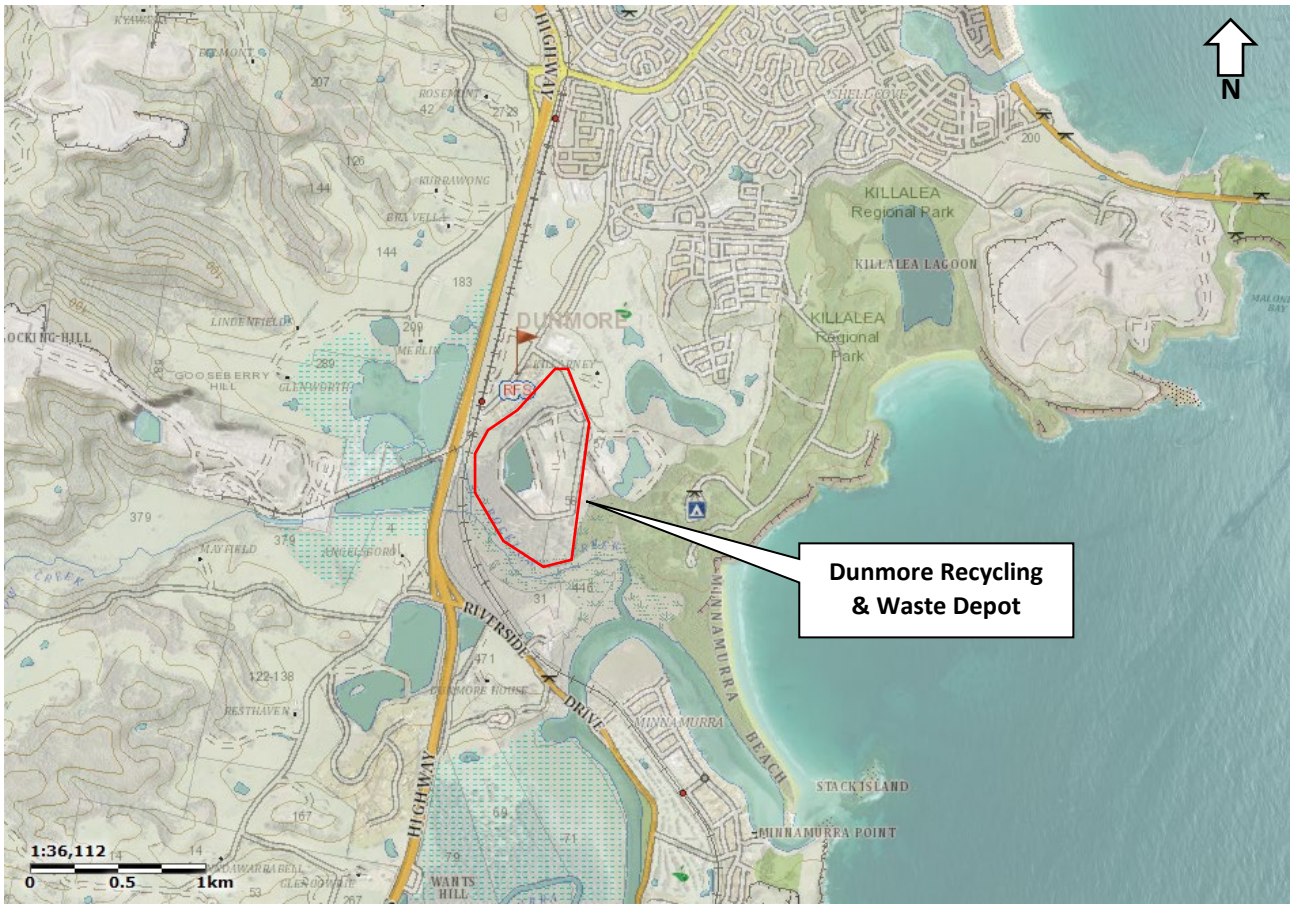
The Site is located at 44 Buckleys Road, Dunmore, NSW, 2529, legally defined as Lot 21 in Deposited Plan 653009 and Lot 1 Deposited Plan 419907. The Site is situated approximately three and a half (3.5) kilometres southwest of the Shellharbour town centre. The area's regional location is defined in **Figure 2-1** below. Details of the Site boundary and sampling points are provided in the Site Plan as **Figure 14-1**. The key features required to identify the Site are summarised in **Table 2-1**.

Table 2-1: Site Identification

Site	Description
Site name	Dunmore Recycling and Waste Depot
Street address	44 Buckleys Road, Dunmore, NSW 2529

Site	Description
Property description	-
(Lot / Deposited Plan)	21 / 653009 and 1 / 419907
Easting/Northing (GDA2020) (approximate centre of Site)	Zone 56H Easting: 302280 Northing: 6168169 (Approximate centre of Site)
Current owners	Shellharbour City Council
Current occupiers	Shellharbour City Council
Site area (total)	72.36 hectares
Site dimensions	Irregular shaped block. Please refer to **Figure 14-1.**
Areas excluded or inaccessible	Assessment was limited to the available data for the sample points listed in the EPL
Local government area	Shellharbour City Council
Current zoning	RU1 Primary Production
Locality map	Albion Park 9028
Trigger for assessment	Reporting requirements of EPL 5984
State or Local government statutory controls	• EPL 5984; • EPL 12903; • Contaminated Land Management Act 1997; • Environment Protection Act 1997; • Environment Protection Regulation 2005. Resilience and Hazards SEPP; • Work Health and Safety Act 2011; • Work Health and Safety Regulations 2011; • Waste Avoidance and Resource Recovery Act (2001).
Legal permissions to access the Site obtained or required	N/A. ENRS did not access the Site.
Consent of adjoining landowners and/or occupiers to access land (if required)	N/A. Not required for this scope of work.

Figure 2-1 Project Location



Source: https://maps.six.nsw.gov.au/ (cited 1/11/2023)

2.2 Surrounding Land Use

The current activities and operations on adjacent properties and the surrounding area include:

Table 2-2: Summary of surrounding land use

Direction	Land Use
North	Buckleys Road, commercial infrastructure and open grassland. Residential dwellings along the northwest border of the Site. Golf course further to the northeast.
East	Dunmore Resources and Recycling facility immediately to the east, bushland to the southeast.
South	Bushland, Rocklow Creek (300m from landfill activities). Further to Kiama Community Recycling Centre and Riverside Drive.
West	Bushland to the southwest, scattered trees immediately to the west and further to the Princes Highway. Boral Quarries complex beyond the Highway. Residential dwellings to the Northwest.

2.2.1 Sensitive Receptors

The nearest sensitive receptors are likely to include:

- Recreational users of the Minnamurra River estuary environs;
- Neighbouring and down gradient stakeholders;
- Ecological receptors - flora and fauna.
- Shallow soil, groundwater and stormwater – vertical and lateral migration of contaminants (if any) and connectivity with shallow groundwater, drainage waterways and nearby tributaries; and
- Down gradient alluvial aquifers, swamps, Rocklow Creek, Minnamurra River and Groundwater Dependent Ecosystems (GDE) near discharge zones.

2.3 Topography

A review of the current series Albion Park (90281N) 1:25,000 topographic map sheet was conducted to assess the regional topography and to identify potential runoff and groundwater controls in the region. Topography provides a useful indicator for groundwater controls including gradient and flow path.

The Site presents low topographic relief, remaining between approximately 3-5 mAHD across the entirety of the Site. The regional topographic gradient trends south-southeast towards Rocklow Creek and Minnamurra River.

2.4 Soil Landscape

Review of the Sites soil landscape was conducted with reference to the Kiama 1:100,000 soil landscape map. The Site was mapped as underlain by organic, black, massive sandy loam topsoil overlying loose bleached light grey sand with iron staining in the subsoil.

Review of the online *Shellharbour City Council* Acid Sulphate Soil Risk Map indicates that the Site lies within a **Class 3** area, suggesting that works beyond 1 metre below the ground level (mbGL) have the potential to encounter Acid Sulphate Soils.

2.5 Geology

A review of the Site geology was undertaken with reference to the Wollongong 1:250,000 geological series sheet (Si56.9) and the Shellharbour-Kiama area coastal quaternary 1:50,000 geology sheet (See Figure 4). The Site is predominately underlain by the Quaternary alluvial deposits (Qal) characterised as Holocene backbarrier flat; marine sand, silt, clay, gravel and shell (Qhbf). The northern most corner of the site is intersected by the Gerringong Volcanics (Pbb) characterised by Latite. Based on the mapped geology, previous investigations and borehole logs, the Site infrastructure including the landfill cell is located within the alluvial deposits.

2.6 Hydrogeology

Groundwater resources in the area are expected to be associated with Shallow unconfined alluvial and unconsolidated systems, generally less than 20 m in depth with moderate to high transmissivity, variable water quality, and strongly controlled by rainfall recharge.

2.6.1 Existing Bores

A network of groundwater monitoring bores is installed at the Site to provide specific data on the quality and nature of groundwater. Given the spatial distribution of the bores and disturbed ground condition expected within the land fill cell, groundwater contours could not be accurately mapped.

A review of the NSW Office of Water (NOW) existing bore records was conducted to develop the conceptual understanding of regional groundwater conditions, including aquifer depths, yields, water quality, and distribution. A search of the Bureau of Meteorology Australian Groundwater Explorer groundwater database identified a total of eighty-eight (88) registered bores within one and a half (1.5) kilometres of the Site (see Figure 5). Registered bores in the area are predominantly associated with the Landfill Site and with the quarry complex (Boral Site) to the west of the EPL Site. The majority of bores are registered for monitoring purposes, excluding a single well (GW044447), which is registered for stock and domestic purposes. The stock bore is located approximately one (1) kilometre to the north of the Site, on the western side of the Princes Highway, which is considered to be up gradient of the Site and not in direct hydraulic connectivity. Registered bore depths are between 1.25 m and 22 m. Bore records indicate shallow unconsolidated aquifer systems.

2.6.2 Flow Regime

Previous reports (Environmental Earth Sciences, 2018) have identified that groundwater flows vary across the Site, but the general trend is south, towards Rocklow Creek.

Based on the unconfined nature of the aquifers, the shallow groundwater flow is inferred to mimic topography with low to moderate hydraulic gradients flowing towards the south.

The Site and adjoining land, was largely unsealed with potential for local recharge from rainfall infiltration. Likely discharge areas are predominantly to the south and east of the Site including swamps and Rocklow Creek. The waterbodies surrounding the Site are recognised as State Environmental Planning Policy No.14 (SEPP14) registered wetlands and Proximity Areas for Coastal Wetlands border the eastern, southern and western boundaries of the Site.

2.7 Surface Water

The Site topography indicates that surface water flow will generally trend to the east towards off Site wetlands and southeast towards Rocklow Creek. These present the primary regional drainage structures for natural surface water and runoff. A series of stormwater infrastructure is present at the Site which is expected to capture run off. Infrastructure includes but not limited to; stormwater drains; sedimentation ponds; levee banks; collection and diversion drains; and leachate dams.

3 Assessment Criteria

ENRS have adopted the most appropriate criteria in accordance with current state and national guidelines. Where available, Australian and NSW EPA endorsed guidelines have been referenced in preference to international standards.

3.1 Water Quality Guidelines

Nationally developed guidelines are provided in the National Water Quality Management Strategy (NWQMS): Guidelines for Groundwater Protection in Australia (ARMCANZ & ANZECC;2013). The relevant criteria to protect environmental values are provided in **Table 3-1**:

Table 3-1: Water Quality Assessment Criteria

Environmental Value	Relevant Guideline
Ecosystems / Health Screening Levels	• ANZG (2018) (Australian and New Zealand Guidelines for Fresh and Marine Water Quality); • ASC NEPM (2013); and • Health Screening Levels for Petroleum Hydrocarbons in Soil & Groundwater (CRC CARE, Sept. 2011)
Drinking Water	• Australian Drinking Water Guidelines (ADWG)

3.1 Groundwater & Surface water Assessment Criteria

The ANZG (2018) provide default guideline values (DGVs) for four (4) levels of protection categorised by the percent of species possibly affected, being 80%, 90%, 95% or 99% of species. Where DGVs are not available reference is made against the ANZECC (2000) Trigger Values (TV). The NSW Office of Water (DECCW;2007) endorsed groundwater management guidelines recommend assessment for aquatic ecosystems based on the 95 per cent of species level of protection. This assessment has adopted the assessment criteria considered most appropriate for the contaminants of concern based on the Site's EPL and results provided by ALS. The adopted TV for the Site Assessment Criteria (SAC) are summarised in **Table 3-2** below.

Table 3-2: Groundwater & Surface Water Assessment Criteria

Analyte	Units	Fresh Water[A]	Marine Water[A]	Drinking Water[B]	
				Health	Aesthetic
Chloride	mg/L	-	-	-	250
Calcium	mg/L	-	-	-	-
Magnesium	mg/L	-	-	-	-
Sodium	mg/L	-	-	-	180
Potassium	mg/L	-	-	-	-
Manganese	mg/L	1.9	-	0.5	0.1
Total iron	mg/L	-	-	-	0.3
Dissolved iron	mg/L	-	-	-	0.3
Fluoride	mg/L	-	-	1.5	-
Ammonia as N[C]	mg/L	0.91 (pH 8)	0.91 (pH 8)	-	0.5
Nitrate as N	mg/L	0.7	-	50	-
Nitrite as N	mg/L	-	-	3	-
Total Organic Carbon	mg/L	-	-	-	-
Bicarbonate alkalinity as CaCO3	mg/L	-	-	-	-
Total alkalinity as CaCO3	mg/L	-	-	-	-
Sulfate as SO4 - turbidimetric	mg/L	-	-	-	250
Dissolved Oxygen - % Saturation (surface water only)	%	85-110%	-	-	-
Suspended Solids (SS) (surface water only)	mg/L	-	-	-	-

Analyte	Units	Fresh Water[A]	Marine Water[A]	Drinking Water[B] Health	Drinking Water[B] Aesthetic
Turbidity (surface water only)	NTU	-	-	-	5
pH	pH	6.5-8.5		6.5-8.5	6.5-8.5
Electrical Conductivity	µS/cm	2200	-	-	-

Table notes:
Criteria is only provided for the analytes test by ALS and listed within EPL 5984.
A: Investigation levels apply to typical slightly-moderately disturbed systems. See ANZECC & ARMCANZ (2000) for guidance on applying these levels to different ecosystem conditions.
B: Investigation levels are taken from the health values of the Australian Drinking Water Guidelines (NHMRC 2011).
D. Criteria for ammonia. See Section 3.1.1:

3.1.1 Ammonia Assessment criteria

In addition to the default TV of 0.91mg/L (pH 8) for ammonia, Table 3.3.2 of the ANZECC (2000) also provides stressor values for physical and chemical stressors for south-east Australia for slightly disturbed ecosystems. The table provides a stressor guideline for ammonia of **0.2mg/L** at pH 8 for lowland rivers. For the purposes of this assessment, the value has been applied to all water samples, excluding the leachate tank.

pH specific ammonia TVs. Additional sample point specific pH dependant trigger values for total ammonia were also adopted when a sample was outside of 8 pH units. Sample specific values were based on Table 8.3.7 of the ANZECC (2000). The additional criteria and results are presented in **Table 14-2** attached.

3.2 Dust Deposition Assessment Criteria

Criteria for collection and assessment of dust deposition concentrations are provided within the Australian standard AS3580.10.1 - Methods for sampling and analysis of ambient air; method 10.1-Determination of particulate matter - Deposited matter - Gravimetric method. AS3580.10.1 provides an acceptable level of 4 g/m2/month.

3.3 Surface Methane Gas Assessment Criteria

The NSW EPA Solid Waste Landfill Guidelines 2nd Edition (2016) provides sampling methodologies and threshold for surface methane gas concentrations at landfill sites. The acceptable threshold for capped landfills is 500 parts per million (ppm) at 5 cm above the capping surface.

3.4 Gas Accumulation Assessment Criteria within Enclosed Structures

The NSW EPA Solid Waste Landfill Guidelines 2nd Edition (2016) provides sampling methodologies and threshold gas levels to ensure that gas is not accumulating within enclosed structures on or within 250m of deposited waste or leachate storage. The acceptable threshold for 1% (volume/volume).

4 Data Quality Objectives (DQO)

If sampling is conducted, Data Quality Objectives (DQO) are required to define the quality and quantity of data needed to support management decisions. The process for establishing DQO's is documented in the National Environment Protection (Assessment of Site Contamination) Measure (NEPC;2013).

4.1 Step 1: State the problem

The Site is currently operating as an active landfill and requires regular environmental monitoring in accordance with the EPL 5984.

4.2 Step 2: Identify the decision/goal of the study

The primary goals / objectives of the investigation program were to:

- Meet the environmental monitoring requirements of Sites EPLs; No. 5984 and 12903;
- Assess and analyse the environmental monitoring data for the Site against NSW EPA endorsed criteria;
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- Advise SCC if the current environmental monitoring program is providing adequate information to identify potential environmental impacts from existing operations (if any) and provide recommendations on improvement to the monitoring program if required; and
- Document monitoring results in a Quarterly Environmental Monitoring Report.

4.3 Step 3: Identify the information inputs

The provided results shall be used to identify any risks to the sensitive receptors or change in site conditions. The following inputs were required:

- Representative environmental samples;
- Measurements of environmental parameters;
- Comparison of the parameter results against the adopted Site Assessment Criteria (SAC);
- The completion of an Quarterly Environmental Monitoring Report.

4.4 Step 4: Define the study boundaries

The assessment was limited to sampling locations listed in EPL 5984. As listed in **Appendix A** and depicted in **Figure 14-1** - **Figure 14-2**.

4.5 Step 5: Develop the analytical approach (decision rule)

The site information and results obtained from this assessment scope will be compared against the NSW EPA endorsed SAC documented in **Section 3** with considerations of the land use and nearby receptors. The decision rule process is defined by the following:

- QA/QC indicate the results are reliable;
- Laboratory Practical Quantitation Limits (PQL) or Limits of Reporting (LOR) are less than the SAC; and

- Results meet the adopted SAC and/or are within background levels and regulatory criteria.

4.6 Step 6: Specify performance or acceptance criteria

To ensure the quality of the environmental data collected during the assessment, detailed quality assurance and quality control (QA/QC) measures will be applied by ALS. The QA/QC measures will be followed from the inception of the project, during field sampling, laboratory analysis of samples and data reporting. The QAQC measures understood to have been adopted by ALS are documented in detail below within **Table 5-1**.

4.7 Step 7: Develop the plan for obtaining data

The seventh and final step involves identifying the most effective sampling and analysis design for generating the data that is required to satisfy the data quality objectives. The required sampling program is based on and accounts for the following key points:

- Requirements of Sites EPLs; No. 5984 and 12903;
- The results will be compared against the adopted SAC for the proposed land use.

The indicators (DQI) used to identify that data obtained and provided by ALS has been done so in a way which meets project data quality objectives (DQO) summarised below.

Table 4-1: Summary of Data Quality Objectives (DQO)

DQO	Evaluation Criteria
Documentation completeness	• Completion of field records, chain of custody documentation, laboratory test certificates from NATA-accredited laboratories.
Data comparability	• Use of appropriate techniques for the sampling, storage and transportation of samples. Use of NATA accredited laboratory using NEPM endorsed procedures.
Data representativeness	• Adequate sampling coverage of all required EPL sample points.
Precision and accuracy for sampling and analysis	• Use properly trained and qualified field personnel and achieve laboratory QC criteria. • Blind field duplicates to be collected at a minimum rate of 1 in 20 samples. • RPD's to be less than 30% for inorganic and 50% for organic analyses. • Rinsate samples not considered necessary as all PCoC measured by the lab were assumed to be present at the site. • Disposable single use items used for the collection of samples.

5 Sampling Methodology

Field sampling was conducted by ALS Environmental (Wollongong) as commissioned by SCC on quarterly basis. ENRS understands that sampling was conducted in accordance with ALS sampling protocols with reference to current industry standards and Code of Practices. The following sub-sections provide a summary of the sampling methodologies.

Monitoring frequency is defined by the EPL's and is designed to capture necessary site data to support assessment of Site conditions (quarterly and annual), any long-term trends or overflow events. Monitoring is conducted quarterly and annually for selected analytes with additional overflow and event-based sampling triggered by Site conditions.

5.1 Water Sampling

5.1.1 Location of Water Monitoring Points

Groundwater and surface water monitoring requirements are defined by the EPL No. 5984, as provided in Appendix A. The water sampling regime includes; five (5) surface waters, one (1) located onsite and four (4) located off-site; twelve (12) groundwater monitoring wells surrounding the landfill operations; and one (1) leachate point. Sampling locations are illustrated in Figure 2 attached.

5.1.2 Depth to Water

Prior to sampling, the depth to the groundwater table was measured from the top of casing (TOC) using a water dipper and clear disposable bailer. The bores were inspected for the presence of hydrocarbon and the thickness of any LNAPL was measured visually in clear disposable bailers. No LNAPL was reported on field sheets provided by ALS.

5.1.3 Sample Collection

Sampling is conducted independently by ALS Environmental under contract with SCC. Chain of Custody records and field sheets are provided in Appendix D. ENRS understand sampling was conducted in accordance with ALS sampling protocols.

5.1.4 Groundwater Sampling

Groundwater wells were sampled in order of distance from any areas of known contamination to ensure that lower contaminated wells are sampled before likely higher contaminated wells. Groundwater bores were purged prior to sampling by removing at least three (3) well volumes with samples being collected using clear disposal bailers or low flow parameter stabilisation methods applied with field sheets provided to document pumping volumes and field parameters. Post sampling all samples were sealed in laboratory-prepared sampling containers appropriate for the analysis.

Surface water samples were collected as 'grab samples' from the midpoint of the source at mid-depth.

Post flushing, leachate samples were sampled from a tap on the discharge line directly into purpose specific, pre preserved sample containers.

All samples were stored on ice immediately after their collection and transported to the laboratory under Chain of Custody (CoC) documentation.

Any loss of volatile compounds was kept to a minimum by employing the following sampling techniques:

- Minimal practical disturbance during sampling;
- Samples placed in sample containers as soon as possible;

- Sample containers contain zero headspace;
- Samples placed directly on ice and transported to the laboratory as soon as possible; and
- Employing the most appropriate analytical method to minimise volatile losses at the laboratory.

5.1.5 Field Testing

Field testing was conducted during bore purging and sampling to record physical water parameters. A multi-probe water quality meter was used to measure the following parameters:

- Oxygen Reduction Potential (ORP, representing redox).
- Electrical Conductivity (Salinity - EC);
- Temperature; and
- pH (Acidity).

5.2 Dust Deposition Sampling

Measurement of dust deposition was carried out in accordance with the Australian Standard AS3580.10.1 (2016). This Australian Standard provides a mean of determining the mean surface concentration of deposited matter from the atmosphere.

Dust collection gauges were set up for a one (1) month periods at during each quarterly sampling event. A total of four (4) dust monitoring locations were considered adequate to assess site conditions.

5.3 Surface Methane Gas Monitoring

The concentration of methane gas (in units of ppm) at the Site was carried out in accordance with EPA Guidelines Solid Waste Landfill 2nd Edition 2016. On the day of sampling the wind speed was below 10 km/hr. Testing was conducted using a calibrated LaserOne portable gas monitor specifically designed for landfill gas monitoring. A calibration Certificate is provided in Appendix F.

One field technician commenced data collection along transect lines in a grid pattern across the landfill surface at 25-metre spacings. A site plan depicting the sampled transect line is provide in Figure 3. Transects were recorded using a Magellan SporTrak GPS. The concentration of methane gas was measured at a height of 5 cm above the ground in areas with intermediate or final cover over the emplaced waste.

5.4 Gas Accumulation Monitoring in Enclosed Structures

The concentration of methane gas (in units of percent volume/volume) inside all enclosed structures within 250m of emplaced waste or leachate storage facility at the Site was carried out in accordance with EPA Guidelines Solid Waste Landfill 2nd Edition 2016. On the day of sampling testing was conducted using a calibrated LaserOne portable gas monitor specifically designed for landfill gas monitoring. A calibration Certificate is provided in Appendix F.

The internal methane concentrations for each enclosed structure were recorded by a field technician. A site plan depicting the location onsite of each structure provided in Figure 3. Any depressions or surface fissures away from the sampling grid were also investigated.

5.5 Laboratory Analysis

ALS, a NATA accredited laboratory, was contracted by SCC to undertake the sample analysis in accordance with current standards. Laboratory QA/QC results are detailed in the Laboratory reports contained in the appendices section of this report.

5.6 Flare Monitoring

Landfill gases (LFG) are formed through bacterial action on emplaced waste and are a normal by-product of Landfilling operations. Landfill gas is a mixture of many different gases, typically its major components include methane and carbon dioxide. Smaller concentrations of nitrogen, oxygen, ammonia, sulphides, hydrogen, carbon monoxide, and nonmethane organic compounds (NMOCs) and Volatile Organic Compounds (VOC's) may also be present.

When operated efficiently the use of a gas flare to burn landfill gas can significantly reduce emissions of methane, NMOCs and VOC's.

The flare was monitored, maintained and operated by LGI LTD. Copies of LFG reports for the relevant reporting period are included as Appendix G.

5.7 QAQC

The Quality Assurance and Quality Control (QA/QC) protocols for the sample program conducted by ALS are summarised in **Table 5-1**.

Table 5-1: Summary of QAQC for Sample Program

Protocol	Description
Sampling Team	Site personnel comprised only experienced and qualified environmental professionals trained in conducting site contamination investigations.
Sample Method	Samples obtained in laboratory prepared containers with preservatives appropriate for the required analysis.
Calibration	Equipment calibration certificates for each sampling event.
Sample Equipment	All sample equipment disposed or decontaminated between sample sites.
Field Screening	Visual and manual inspection of sample materials for potential contamination recorded on field sheets.
Chain of Custody Forms	All samples logged and transferred under appropriately completed Chain of Custody (COC) forms with Sample Receipts issued by the laboratory.
Blind Field Duplicate	At least one (1) blind field duplicate collected per 20 samples and submitted for analysis accompanied by COC forms.

6 Water Quality Results

Laboratory results for groundwater and surface water were provided to ENRS for tabulation and comparison with relevant EPL assessment criteria. A summary of results is provided in **Table 14-1 - Table 14-2** with comparison against the relevant Site Assessment Criteria (SAC). The laboratory certificates of analysis are provided in **Appendix B**.

6.1 Overflow Results

ENRS understands that one (1) overflow event occurred during the Q3 June 2024 monitoring period on the 7th June 2024. An overflow water sample was collected by ALS at the SWP1 overflow point. The sample was analysed at the laboratory of a suite of analytes consistent with the EPL requirement for surface water samples. Results generally reports concentrations of analytes below the SAC. However the following exceedances were reported:

- Ammonia as N: result of 3.06mg/L (SAC of 0.2mg/L, 0.91mg/L
- Nitrate as N: result of 1.03mg/L (SAC 0.7m);

6.2 Physical Indicators

6.2.1 Groundwater Depth

The measured depth to groundwater was measured between 0.75 mbgl (BH-15) to 4.33 mbgl (BH-18). The Site was charactered by a shallow water table hosted in the underlying unconsolidated sand and sediments.

6.2.2 Salinity

Salinity is reported by the laboratory as either Electrical Conductivity (EC) or Total Dissolved Solids (TDS). The ANZECC guidelines document a conversion ratio of 0.68 mg/L = 0.68 EC (µS/cm). Table 3.3.3 of the ANZECC (2000) guidelines document default TV for EC in lowland freshwater rivers between 125 µS/cm - 2,200 µS/cm (~1,500 mg/L). Marine waters may be characterised by an EC between 35,000 µS/cm - 50,000 µS/cm.

Groundwater

The Site was generally characterised freshwater EC values in the upgradient northern portions of the Sites, tending to become more saline towards Rocklow Creek, being a tidal river system. Results for groundwater were reported between 328 µS/cm (BH19r) and 7,500 µS/cm (BH1c). The results were all considered to be in range of historical values.

Surface Waters

Surface water samples collected from Rocklow Creek reported EC values between 5,890 µS/cm (SW_Up) and 15,200 µS/cm (SWC_Down 2). EC values were expected to be elevated and fluctuate due to Rocklow Creek being a tidal system.

Results for onsite surface water location SWP1 was reported at 1,120 µS/cm which was in range of historical data.

Leachate

Leachate salinity was 3,720 µS/cm which was generally in range of historical data. Salinity in leachate is expected to vary significantly with leachate concentration and stormwater dilution.

6.2.3 Dissolved Oxygen

Levels of Dissolved Oxygen (DO) were measured in the field for surface waters only. DO reflects the equilibrium between oxygen-consuming processes and oxygen-releasing processes. DO can initiate redox reactions resulting in the uptake or release of nutrients. Low DO concentrations can

result in adverse effects on many aquatic organisms which depend on oxygen for their efficient metabolism. At reduced DO concentrations many compounds become increasingly toxic, for example Zinc, Lead, Copper, phenols, cyanide, hydrogen sulphide and Ammonia.

The ANZG (2018) guidelines Table 3.3.2 outlines a range between 85% to 110% saturation for low land rivers. Assuming a water temperature of 18°C this is equivalent to approximately 7-11 mg/L or ppm. DO is reported by the laboratory in mg/L which be converted to a percentage.

Surface Waters

Dissolved Oxygen within onsite surface water location SWP-1 was 4.16mg/L or 45.74%. The result was generally below the TV and were consistent with historical data.

Results for DO within offsite surface water locations within Rocklow Creek ranged from 7.78 mg/L or 85.54% (SWC_ Down 2) and to 8.89 mg/L or 97.74% (SWC_Up). The results were generally consistent with the historical data.

Leachate

Dissolved oxygen within leachate tank LP1 was 1.27 mg/L or 13.96%. The results were generally in range of the historical data.

6.2.4 pH

pH is a measure of hydrogen activity. pH determines the balance between positive hydrogen ions (H+) and negative hydroxyl ions (OH-) and provides a test of water acidity (low pH) or alkalinity (high pH). Most natural freshwaters have a pH in the range 6.5 to 8.0. Changes in pH may affect the physiological functioning of biota and affect the toxicity of contaminants. Both increases and decreases in pH can result in adverse effects, although decreases are likely to cause more significant problems. Low pH indicates acidic conditions which may increase the mobility of heavy metals, whilst high pH indicates alkaline conditions which may also generate Ammonia. Previous investigations of other regional Landfill Sites in the Illawarra-Shoalhaven (Forbes Rigby;1996) report regionally acidic groundwater with low readings in the range of 4.3 pH associated with silica saturation and oxidation of accessory marcasites grains (iron sulphide).

Groundwater

Results pH in groundwater was reported between 6.6 (BH12r and BH22) and 7.40 (BH3 and BH18). The results were relatively neutral and within the SAC. No exceedances were recorded. The results were considered to be satisfactory.

Surface Water

Results for pH in surface waters reported neutral conditions between 7.40 and 7.50 which was within the SAC and was considered satisfactory.

Leachate

The pH of leachate tank LP1 was 8.20. The result was considered to be within range of historical values.

6.2.5 Total Suspended Solids (TSS)

TSS provides a measure of turbidity reported as the mass of fine inorganic particles suspended in the water. Measurement of TSS provides a valuable indication of the sediment and potential nutrient load. Elevated TSS decreases light penetration whilst phosphorus is absorbed onto sediment surfaces. TSS was measured for surface water sample points only.

Results for TSS in Rocklow Creek samples were generally reported below the LOR of <5mg/L. A result of 9mg/L was reported in sample SWC_Up. The results were within range of historical values.

Results for TSS in onsite SWP1 below the LOR of <5mg/L.

6.3 Inorganic Analytes

Water samples were analysed for select nutrients including Ammonia, Ammonium, Nitrate and Nitrite. The most bio-available forms of Nitrogen are Ammonium (NH4+) and Nitrate (NO3-). Ammonia is an oxygen-consuming compound and is toxic to aquatic biota at elevated concentrations. Ammonia toxicity increases under low oxygen levels and higher pH.

6.3.1 Ammonia

Groundwater

Results for ammonia in groundwater over the monitoring period reported exceedances above the ecological stressor value of 0.2 mg/L, 95% TV of 0.91 mg/L and pH modified TV's (see Table 14-2) in all samples. Results ranged between 0.54 mg/L (BH19r) and 352mg/L (BH1c). Results were considered to be significantly above the SAC and within range of the previous values.

Surface Water

Ammonia in onsite surface water at SWP-1 was 2.10 mg/L which was above the SAC.

Ammonia concentrations in Rocklow Creek reported minor detections which ranged between 0.10 mg/L (SWC_Down and SWC_Down 2) and 0.16 mg/L (SWC_Down 2). Results were below the SAC and within range of historical data.

Leachate

Ammonia in leachate tank LP1 was 60 mg/L which was above the SAC. Historically, untreated leachate has displayed elevated results.

6.3.2 Nitrate

Groundwater

Results for Nitrate in groundwater samples were generally reported results below the SAC. Four (4) exceedances were reported above the SAC of 0.7mg/L being 1.2 mg/L (BH12r), 4.83 mg/L (BH3), 5.68 mg/L (BH13) and 19.30 mg/L (BH14).

Surface Water

Nitrate concentrations for all surface water were reported below the SAC and considered satisfactory.

Leachate

Nitrate concentrations for leachate tank LP1 was reported at 0.1 mg/L which was below the SAC and historical values. Increased concentrations of nitrate may be characterised of untreated leachate.

6.3.3 Nitrite

Results for nitrate in all groundwater, surface water and Leachate Tank LP1 were all reported below the SAC.

6.4 Anions

6.4.1 Chloride

The results for chloride in groundwater were reported between 11 mg/L (BH19r) and 989 mg/L (BH1c). Onsite surface water dam SWP1 reported concentrations of chloride of 183 mg/L. Chloride within Leachate Tank LP1 was reported at 591 mg/L.

Elevated chloride results were measured within Rocklow Creek which may be characteristic of the tidal river system. In comparison, upgradient groundwater results reported slightly lower chloride concentrations. Results were generally consistent with historical data.

6.4.2 Fluoride

The results for fluoride in groundwater, surface water and leachate tank were all reported below the SAC and were generally consistent with the historical data.

6.4.3 Sulphate

Results for sulphate in groundwater generally reported satisfactory results that were in range of the historical data. Higher sulphate results were reported in Rocklow Creek, which may be characteristic of the tidal river system.

6.4.4 Total Alkalinity

Surface Water

Results for total alkalinity were consistent with historical data and considered to be satisfactory.

6.4.5 Bicarbonate Alkalinity

Bicarbonate alkalinity in groundwaters were consistent with historical data and considered to be satisfactory.

6.5 Metals

6.5.1 Manganese (Total Mn)

Groundwater

Results for manganese in all groundwater, surface water and leachate tanks samples were reported below the 95% TV of 1.9 mg/L. The results were generally consistent with historical data.

6.5.2 Iron (total Fe)

Total iron was measured in surface water and leachate tank LP1 only. Results for total iron were reported between 0.11mg/L (SWP1) and 7.41 (LP1). The results were generally consistent with historical data.

6.5.3 Iron (Dissolved Fe)

Concentrations of dissolved iron in groundwater were reported results between 0.20 mg/L (BH3) and 21.8 mg/L (BH22). The results were generally consistent with the historical data.

6.5.4 Calcium

Results for calcium in groundwater, surface water and leachate tank LP1 were reported between 46 mg/L (BH19r) and 218 mg/L (BH9).

6.5.5 Potassium

Results for potassium in groundwater, surface water and leachate tank LP1 were all reported within range of historical data.

6.6 Organic Analytes

6.6.1 Total Organic Carbon

Total Organic Carbon (TOC) provides a measure of the total concentration of organic material in a water sample. TOC is typically higher in surface water than groundwater. However, high TOC is also characteristic of leachate from landfill. TOC provides a marker for biological activity associated with contaminant degradation and can be used to delineate contaminant plumes. TOC influences geochemical processes by:

- acting as proton donors/acceptors;
- providing pH buffering;
- participating in mineral dissolution/precipitation reactions; and
- providing carbon substrate for microbe-based biodegradation.

Results for TOC in groundwater and surface water samples were generally low and consistent with historical data.

TOC in leachate tank LP1 was 323 mg/L which was generally consistent with historical data.

7 Dust Gauge Results

The below table provides the results of the dust depositions results. A total of four (4) dust collectors were onsite for one (1) month for each quarterly sampling round between 3/05/2024 - 3/06/2024. Sampling was conducted in general accordance with AS3580.10.1. Dust gauge locations are provided in **Figure 14-1** attached. A summary of the results is provided in **Table 7-1** below.

Table 7-1: Summary of Dust Gauge Results

Quarter	Sample ID	Guideline Criteria (g/m2/month)	Total Insolvable Matter (g/m2/month)	Comment
Quarter 3 3/05/2024 - 3/06/2024	DDG1	4	0.8	Below SAC
	DDG2		0.1	Below SAC
	DDG3		0.2	Below SAC
	DDG4		**5.1**	Above SAC

Results for depositional dust during the June 2024 Q3 monitoring period generally reported levels of dust below the adopted assessment criteria of 4 g/m^2/month. A single exceedance was report for DDG4 of 5.1 g/m2/month. DDG4 also reported an exceedance within the Q1 and Q2 2024 periods. It is recommended that monitoring is continued in accordance with EPL 5984.

8 Methane Monitoring Results

8.1 Surface Gas Methane

The surface gas monitoring for the March 2024 Q2 quarterly monitoring period DID NOT detect any levels of methane above the EPA license limits of 500 ppm. The results were considered satisfactory. A table of results is provided in **Appendix D**.

8.2 Gas Accumulation Monitoring in Enclosed Structures

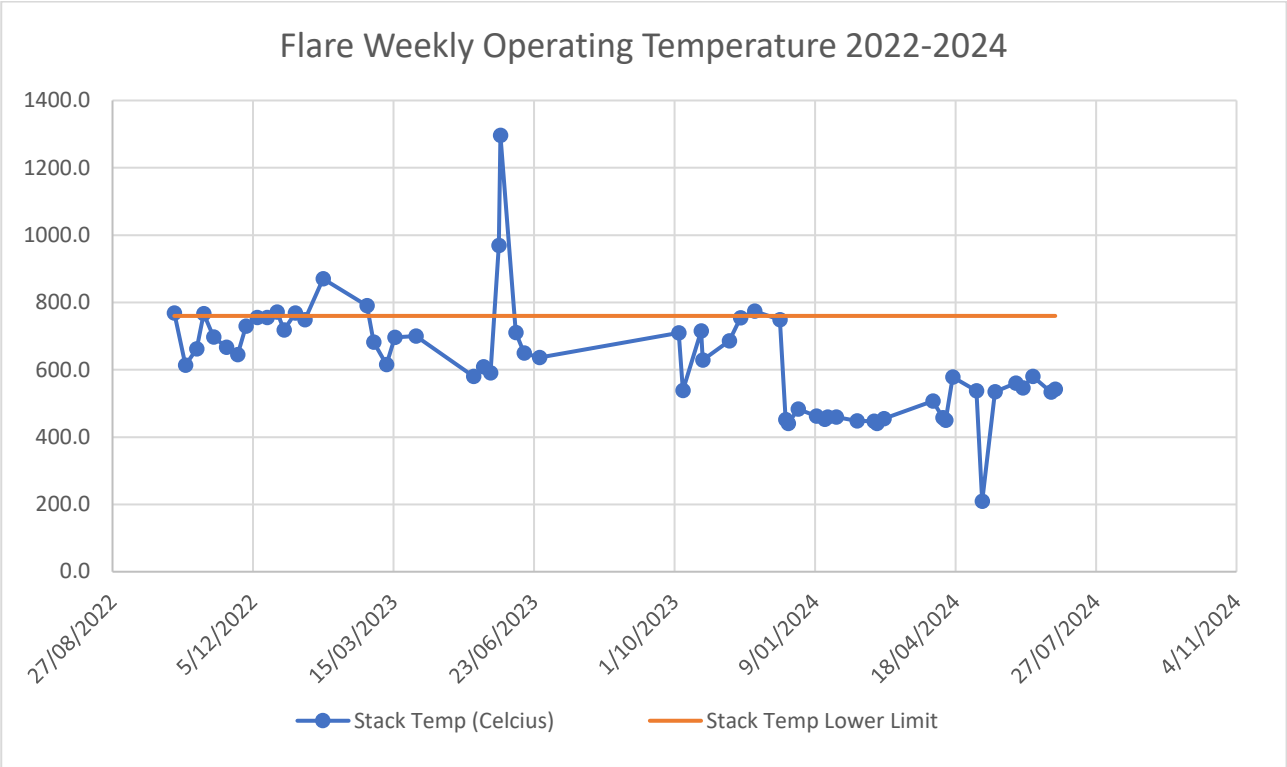
The internal methane testing for enclosed structures within 250m of the landfill during the June 2024 Q3 quarterly monitoring period DID NOT detect any levels of methane above the EPA license limits of 1% V/V. The results were considered satisfactory.

9 Flare Operations Results

Weekly average operating temperatures for the flare were supplied by LGI and displayed typical variation associated with a continuous process. Results are summarised in Chart 1 below. LGI Gas Flare reports included as **Appendix G**.

Weekly average operating temperatures for the Q3 period supplied by LGI displayed an average temperature of 503 degrees Celsius. This was lower than the historical data and below the minimal operational temperature limit of 760 degrees as specified within EPL 5989. The decline was first measured on the 19/12/2024 and was relatively consistent throughout the Q1, Q2, Q3 2024 monitoring periods.

Chart 1: Weekly Flare Operating Temperatures October 2022 – June 2024



Notes: Data sourced from the LGI reports provided in Appendix G.

10 Quality Assurance/Quality Control Data Evaluation (QAQC)

10.1 Field Sampling QAQC

It was understood that the sample program was completed in general accordance with the ALS standard operation procedures (SOP) which references current industry guidelines.

The QAQC procedures and indicators for field sampling procedures are summarised in Table 10-1.

Table 10-1: Sampling QAQC Procedures

QAQC Indicator	Completeness	Comparability	Representativeness	Precision	Accuracy	Status			Procedures and performance
						Yes	No	N/A	
Details of sampling team	X	X				☒	☐	☐	Tertiary qualified, LAA, consistent team.

QAQC Indicator	Completeness	Comparability	Representativeness	Precision	Accuracy	Status: Yes	Status: No	Status: N/A	Procedures and performance
Reference to sampling plan/method, including any deviations from it – sampling and analysis quality plan	X					☒	☐	☐	Sampling in accordance with the SOP.
Any information that could be required to evaluate measurement uncertainty for subsequent testing (analysis)				X	X	☒	☐	☐	Field sampling records and chain of custody completed in full.
Decontamination procedures carried out between sampling events			X	X	X	☒	☐	☐	Equipment such as decontaminated between samples by washing with phosphate free detergent followed by rinsing with potable water. Re-use of sampling equipment was avoided, where possible. Single use deposable sampling equipment was the preferred method.
Logs for each sample collected, including date, time, location (with GPS coordinates if possible), sampler, duplicate samples, chemical analyses to be performed, site observations and weather/environmental (i.e. surroundings) conditions. Include any diagrams, maps, photos.		X	X			☒	☐	☐	Sampling field sheets were used as required.
Chain of custody fully identifying – for each sample – the sampler, nature of the sample, collection date, analyses to be performed, sample preservation method, departure time from the site and dispatch courier(s) (where applicable)	X	X				☒	☐	☐	COC's completed in full.

QAQC Indicator	Completeness	Comparability	Representativeness	Precision	Accuracy	Status: Yes	Status: No	Status: N/A	Procedures and performance
Field quality assurance/quality control results (e.g. field blank, rinsate blank, trip blank, laboratory prepared trip spike)				X	X	☒	☐	☐	Field QAQC analysed for chemical samples – field duplicate.
Sample splitting techniques – subsampling, containers/preservation (ensure unique ID for subsequent samples provided)			X			☒	☐	☐	Samples obtained in laboratory prepared sample containers appropriate for the analytes.
Statement of duplicate frequency			X	X		☒	☐	☐	Blind field duplicates collected at 1/20 frequency
Background sample results	X	X				☒	☐	☐	Reviewed against previous investigation results.
Field instrument calibrations (when used)				X	X	☐	☐	☒	Yes field equipment was calibrated prior to use.
Sampling devices and equipment	X	X				☒	☐	☐	Manual sampling with decontamination procedures and disposable equipment.
A copy of signed chain-of-custody forms acknowledging receipt date, time and temperature and identity of samples included in shipments	X	X				☒	☐	☐	COC's completed in full, final records from NATA laboratory attached to CoAs.

10.2 Laboratory QAQC

The QAQC procedures and indicators for laboratory analysis procedures are summarised in Table 10-2.

Table 10-2: Laboratory QAQC procedures

QAQC Indicator	Completenes	Comparability	Representativ	Precision	Accuracy	Status			Procedures and performance
						Yes	No	N/A	
A copy of signed chain-of-custody forms acknowledging receipt date, time and temperature and identity of samples included in shipments	X	X				☒	☐	☐	All samples were logged and transferred under appropriately completed Chain of Custody Forms.
Record of holding times and a comparison with method specifications	X	X				☒	☐	☐	Records documented in the laboratory QAQC report attached to CoA.
Analytical methods used, including any deviations	X	X				☒	☐	☐	Recorded in the CoA.
Laboratory accreditation for analytical methods used, also noting any methods used which are not covered by accreditation	X			X		☒	☐	☐	Recorded in the CoA.
Laboratory performance for the analytical method using inter-laboratory duplicates		X			X	☒	☐	☐	Records documented in the laboratory QAQC report attached to CoA.
Surrogates and spikes used throughout the full method process, or only in parts. Results are corrected for the recovery	X	X				☒	☐	☐	Records documented in the laboratory QAQC report attached to CoA.
A list of what spikes and surrogates were run with their recoveries and acceptance criteria (tabulate)		X			X	☒	☐	☐	Records documented in the laboratory QAQC report attached to CoA.
Practical quantification limits (PQL)	X	X				☒	☐	☐	Recorded in the CoA. PQLs <SAC.
Reference laboratory control sample (LCS) and check results	X					☒	☐	☐	Records documented in the laboratory QAQC report attached to CoA.
Laboratory duplicate results (tabulate)	X				X	☒	☐	☐	Records documented in the laboratory QAQC report attached to CoA.
Laboratory blank results (tabulate)	X				X	☒	☐	☐	Records documented in the laboratory QAQC report attached to CoA.
Results are within control chart limits	X					☒	☐	☐	Records documented in the laboratory QAQC report attached to CoA.

QAQC Indicator	Completenes	Comparability	Representativ	Precision	Accuracy	Status: Yes	Status: No	Status: N/A	Procedures and performance
Evaluation of all quality assurance/control information listed above against the stated data quality objectives, including a quality assurance/control data evaluation	X	X	X	X	X	☒	☐	☐	Records documented in the laboratory QAQC report attached to CoA.

10.3 QAQC Discussion

A summary of the Data Quality performance and evaluation is summarised in **Table 10-3** below:

Table 10-3: QAQC and Data Evaluation Summary

Objective	Performance	Status
Documentation completeness	• Completion of field records; • Chain of Custody (COC) documentation; • Calibration certificates for equipment; • NATA Laboratory Sample Receipt Notification (SRN); and • NATA laboratory Certificate of Analysis (COA). • Sample Location Plans. • Sample field sheets.	✓
Precision & accuracy for sampling & analysis	• Use only trained and qualified field personnel; • Calibration certificates for field equipment; • Appropriate sampling and field techniques; • Decontamination procedures; • Achieve laboratory QC criteria; and • Achieve QAQC requirements for RPDs and Recovery	✓
Identify Anomalies	• No elevated results not expected by the CSM; • No labelling or sample management errors; • No laboratory analyses or reporting errors	✓
DATA completeness	• Sampling density comparison meets NSW EPA (1995) 'Sampling Design Guidelines' for or all potential contaminants of concern at all areas of environmental concern; and • Systematic and judgemental sampling to provide sufficient data representative of all AECs.	✓
Data comparability	• Use of appropriate techniques for the sampling, storage and transportation of sample media; • Use of NATA certified laboratory using NEPM endorsed procedures; and • Comparison with previous site information, if any.	✓

Objective	Performance	Status
Data representative ness	• Adequate sampling coverage at all points listed in the EPL. • Selection of representative samples from each sampling location; & • Analysis for PCoC. • Achieve laboratory QC criteria. • Achieve QAQC requirements for RPDs and Recovery.	✓

The laboratory was NATA accredited, and the Practical Quantitation Limits (PQL) also referred to as Limits of Reporting (LOR) were within the acceptable levels for the investigation criteria. Laboratory certificates of analysis provided in **Appendix C** indicate that for the samples collected during the scope of works, sampling techniques, transport procedures and laboratory analysis were satisfactory. Analysis of Relative Percent Differences (RPD) was conducted of duplicates for each quarterly sampling event. RPDs calculation tables are provided in **Table 14-3** and **Table 14-4**. RPD results generally reported satisfactory differences within the criteria of 30% for organics and 50% for inorganics. Emissions of QA/QC including rinsate samples, trip blank spikes and triplicate were considered to be minor and unlikely to impact the validity of the data.

In summary, the QA/QC indicators all complied with the ALS standards or showed variations that would have no significant effect on the quality of the data or the conclusions of this assessment. Based on the following conclusions it is therefore determined that, for the purposes of this study, the QA/QC results are valid, and ***the quality of the data is acceptable for use in this assessment:***

- The data was representative of site conditions;
- The data was complete with comprehensive records available from all field work undertaken, and all areas of concern sampled and analysed;
- The data was comparable for samples analysed at different times, and consistent with field observations; and
- The data was precise and accurate based on the laboratory achievement of relevant quality control criteria.

11 Quarterly Environmental Assessment

11.1 Monitoring Point Summary

Based on the results of field measurements and NATA laboratory results conducted by ALS, the following summaries were noted for the June 2024 Q3 monitoring period;

- Groundwater monitoring wells located across the site reported elevated concentrations of key indicators of leachate above the site assessment criteria, specifically ammonia. Groundwater wells were located across the Site including upgradient, adjacent to and downgradient of the landfill cells. The elevated results were generally consistent with the available historical data;
- The leachate tank LP1 reported elevated results of key leachate analysis which was considered to be characteristic of untreated leachate;
- Onsite surface water dam SWP1 generally reported results within the Site Assessment Criteria;

- Offsite surface water of Rocklow Creek generally reported conditions characteristic of a tidal river system. Concentrations of ammonia and other analytes associated with leachate within the creek were reported below adopted the ecological protection trigger values;
- Dust monitoring reported a single exceedance at the DDG4 location. This location also exceeded the criteria in the previous December Q1 and Q2 2024 periods;
- Surface gas monitoring did not detect any methane above the allowable limit across the site surface transects or within onsite buildings;
- One (1) overflow event occurred at surface water dam SWP1 during the Q3 2024 monitoring period on the 7th June 2024. A water sample collected from the SWP1 overflow drain reported elevated results for Ammonia and Nitrate; and
- Review of the gas flare reports prepared by LGI indicated a drop in flare temperature below the minimum requirement of 760 degrees Celsius as specified within EPL 5984. The drop in flare temperature was first detected in December 2023 and remained relatively consistent throughout the Q1, Q2 and Q3 2024 periods.

11.2 Environmental Management

11.2.1 Landfill Operations

ENRS understand 'solid' waste (general solid waste putrescible and non-putrescible) landfill operations are ongoing at the Site. Landfill practices should be conducted in accordance with the Site's Landfill Environmental Management Plan (LEMP) and the EPA Solid Waste Landfill Guidelines (EPA; 2016).

11.3 Environmental Safeguards

Appropriate management actions are required to continue to prevent and detect potential groundwater and surface water pollution. The nearest sensitive receptors for any uncontrolled Site water and leachate include; areas of adjoining bushland; recreational users of the Minnamurra River estuary environs, down gradient stakeholders; and down gradient alluvial aquifers, swamps, Rocklow Creek, Minnamurra River and Groundwater Dependent Ecosystems (GDE).

It is recommended that any drainage and detention structures are inspected annually by a suitably qualified environmental professional to assess their structural integrity and identify the need for any maintenance (such as removal of deep rooted vegetation, sediment, and re-lining).

Access tracks to sampling points should be inspected and maintained prior to each quarterly sampling events.

Continue to review surface and groundwater monitoring results from up and down gradient of the land fill cells and offsite sampling locations within Rocklow Creek. Continue to monitor surface methane gas in order to assess the capping integrity of the landfill cells.

11.4 Monitoring Program

The Site's EPL's and monitoring regime should be reviewed annually by SCC and the regulator.

Review of the June 2024 Q3 monitoring results indicated no significant change in environmental conditions at the Site. Key indicators of leachate were reported within the groundwater monitoring

locations across the Site. Future sampling events should continue to monitor the key indicators of leachate within ground and surface waters, especially concentration of ammonia and nitrate.

Should monitoring continue to report any significant changes in analyte concentrations the need for additional monitoring locations should be reviewed, including additional groundwater monitoring bores both up and down gradient locations of areas with analytical exceedances.

It is recommended that water quality results from future monitoring rounds continue be forwarded to a suitably qualified environmental professional for review within the laboratory holding time to compare against relevant guidelines and identify any irregularities so that additional testing may be conducted within the sample holding time.

12 Conclusions

Based on the findings obtained during the June 2024 Q3 monitoring program the following conclusions and recommendations are provided:

- Shallow groundwater flow is expected to mimic topography with low hydraulic gradients flowing towards the south and southeast towards Rocklow Creek. The nearest sensitive receptors are likely to include; recreational users of the Minnamurra River estuary environs; down gradient stakeholders; and downgradient alluvial aquifers, swamps, Rocklow Creek, Minnamurra River and Groundwater Dependent Ecosystems near discharge zones;
- Groundwater throughout the monitoring period reported exceedances of the assessment criteria for; ammonia, heavy metals, nitrate and salinity (EC) within groundwater bores. These exceedances were considered to be consistent with historical values;
- Offsite sample locations within Rocklow Creek reported concentrations of analytes below the SAC;
- Surface gas methane monitoring reported satisfactory results all within the adopted assessment criteria;
- Methane levels of enclosed structures on or withing 250m of deposited waste or leachate storage were tested and found to be below the acceptable threshold for 1% (volume/volume) in all cases;
- Dust deposition gauges generally recorded satisfactory results below the guidelines provided in AS3580.10.1, with the exception of DDG4. The cause should be reviewed by the client. Monitoring should continue in accordance with EPL 5984 requirements;
- Based on the data reviewed for the June 2024 Q3 monitoring period, contaminants associated with the landfill cell, leachate dam/s and general site uses were present within groundwater and consistent with the historical data;
- Flare temperatures were below the required KPI of 760 degrees Celsius throughout the quarter. The reader is referred to the LGI Flare Reports provided in **Appendix G**;
- Should any change in Site conditions or incident occur which causes a potential environmental impact, a suitable environmental professional should be engaged to further assess the Site and consider requirements for any additional monitoring; and
- This report must be read in conjunction with the attached Statement of Limitations.

13 References

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14 Limitations

This report and the associated services performed by ENRS are in accordance with the scope of services set out in the contract between ENRS and the Client. The scope of services was defined by the requests of the Client, by the time and budgetary constraints imposed by the Client, and by the availability of access to Site.

ENRS derived the data in this report primarily from visual inspections, and, limited sample collection and analysis made on the dates indicated. In preparing this report, ENRS has relied upon, and presumed accurate, certain information provided by government authorities, the Client and others identified herein. The report has been prepared on the basis that while ENRS believes all the information in it is deemed reliable and accurate at the time of preparing the report, it does not warrant its accuracy or completeness and to the full extent allowed by law excludes liability in contract, tort or otherwise, for any loss or damage sustained by the Client arising from or in connection with the supply or use of the whole or any part of the information in the report through any cause whatsoever.

Limitations also apply to analytical methods used in the identification of substances (or parameters). These limitations may be due to non-homogenous material being sampled (i.e. the sample to be analysed may not be representative), low concentrations, the presence of 'masking' agents and the restrictions of the approved analytical technique. As such, non-statistically significant sampling results can only be interpreted as 'indicative' and not used for quantitative assessments.

The data, findings, observations, conclusions and recommendations in the report are based solely upon the state of Site at the time of the investigation. The passage of time, manifestation of latent conditions or impacts of future events (e.g. changes in legislation, scientific knowledge, land uses, etc) may render the report inaccurate. In those circumstances, ENRS shall not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on, the contents of the report.

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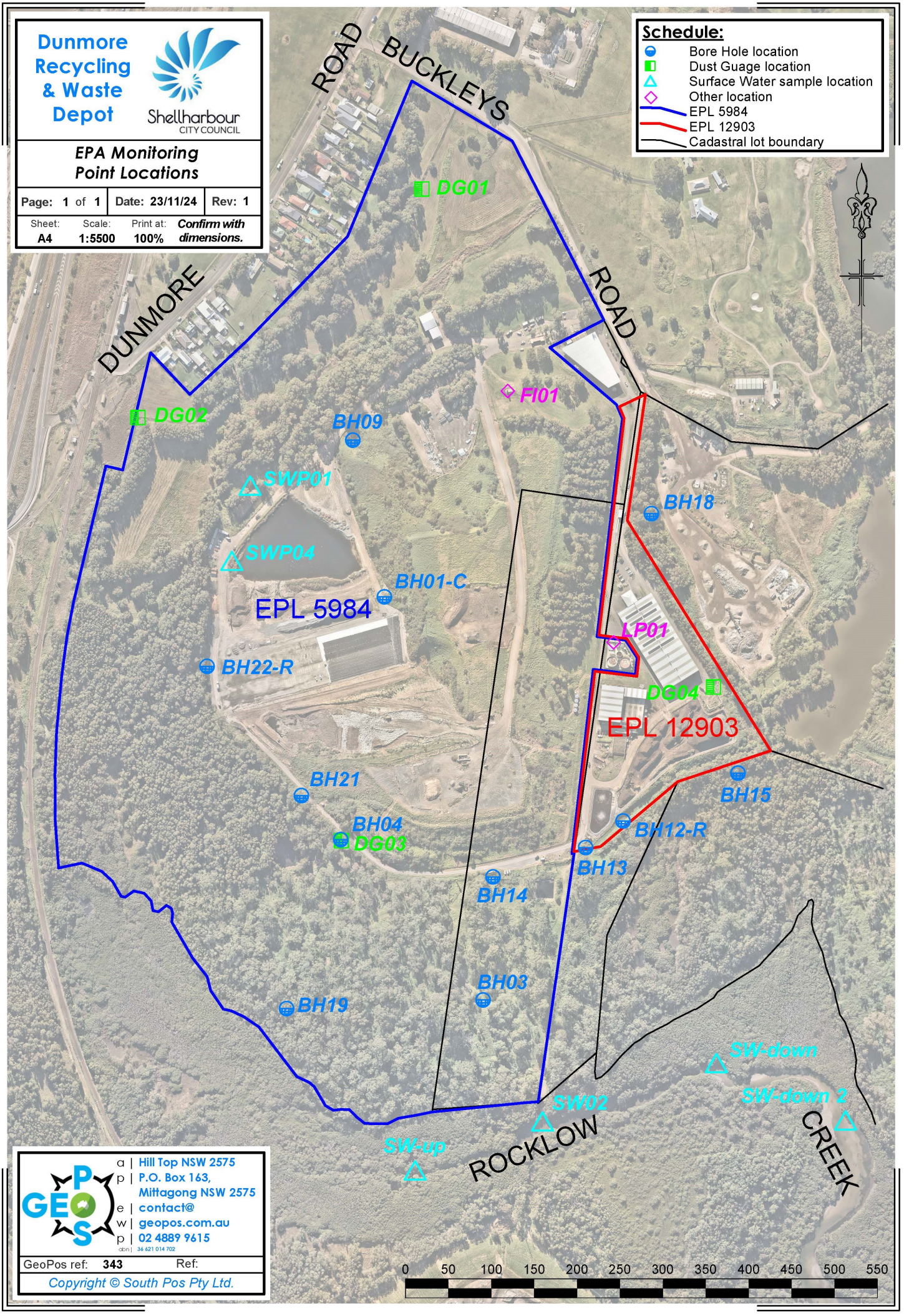
It is the responsibility of the Client to accept if the Client so chooses any recommendations contained within and implement them in an appropriate, suitable and timely manner.

FIGURES


Dunmore Recycling & Waste Depot
Shellharbour CITY COUNCIL
EPA Monitoring Point Locations
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Date: 23/11/24
Rev: 1
Sheet: A4
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Schedule:
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Dust Guage location
Surface Water sample location
Other location
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EPL 12903
Cadastral lot boundary
ROAD BUCKLEYS
DUNMORE
ROAD
ROCKLOW
CREEK
DG01
DG02
DG03
DG04
FI01
LP01
BH09
BH01-C
BH22-R
BH21
BH04
BH19
BH14
BH03
BH13
BH12-R
BH15
BH18
SWP01
SWP04
SW02
SW-up
SW-down
SW-down 2
EPL 5984
EPL 12903
0 50 100 150 200 250 300 350 400 450 500 550
a | Hill Top NSW 2575
p | P.O. Box 163, Mittagong NSW 2575
e | contact@
w | geopos.com.au
p | 02 4889 9615
abn | 36 621 014 702
GeoPos ref: 343
Ref:
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Client:	**Shellharbour City Council**	Drawn:	**PL**	Figure:	**3**
Project:	**ENRS0033**	Source:	**SixMaps**	Date:	**16/01/2020**
Location:	Dunmore Recycling & Waste Depot 44 Buckleys Rd, Dunmore, NSW, 2529	Scale:	**NA**	Title:	**Surface Gas Sample transects**
		Status:	**Rev 1**		

TABLES

TABLE 14-1: Total Concentration Results

Quarterly Water Monitoring Results - June 2024 : Dunmore Recycling and Waste Depot

GILs -Trigger Values for Freshwater (Protection of 95% of Species) [A]					-	-	-	-	-	1.9	-	-	-	0.9 (pH 8)	-	0.7	-	-	-	-	-	-	-	-	-	6.5 - 8.5	2200	-	-	
GILs -Trigger Values for Marine Water (Protection of 95% of Species) [A]					-	-	-	-	-	-	-	-	-	0.91 (pH 8)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Australian Drinking Water Guidelines (2018)[C]				Health	-	-	-	-	-	0.5	-	-	1.5	-	3	50	-	-	-	-	-	-	-	-	-	6.5 - 8.5	-	-	-	
				Aesthetic	250	-	-	180	-	0.1	0.3	0.3	-	0.5	-	-	-	-	-	-	250	-	-	-	5	6.5 - 8.5	-	-	-	
Lab Report No.	Sample No.	Sample type	EPA No,	Date Sampled	Chloride	Calcium	Magnesium	Sodium	Potassium	Manganese	Total Iron	Dissolved Iron	Fluoride	Ammonia as N	Nitrite as N	Nitrate as N	Total Organic Carbon	Bicarbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Sulfate as SO4 - Turbidimetric	Dissolved Oxygen	Dissolved Oxygen - % Saturation	Suspended Solids (SS)	Turbidity	pH	Electrical Conductivity (Non Compensated)	Temperature	Standing Water Level	Comments
				Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	%	mg/L	NTU	pH	µS/cm	°C	mbgl	
				Laboratory PQL	1	1	1	1	1	0.001	0.05	0.05	0.1	0.01	0.01	0.01	1	1	1	1	0.01	0.1	5	0.1	0.01	1	0.1	0.01	-
EW2402552001	BH1c	Groundwater	3	Jun 2024	989	124			206	0.11		12.40	0.4	352.00	0.05	< 0.10	183	2,570	2,570	261					7.00	7,500	25.0	2.75	-
EW2402552002	BH3	Groundwater	5	Jun 2024	115	98			30	0.05		0.20	0.2	6.56	0.02	4.83	14	282	282	69					7.40	759	18.4	2.83	-
EW2402552003	BH4	Groundwater	6	Jun 2024	120	117			23	0.12		2.65	0.1	3.63	< 0.01	0.06	11	350	350	57					7.20	842	19.0	4.15	-
EW2402552004	BH9	Groundwater	18	Jun 2024	528	218			75	0.73		2.95	0.5	96.80	0.01	0.02	69	1,510	1,510	146					6.90	3,790	17.7	2.75	-
EW2402552005	BH12r	Groundwater	17	Jun 2024	230	184			32	0.43		4.57	0.2	2.50	0.05	1.20	30	574	574	84					6.60	1,860	21.3	4.04	-
EW2402552006	BH13	Groundwater	10	Jun 2024	206	182			25	0.44		2.08	0.2	14.00	0.01	5.68	35	652	652	85					6.80	1,900	22.0	3.90	-
EW2402552007	BH14	Groundwater	11	Jun 2024	158	160			22	0.21		0.92	0.4	1.50	0.24	19.30	33	464	464	50					6.80	1,450	21.6	4.22	-
EW2402552008	BH15	Groundwater	7	Jun 2024	147	54			89	0.12		3.81	0.2	7.15	< 0.01	< 0.01	29	347	347	60					6.90	1,090	16.6	0.75	-
EW2402552009	BH18	Groundwater	25	Jun 2024	37	92			42	0.05		0.53	0.2	1.24	< 0.01	0.04	12	326	326	38					7.40	683	18.7	4.33	-
EW2402552010	BH19r	Groundwater	16	Jun 2024	11	46			7	0.03		0.54	0.2	0.54	< 0.01	< 0.01	9	181	181	< 10					6.90	328	20.5	1.99	-
EW2402552011	BH21	Groundwater	23	Jun 2024	299	124			14	0.45		2.57	0.4	4.07	< 0.01	< 0.01	31	729	729	126					7.20	2,230	22.3	2.70	-
EW2402552012	BH22	Groundwater	24	Jun 2024	162	84			7	0.33		21.80	0.3	5.41	< 0.01	< 0.01	38	356	356	52					6.60	1,160	18.9	2.06	-
EW2402546001	SWP1	Surfacewater	1	Jun 2024	183	70	44	204	11	0.04	0.11	< 0.05	0.5	2.10	0.14	0.45	19	316	316	233	4.16		< 5	3.40	7.50	1,120	12.6		-
EW2402546003	SWC_up	Surfacewater	20	Jun 2024	2,430	69	161	1,330	52	0.07	0.88	0.07	0.3	0.12	0.02	0.34	8	108	108	346	8.89		9	11.30	7.40	5,890	13.5		-
EW2402546002	SWC_2	Surfacewater	19	Jun 2024	2,780	76	180	1,500	59	0.07	0.86	0.06	0.3	0.16	0.01	0.41	8	109	109	391	8.81		< 5	10.60	7.50	6,580	13.3		-
EW2402546004	SWC_down	Surfacewater	21	Jun 2024	5,440	136	371	3,140	116	0.06	0.61	< 0.05	0.4	0.10	0.02	0.27	8	110	110	810	8.70		< 5	8.30	7.40	13,100	13.6		-
EW2402546005	SWC_down_2	Surfacewater	22	Jun 2024	6,170	155	442	3,630	134	0.06	0.54	< 0.05	0.5	0.10	0.01	0.25	7	109	109	940	7.78		< 5	7.60	7.40	15,200	13.7		-
EW2402550001	Leachate Storage Tank LP1	Leachate	2	Jun 2024	591	90			842	0.59	7.49		0.2	60	< 0.10	< 0.10	323	973	973	< 10	1.27	12.9			8.20	3,720	14.2		-

TABLE 14-2: Ammonia Results
June 2024 Quarter 3: Dunmore Recycling and Waste Depot

Ammonia Results comapred against the pH Modified Trigger Values - ANZACC (2000) Table 8.3.7				pH		Assessment Criteria		Result	Comment
				pH (lab)	Ecological Stressor Value	pH Modified Trigger Values - 95% Freshwater	pH Modified Trigger Values - 95% Marine Water	Ammonai As N	
Total Concentrations - PQL				0.1	-	-	-	0.01	
Lab Report No.		Sample ID.	Date	pH	mg/L	mg/L	mg/L	mg/L	
EW2400913001	Groundwater	BH1c	4/06/2024	7.00	0.20	2.18	3.91	352.00	> TV
EW2400913002		BH3	4/06/2024	7.40		1.75	2.49	6.56	> TV
EW2400913003		BH4	4/06/2024	7.20		1.99	3.20	3.63	> TV
EW2400913004		BH9	4/06/2024	6.90		2.26	4.24	96.80	> TV
EW2400913005		BH12r	4/06/2024	6.60		2.43	5.07	2.50	> TV
EW2400913006		BH13	4/06/2024	6.80		2.33	4.55	14.00	> TV
EW2400913007		BH14	4/06/2024	6.80		2.33	4.55	1.50	> TV
EW2400913008		BH15	4/06/2024	6.90		2.26	4.24	7.15	> TV
EW2400913009		BH18	4/06/2024	7.40		1.75	2.49	1.24	> TV
EW2400913010		BH19r	4/06/2024	6.90		2.26	4.24	0.54	> TV
EW2400913011		BH21	4/06/2024	7.20		1.99	3.20	4.07	> TV
EW2400913012		BH22	4/06/2024	6.60		2.43	5.07	5.41	> TV
EW2400977001	Onsite Dam	SWP1	3/06/2024	7.50		1.61	2.15	2.10	> TV
EW2400977002	Rocklow Creek Surface Water	SWC_up	3/06/2024	7.40		1.75	2.49	0.12	< TV
EW2400977003		SWC_2	3/06/2024	7.50		1.61	2.15	0.16	< TV
EW2400977004		SWC_down	3/06/2024	7.40		1.75	2.49	0.10	< TV
EW2400977005		SWC_down_2	3/06/2024	7.40		1.75	2.49	0.10	< TV

TABLE 14-3: Duplicate Groundwater Sample Results and QC Data

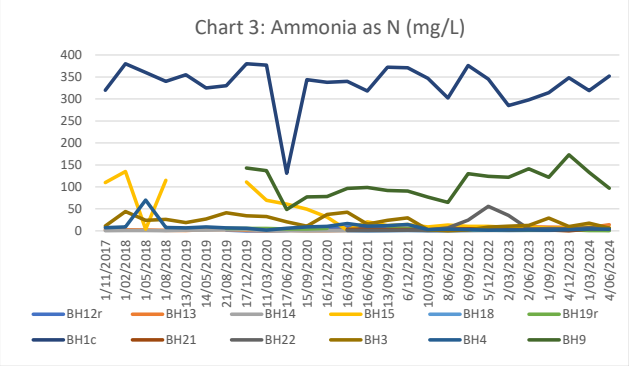
Lab Report No.				EW2402552009	EW2402552013	RPD
Sample No.				BH18	GWDuplicate	
Sample type				Groundwater	GWQC	
EPA No,				25	QC1	
Date Sampled				4/06/2024	4/06/2024	
Analyte	Units	PQL	5 x PQL	Result	Result	
Chloride	mg/L	1	5	37	14	90.20
Calcium	mg/L	1	5	92	46	66.67
Potassium	mg/L	1	5	42	7	142.86
Manganese	mg/L	0.001	0.005	0.054	0.029	60.24
Dissolved Iron	mg/L	0.05	0.25	0.53	0.54	1.87
Fluoride	mg/L	0.1	0.5	0.20	0.30	40.00
Ammonia as N	mg/L	0.01	0.05	1.24	0.54	78.65
Nitrite as N	mg/L	0.01	0.05	< 0.01	< 0.01	0.00
Nitrate as N	mg/L	0.01	0.05	0.04	< 0.01	120.00
Nitrite + Nitrate as N	mg/L	0.01	0.05	0.04	< 0.01	120.00
Total Organic Carbon	mg/L	1	5	12	9	28.57
Bicarbonate Alkalinity as CaCO3	mg/L	1	5	326	180	57.71
Total Alkalinity as CaCO3	mg/L	1	5	326	180	57.71
Sulfate as SO4 - Turbidimetric	mg/L	1	5	38	< 10	116.67
pH	pH	0.01	0.05	7.40	6.90	6.99
Electrical Conductivity (Non Compensated)	µS/cm	1	5	683	328	70.23
Temperature	°C	0.1	0.5	18.7	20.5	9.18
Standing Water Level	mbgl	-		4.33	1.99	74.05

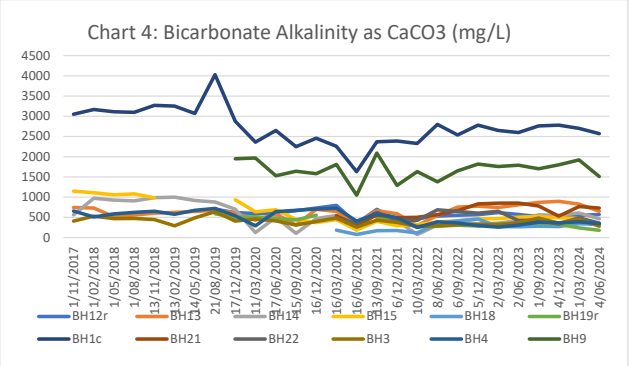
TABLE 14-4: Duplicate Surface Water Results and QC Data

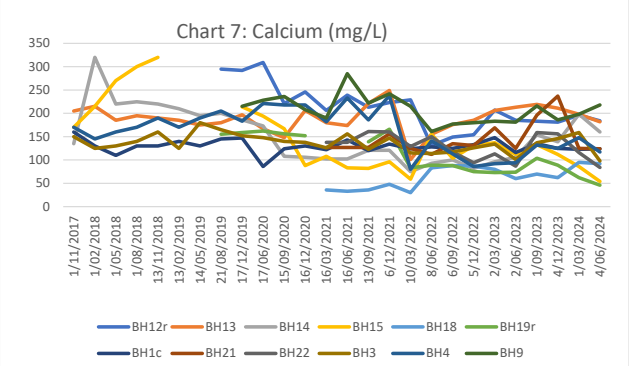
Lab Report No.				EW2402546002	EW2402546006	RPD
Sample No.				SWC_2	SWDuplicate	
Sample type				Surfacewater	OffSiteSWQC	
EPA No,				19	QC2	
Date Sampled				3/06/2024	3/06/2024	
Analyte	Units	PQL	5 x PQL	Result	Result	
Chloride	mg/L	1	5	2,780	176	176.18
Calcium	mg/L	1	5	76	70	8.22
Potassium	mg/L	1	5	59	11	137.14
Manganese	mg/L	0.001	0.005	0.072	0.038	61.82
Total Iron	mg/L	0.05	0.25	0.86	0.12	151.02
Dissolved Iron	mg/L	0.05	0.25	0.06	< 0.05	18.18
Fluoride	mg/L	0.1	0.5	0.3	0.5	50.00
Ammonia as N	mg/L	0.01	0.05	0.16	1.87	168.47
Nitrite as N	mg/L	0.01	0.05	0.01	0.14	173.33
Nitrate as N	mg/L	0.01	0.05	0.41	0.45	9.30
Nitrite + Nitrate as N	mg/L	0.01	0.05	0.42	0.59	33.66
Total Organic Carbon	mg/L	1	5	8	18	76.92
Bicarbonate Alkalinity as CaCO3	mg/L	1	5	109	314	96.93
Total Alkalinity as CaCO3	mg/L	1	5	109	314	96.93
Sulfate as SO4 - Turbidimetric	mg/L	1	5	391	231	51.45
Dissolved Oxygen	mg/L	0.01	0.05	8.81	4.10	72.97
pH	pH	0.01	0.05	7.50	7.50	0.00
Electrical Conductivity (Non Compensated)	µS/cm	1	5	6,580	1,130	141.37
Temperature	°C	0.1	0.5	13.3	12.5	6.20

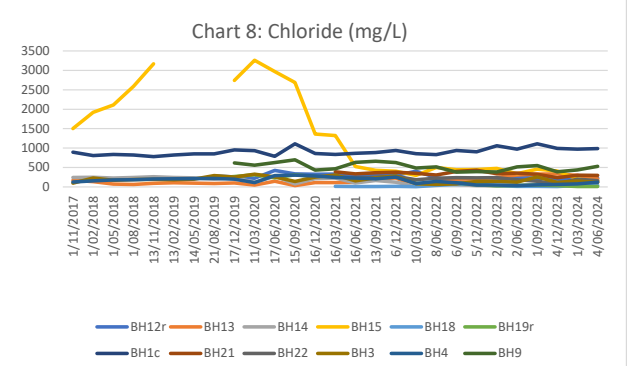
CHARTS

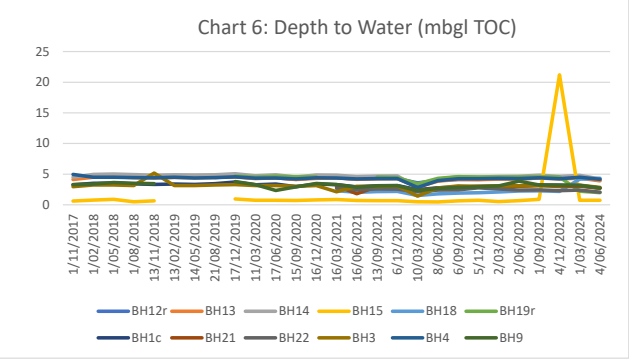
Charts 3-18: Groundwater Charts

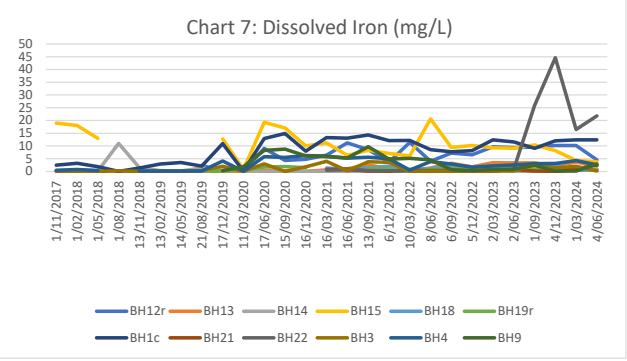


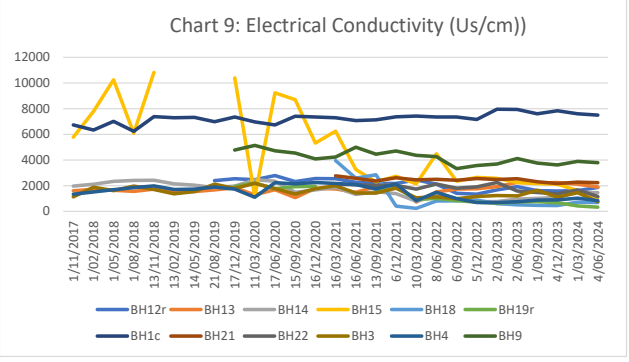


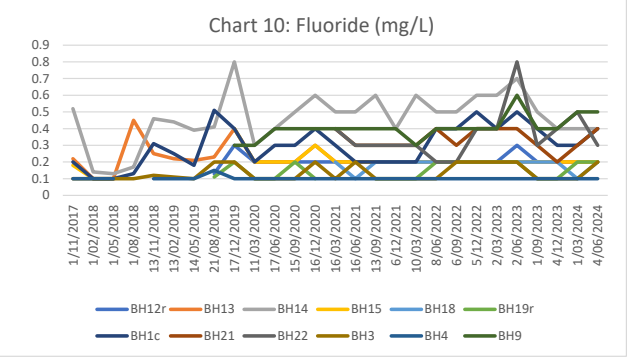












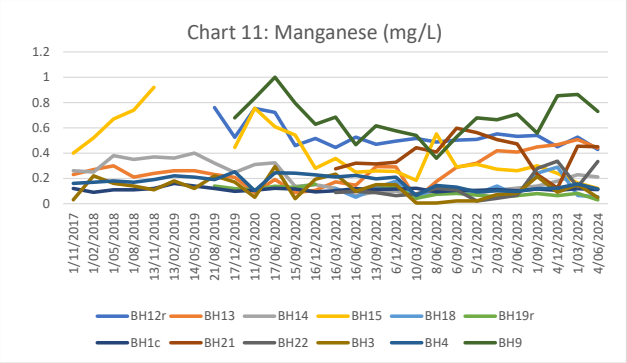


Chart 11: Manganese (mg/L)
1.2
1
0.8
0.6
0.4
0.2
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
16/12/2020
16/03/2021
16/06/2021
13/09/2021
6/12/2021
10/03/2022
8/06/2022
6/09/2022
5/12/2022
2/03/2023
2/06/2023
1/09/2023
4/12/2023
1/03/2024
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BH19r
BH1c
BH21
BH22
BH3
BH4
BH9

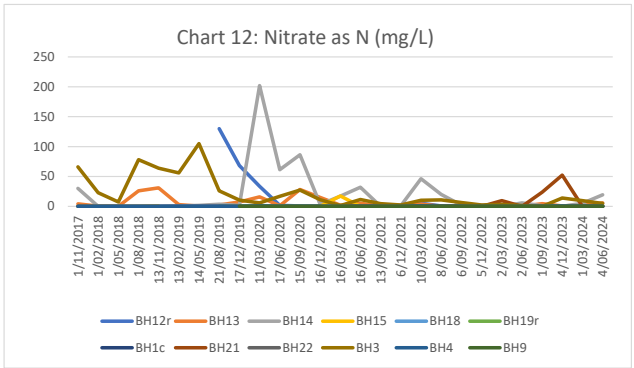
Chart 12: Nitrate as N (mg/L)
250
200
150
100
50
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
16/12/2020
16/03/2021
16/06/2021
13/09/2021
6/12/2021
10/03/2022
8/06/2022
6/09/2022
5/12/2022
2/03/2023
2/06/2023
1/09/2023
4/12/2023
1/03/2024
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BH19r
BH1c
BH21
BH22
BH3
BH4
BH9

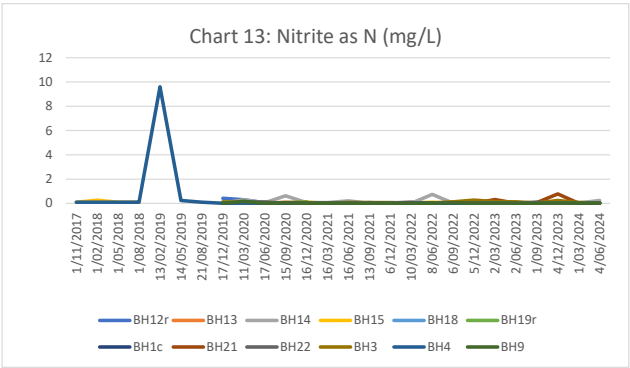
Chart 13: Nitrite as N (mg/L)
12
10
8
6
4
2
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
16/12/2020
16/03/2021
16/06/2021
13/09/2021
6/12/2021
10/03/2022
8/06/2022
6/09/2022
5/12/2022
2/03/2023
2/06/2023
1/09/2023
4/12/2023
1/03/2024
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BH19r
BH1c
BH21
BH22
BH3
BH4
BH9

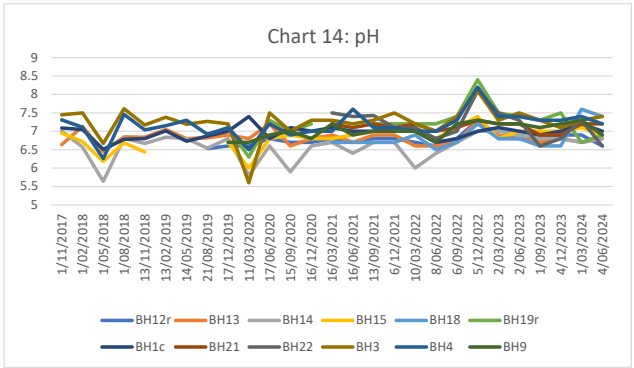
Chart 14: pH
9
8.5
8
7.5
7
6.5
6
5.5
5
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
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8/06/2022
6/09/2022
5/12/2022
2/03/2023
2/06/2023
1/09/2023
4/12/2023
1/03/2024
4/06/2024
BH12r
BH13
BH14
BH15
BH18
BH19r
BH1c
BH21
BH22
BH3
BH4
BH9

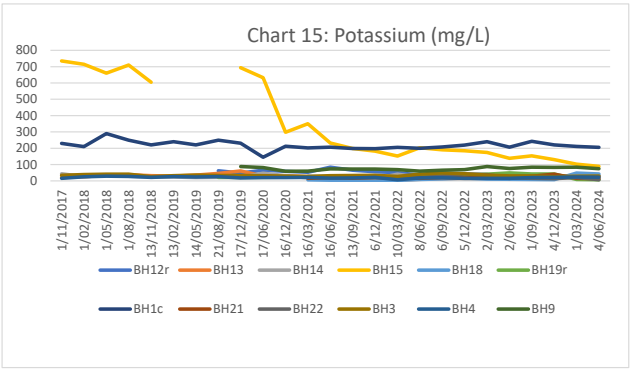


Chart 15: Potassium (mg/L)
800
700
600
500
400
300
200
100
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
17/06/2020
16/12/2020
16/03/2021
16/06/2021
13/09/2021
6/12/2021
10/03/2022
8/06/2022
6/09/2022
5/12/2022
2/03/2023
2/06/2023
1/09/2023
4/12/2023
1/03/2024
4/06/2024
BH12r
BH13
BH14
BH15
BH18
BH19r
BH1c
BH21
BH22
BH3
BH4
BH9

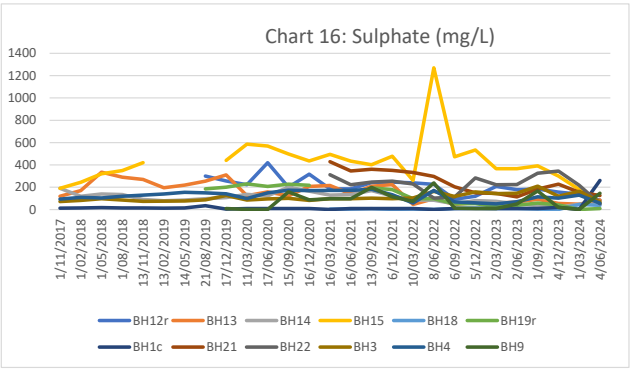


Chart 16: Sulphate (mg/L)
1400
1200
1000
800
600
400
200
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
16/12/2020
16/03/2021
16/06/2021
13/09/2021
6/12/2021
10/03/2022
8/06/2022
6/09/2022
5/12/2022
2/03/2023
2/06/2023
1/09/2023
4/12/2023
1/03/2024
4/06/2024
BH12r
BH13
BH14
BH15
BH18
BH19r
BH1c
BH21
BH22
BH3
BH4
BH9

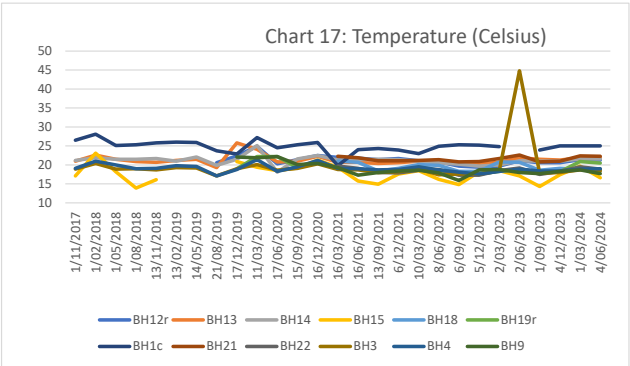


Chart 17: Temperature (Celsius)
50
45
40
35
30
25
20
15
10
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
16/12/2020
16/03/2021
16/06/2021
13/09/2021
6/12/2021
10/03/2022
8/06/2022
6/09/2022
5/12/2022
2/03/2023
2/06/2023
1/09/2023
4/12/2023
1/03/2024
4/06/2024
BH12r
BH13
BH14
BH15
BH18
BH19r
BH1c
BH21
BH22
BH3
BH4
BH9

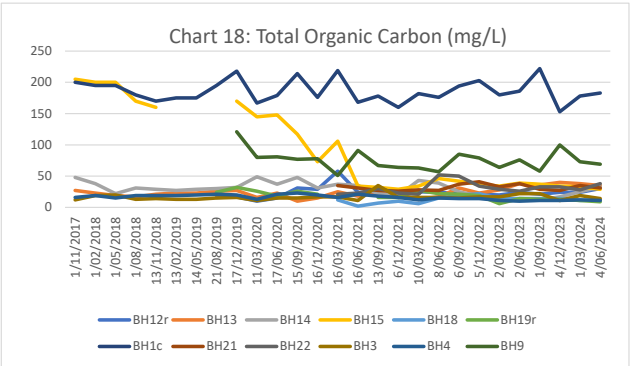
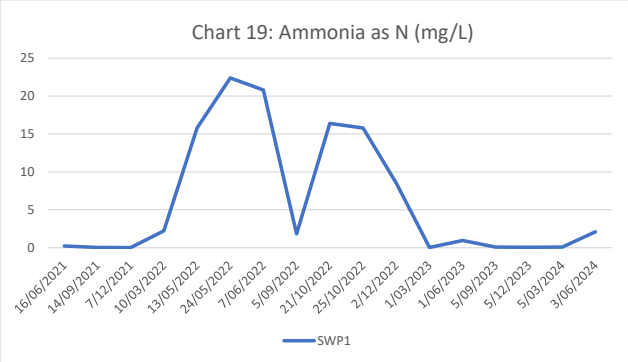
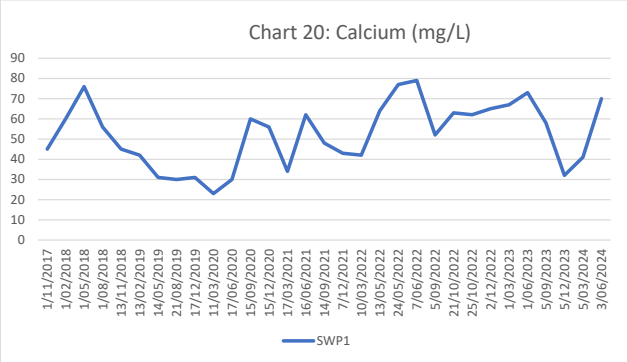
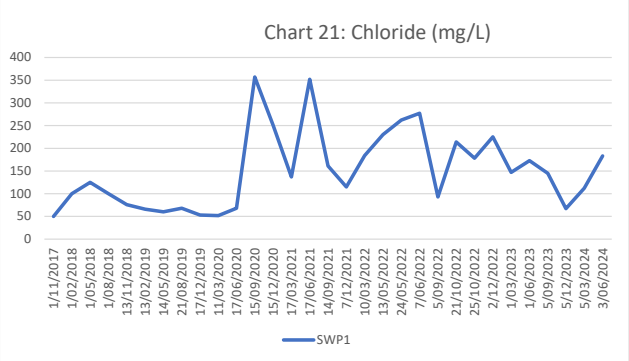


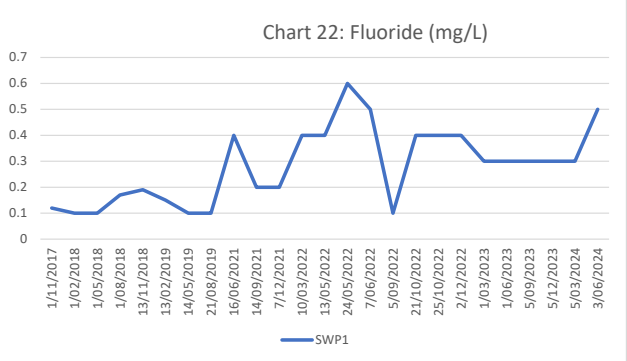
Chart 18: Total Organic Carbon (mg/L)
250
200
150
100
50
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
16/12/2020
16/03/2021
16/06/2021
13/09/2021
6/12/2021
10/03/2022
8/06/2022
6/09/2022
5/12/2022
2/03/2023
2/06/2023
1/09/2023
4/12/2023
1/03/2024
4/06/2024
BH12r
BH13
BH14
BH15
BH18
BH19r
BH1c
BH21
BH22
BH3
BH4
BH9

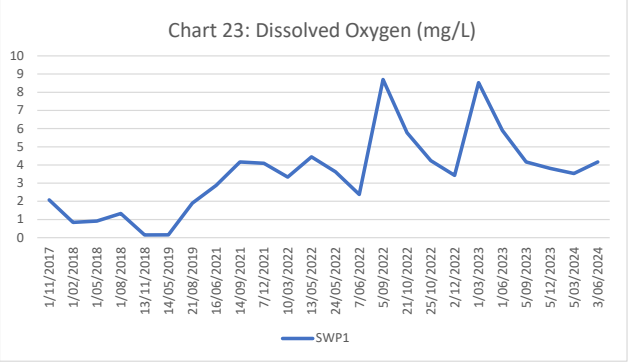
Charts 19-34: Onsite Surface Water Charts

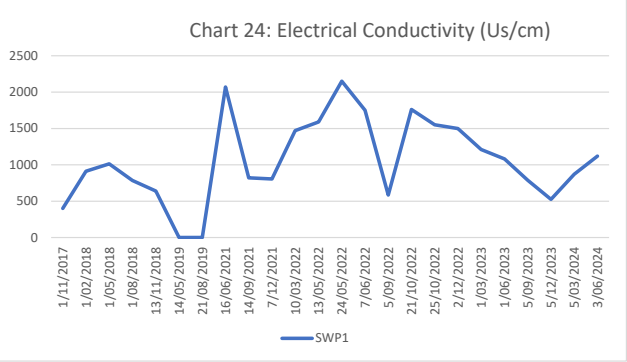


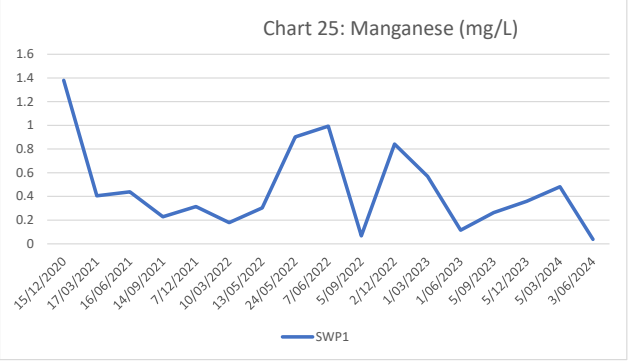


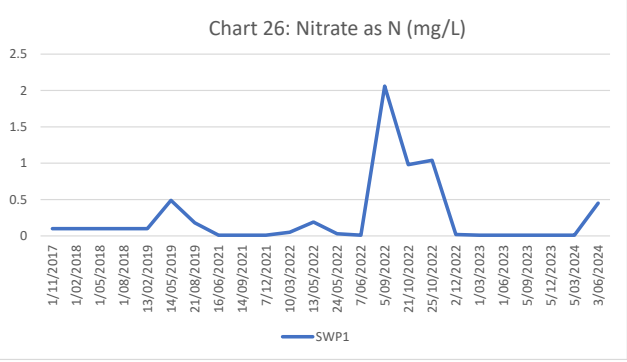












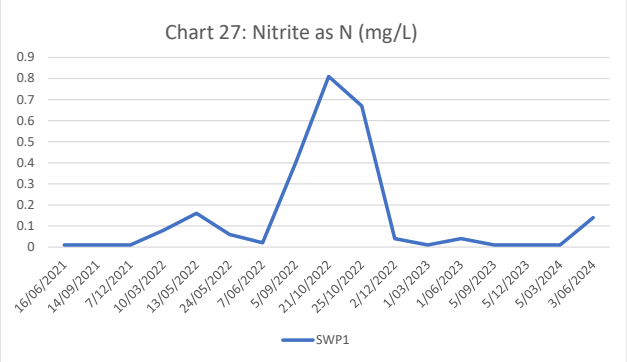


Chart 27: Nitrite as N (mg/L)
SWP1

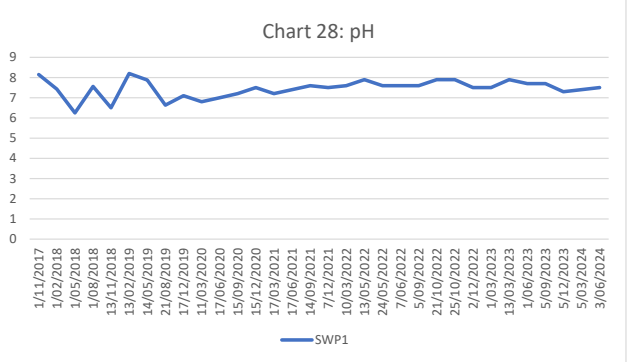


Chart 28: pH
SWP1

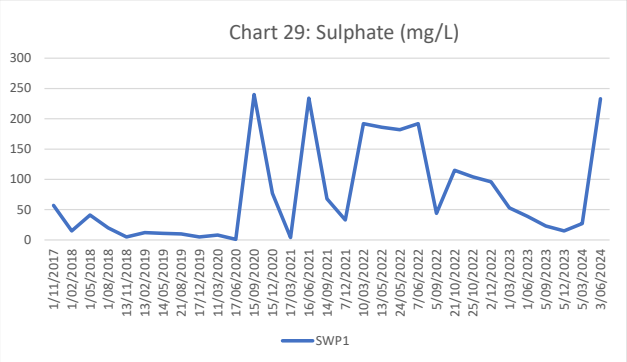


Chart 29: Sulphate (mg/L)
SWP1

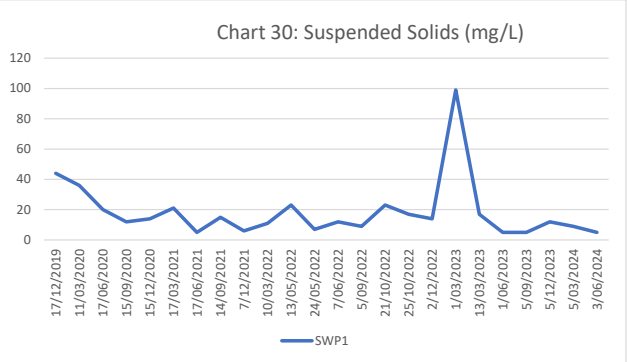


Chart 30: Suspended Solids (mg/L)
SWP1

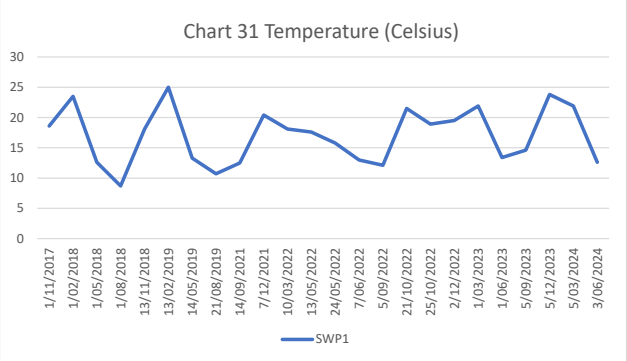


Chart 31 Temperature (Celsius)
SWP1

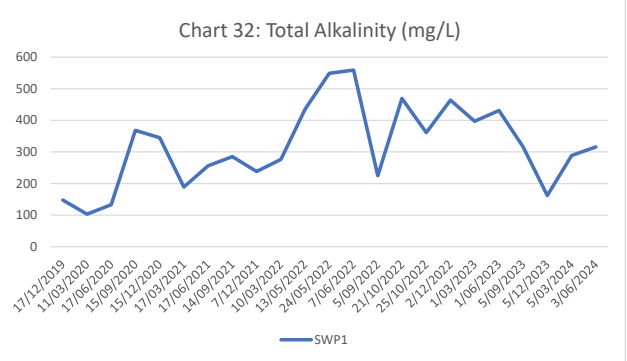


Chart 32: Total Alkalinity (mg/L)
SWP1

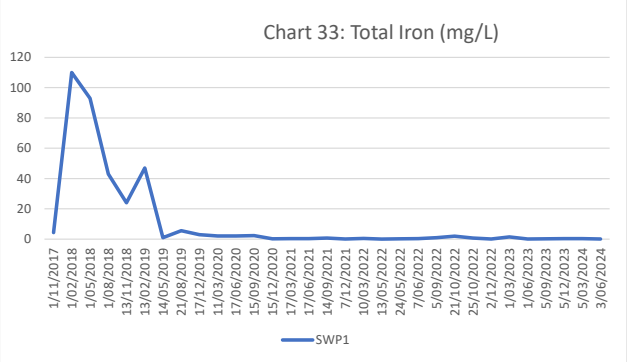


Chart 33: Total Iron (mg/L)
SWP1

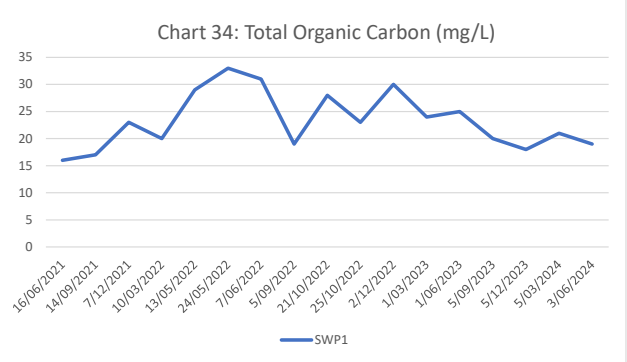
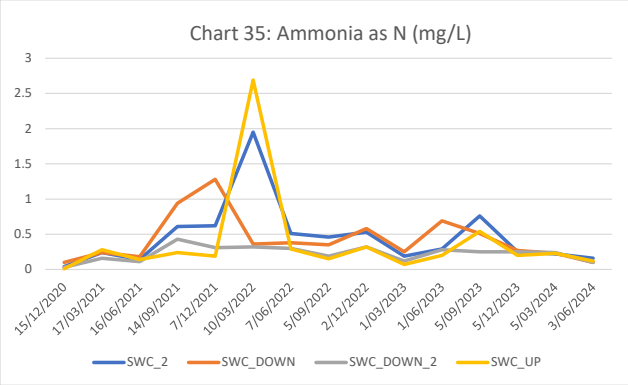
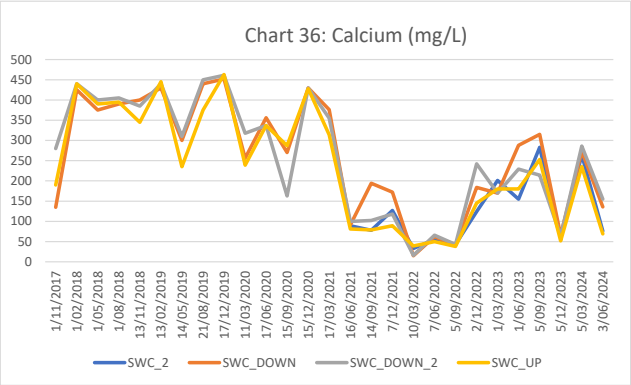
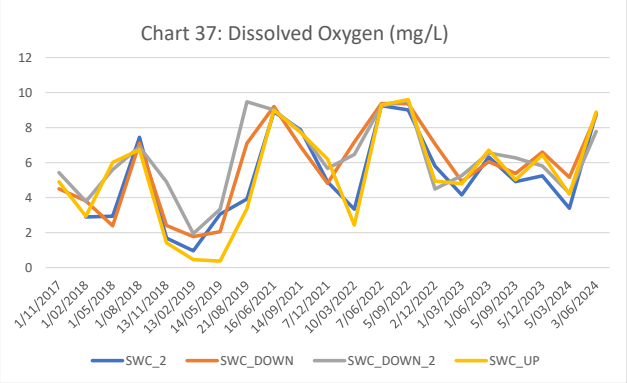


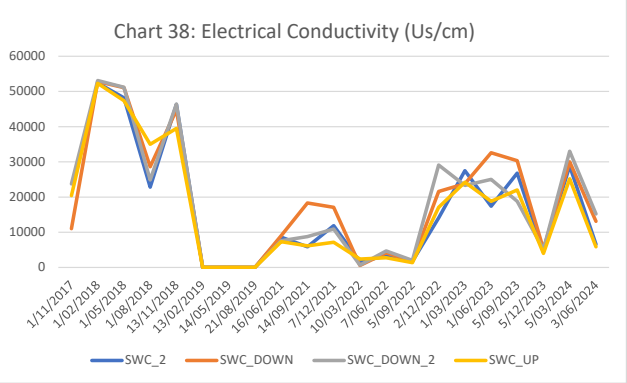
Chart 34: Total Organic Carbon (mg/L)
SWP1

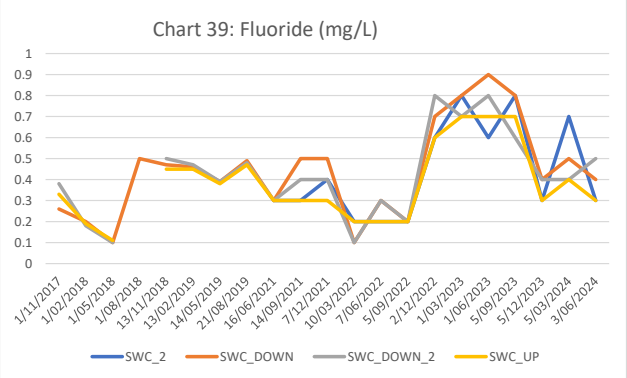
Charts 35-46: Rocklow Creek Surface Water Charts

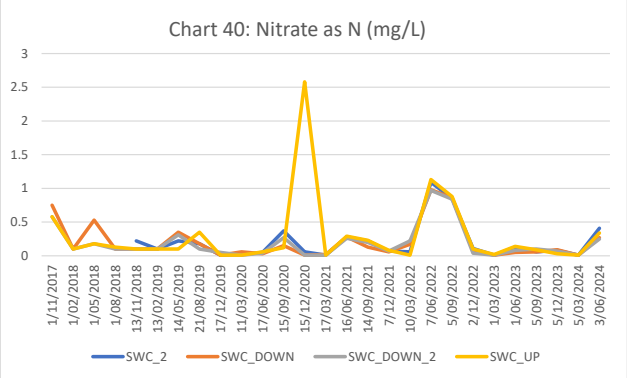


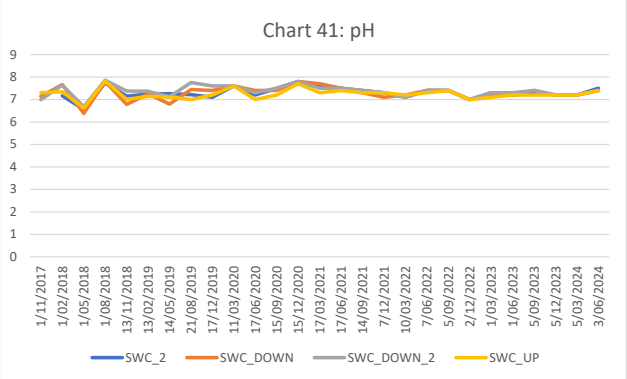


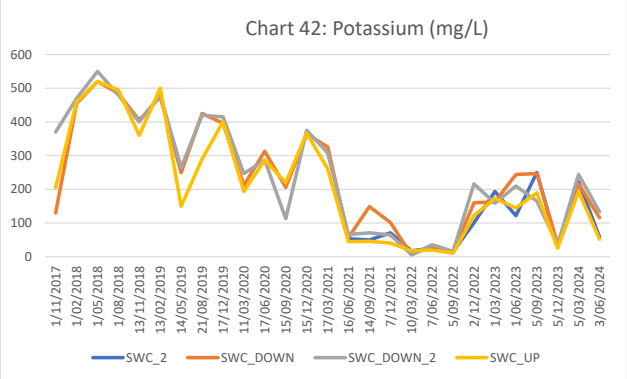












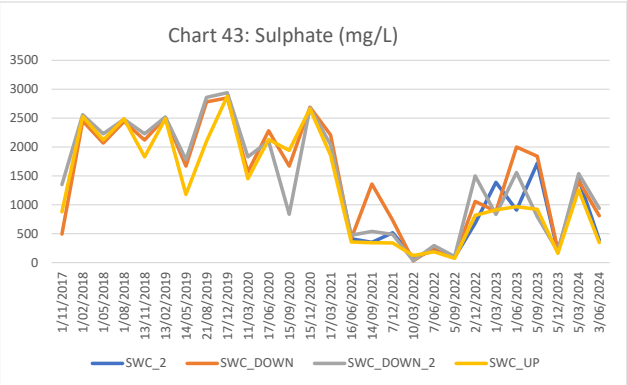


Chart 43: Sulphate (mg/L)
3500
3000
2500
2000
1500
1000
500
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
16/06/2021
14/09/2021
7/12/2021
10/03/2022
7/06/2022
5/09/2022
2/12/2022
1/03/2023
1/06/2023
5/09/2023
5/12/2023
5/03/2024
3/06/2024
SWC_2
SWC_DOWN
SWC_DOWN_2
SWC_UP

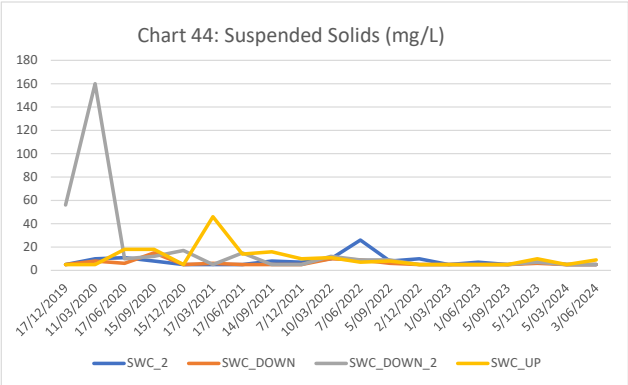


Chart 44: Suspended Solids (mg/L)
180
160
140
120
100
80
60
40
20
0
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
17/06/2021
14/09/2021
7/12/2021
10/03/2022
7/06/2022
5/09/2022
2/12/2022
1/03/2023
1/06/2023
5/09/2023
5/12/2023
5/03/2024
3/06/2024
SWC_2
SWC_DOWN
SWC_DOWN_2
SWC_UP

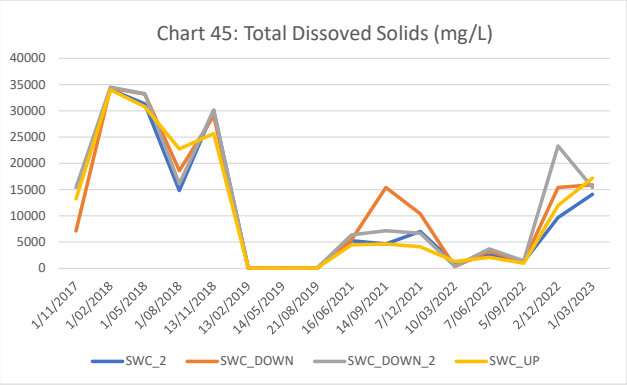


Chart 45: Total Dissoved Solids (mg/L)
40000
35000
30000
25000
20000
15000
10000
5000
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
16/06/2021
14/09/2021
7/12/2021
10/03/2022
7/06/2022
5/09/2022
2/12/2022
1/03/2023
SWC_2
SWC_DOWN
SWC_DOWN_2
SWC_UP

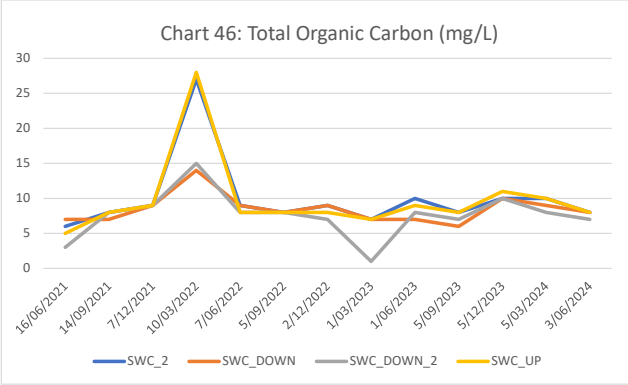
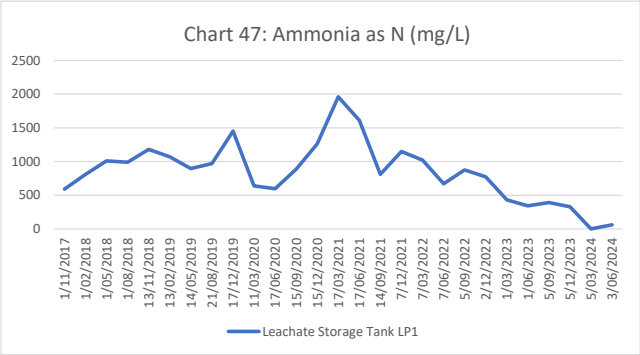
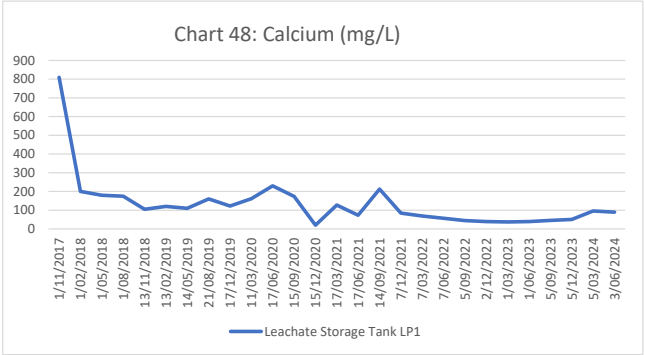
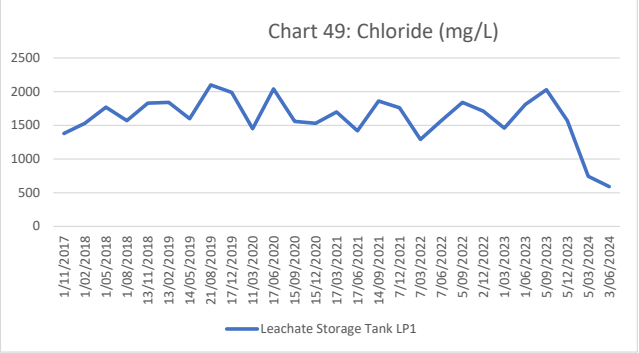


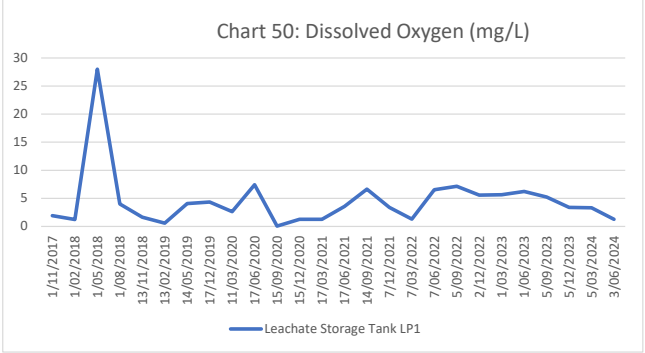
Chart 46: Total Organic Carbon (mg/L)
30
25
20
15
10
5
0
16/06/2021
14/09/2021
7/12/2021
10/03/2022
7/06/2022
5/09/2022
2/12/2022
1/03/2023
1/06/2023
5/09/2023
5/12/2023
5/03/2024
3/06/2024
SWC_2
SWC_DOWN
SWC_DOWN_2
SWC_UP

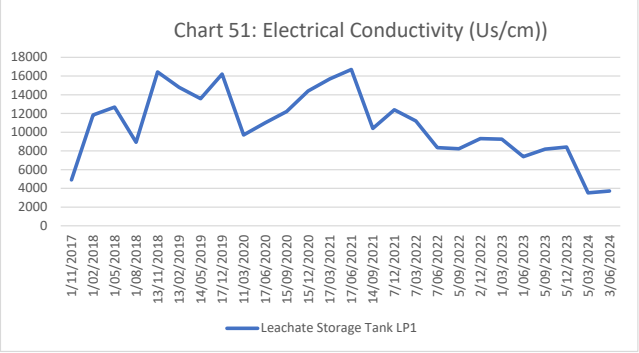
Charts 47-61 Leachate Water Quality Charts

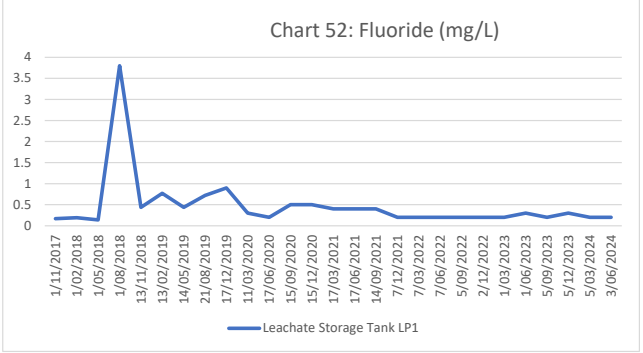


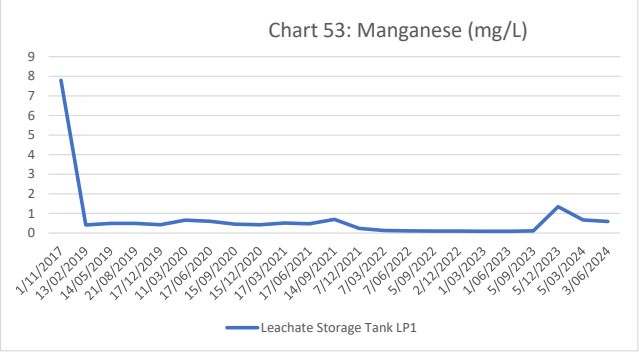


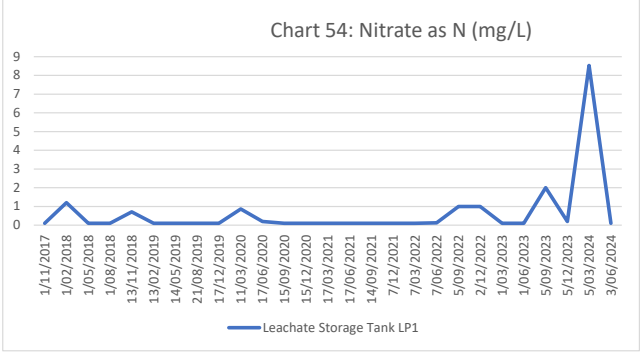












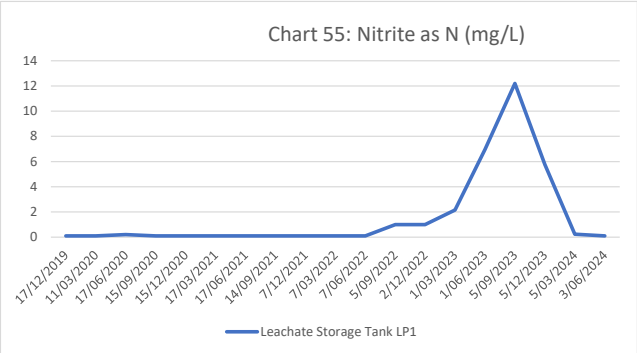


Chart 55: Nitrite as N (mg/L)
Leachate Storage Tank LP1

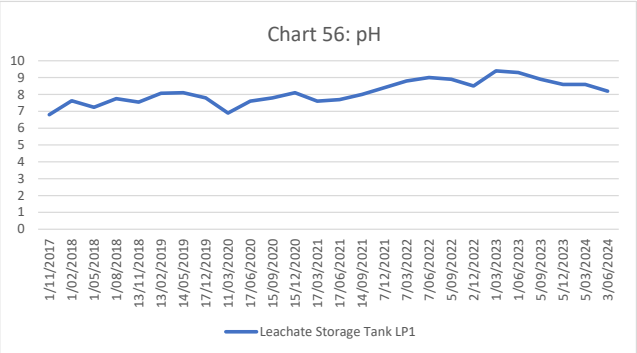


Chart 56: pH
Leachate Storage Tank LP1

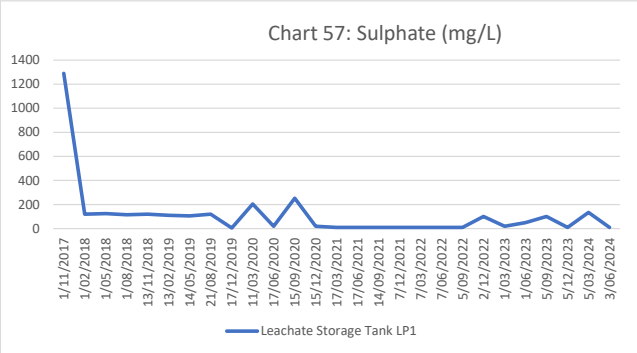


Chart 57: Sulphate (mg/L)
Leachate Storage Tank LP1

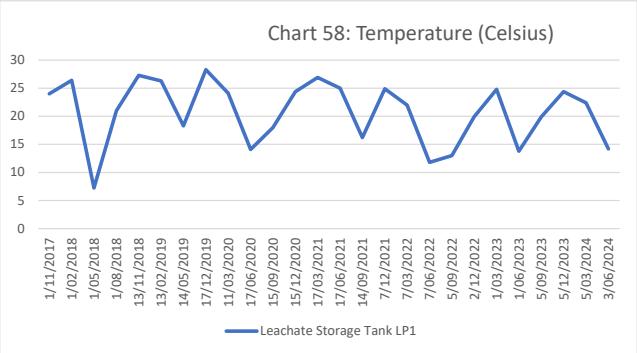


Chart 58: Temperature (Celsius)
Leachate Storage Tank LP1

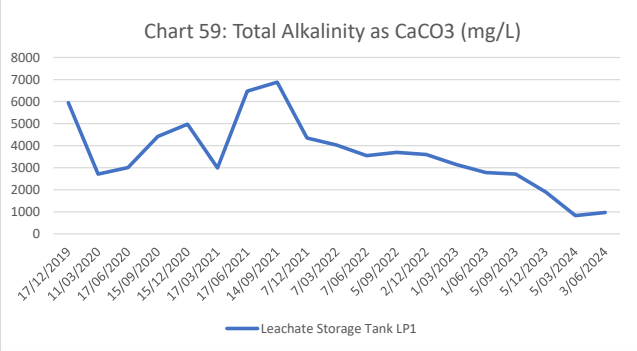


Chart 59: Total Alkalinity as CaCO3 (mg/L)
Leachate Storage Tank LP1

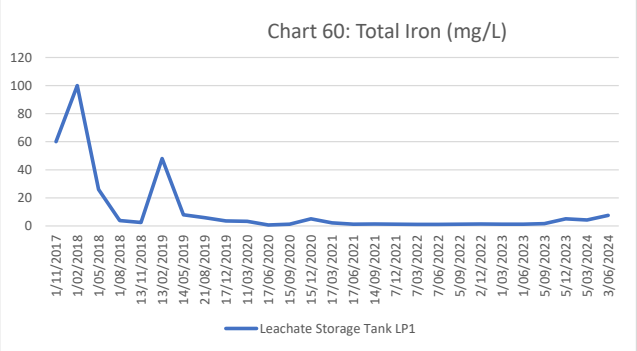


Chart 60: Total Iron (mg/L)
Leachate Storage Tank LP1

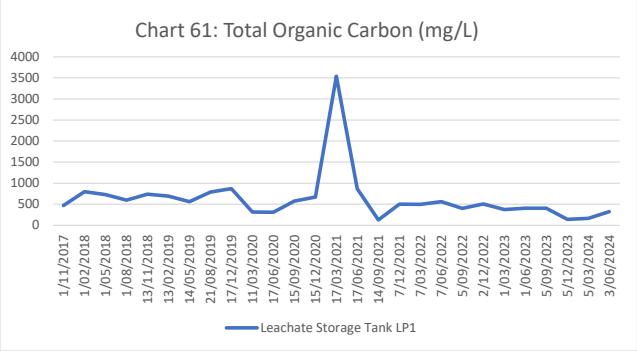


Chart 61: Total Organic Carbon (mg/L)
Leachate Storage Tank LP1

APPENDICES

Appendix A:

EPL 5984 Sampling Point Summary (NSW EPA, 10/02/2022. Updated 30/04/2024)

2	Leachate monitoring	Leachate tank labelled LP1 on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
3	Groundwater monitoring	BH1c - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
5	Groundwater monitoring	BH3 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
6	Groundwater monitoring	BH4 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
7	Groundwater monitoring	BH15 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
10	Groundwater monitoring	BH13 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
11	Groundwater monitoring	BH14 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
16	Groundwater monitoring	BH19 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
17	Groundwater monitoring	BH12R - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA

		Ref. no. DOC19/1027702).
18	Groundwater monitoring	BH9 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
19	Surface Water Monitoring	SWC_2 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
20	Surface Water Monitoring	SWC_UP - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
21	Surface Water Monitoring	SWC_DOWN - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
22	Surface Water Monitoring	SWC_DOWN2 - as shown on the drawing titled "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
23	Groundwater Monitoring	BH21 - as shown on drawing titled "Monitoring Point Location Plan - Dunmore Recycling and Waste Depot - EPL No. 5984" prepared by Cardno and attached to correspondence dated 7 April 2020 (EPA ref. no. DOC20/317779).
24	Groundwater monitoring	BH22 - as shown on drawing titled "Monitoring Point Location Plan - Dunmore Recycling and Waste Depot - EPL No. 5984" prepared by Cardno and attached to correspondence dated 7 April 2020 (EPA ref. no. DOC20/317779).
25	Groundwater monitoring	BH18 - as shown on drawing titled "Monitoring Point Location Plan - Dunmore Recycling and Waste Depot - EPL No. 5984" prepared by Cardno and attached to correspondence dated 7 April 2020 (EPA ref. no. DOC20/317779).

Appendix B:
Laboratory Chain of Custody (COC) & Certificates of Analysis (COA) – Water Samples

CHAIN OF CUSTODY

Mandatory Fields

Page ___of___

CoC #: *(if applicable)*

CLIENT CODE:	**SHECIT**	***PROJECT MANAGER:**	**Ryan Stirling**	SAMPLER:	**SAMPLED BY ALS**
***CLIENT:**	**Shellharbour City Council**	***PM MOBILE:**		SAMPLER MOBILE:	**02 4225 3125**
OFFICE: *(Invoiced Office)*	**Shellharbour**	ALS QUOTE # *(Client PL if blank)*	**WO/030/19 TENDER**	PURCHASE ORDER NO.:	**156810**
PROJECT NO./PROJECT:	**Dunmore Quarterly Ground Waters EPL**			SITE:	**Dunmore**
***INVOICE** TO: *(client default if nil)*	Financial@shellharbour.nsw.gov.au			☐ CC Invoice to PM	
***EMAIL REPORTS** TO: *(default to PM if blank)*	Ryan.stirlingshellharbour.nsw.gov.au, Glenn.holdenshellharbour.nsw.gov.au, Mitchell.copasshellharbour.nsw.gov.au, lab@enrs.com.au				

BIOSECURITY

Environmental Division Wollongong
Work Order Reference
EW2402552

Telephone : 02 42253125

*** STORAGE REQUIREMENTS** *Please check box.* →
Standard Storage time from receipt of samples:
Waters - 3 weeks
Soils - 2 months

☐ Standard Storage
☐ Extended Storage
Specify Disposal Date:
Note: Extended storage incurs a fee and requires a signed agreement.

*** TURNAROUND** *Please check box.* →
(Not all tests can be expedited, contact Client Services for more information)

☐ 5+ days (no surcharge)
☐ 3 day (+15%)
☐ 2 day (+30%)
☐ 1 day (+50%)

***ANALYSIS REQUIRED**
(NB. ALS Quote No. and/or Analysis Suite Codes must be listed to attract suite/quoted price)
Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).
Mark an X in the boxes below analysis to indicate the parameter listed above to be tested on that sample.

Comments:

ALS Use Only Lab ID	Sample ID	Depth	Date/Time	No. Bottles	MATRIX: Soil/Solid(S) Water(W) Sediments (SD), Dust (D), Product (P), Biota (B), Biosolid (BS)	Ammonia NT-04 (NO2 & NO3)	TOC	NT-2A (Alka, So4, Cl, Fl) Filtered Ca, K	Dissolved Fe & Mn	Field Tests pH, EC, Temp & SWL	Send to Eurofins							Lab QC *(additional bottles req.)* Dup	Lab QC MS	Additional Information *(Comment on hazards - e.g., asbestos, known high contamination)*
	BH1C		4.6.24 10:10	4	W	X	X	X	X	X								☐	☐	
	BH3		14:00	4	W	X	X	X	X	X								☐	☐	
	BH4		13:20	4	W	X	X	X	X	X								☐	☐	
	BH9		9:23	4	W	X	X	X	X	X								☐	☐	
	BH12R		12:05	4	W	X	X	X	X	X								☐	☐	
	BH13		12:25	4	W	X	X	X	X	X								☐	☐	
	BH14		12:55	4	W	X	X	X	X	X								☐	☐	
	BH15		11:57	4	W	X	X	X	X	X								☐	☐	
	BH19R		13:40	4	W	X	X	X	X	X								☐	☐	
	BH18		8:25	4	W	X	X	X	X	X										
	BH21		11:10	4	W	X	X	X	X	X										
	BH22		10:38	4	W	X	X	X	X	X										
	Duplicate		8:25	4	W	X	X	X	X	X										
	Triplicate		8:25	4	W						X							☐	☐	

Receipt Detail (Lab Use ONLY)
Chilling Method: Ice: Frozen / Melted — Ice Bricks: Frozen / Thawed — None
Sample Temp at Receipt: 7.9°c 6.8°c 7.1 °c
Security Seal Intact *(circle)*: Yes / No / NA(None)
Carrier Details: ☐ Courier/Post ☐ Client
Con Note #:
Packaging: *(Circle)* Hard Esky / Foam Esky / Box/Bag/Other
Count: # 2 # #

Relinquished by: Robert DeLio Signature: Date/Time: 4.6.24 15:15
Relinquished by: Signature: Date/Time:

Received by: Michael Santos Signature: Date/Time: 4.6.24. 15:10
Received by: Signature: Date/Time:

CERTIFICATE OF ANALYSIS

Work Order	: **EW2402552**	Page	: 1 of 8
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Ryan Stirling	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Quarterly Groundwaters EPL	Date Samples Received	: 04-Jun-2024 15:10
Order number	: 156810	Date Analysis Commenced	: 04-Jun-2024
C-O-C number	: ----	Issue Date	: 20-Jun-2024 17:03
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER GROUNDWATERS CPI 2024		
No. of samples received	: 14		
No. of samples analysed	: 13		

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*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Robert DaLio	Sampler	Laboratory - Wollongong, NSW

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.

- **Analytical work for this work order will be conducted at ALS Sydney.**
- ED041G: LOR raised for Sulfate on sample nos. 10 and 13 due to sample matrix.
- EK059G: LOR raised for NOx on sample no.1 due to sample matrix.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- Sampling and groundwater depth measurements completed by ALS Wollongong via inhouse sampling method EN/67.11 Groundwater Sampling High Flow and Bailer Method.
- Temperature performed by ALS Wollongong via in-house method EA116 and EN67 PK.
- Sample collection of Ground Waters by in-house EN67 where the “surface layer of the aquifer was sampled”.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH1C	BH3	BH4	BH9	BH12R
				Sampling date / time	04-Jun-2024 10:10	04-Jun-2024 14:00	04-Jun-2024 13:20	04-Jun-2024 09:23	04-Jun-2024 12:05
Compound	CAS Number	LOR	Unit		EW2402552-001	EW2402552-002	EW2402552-003	EW2402552-004	EW2402552-005
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		7.0	7.4	7.2	6.9	6.6
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		7500	759	842	3790	1860
EA116: Temperature									
Temperature	----	0.5	°C		25.0	18.4	19.0	17.7	21.3
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		2570	282	350	1510	574
Total Alkalinity as CaCO3	----	1	mg/L		2570	282	350	1510	574
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		261	69	57	146	84
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		989	115	120	528	230
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		124	98	117	218	184
Potassium	7440-09-7	1	mg/L		206	30	23	75	32
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		0.112	0.049	0.116	0.730	0.428
Iron	7439-89-6	0.05	mg/L		12.4	0.20	2.65	2.95	4.57
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		0.4	0.2	0.1	0.5	0.2
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		352	6.56	3.63	96.8	2.50
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		0.05	0.02	<0.01	0.01	0.05
EK058G: Nitrate as N by Discrete Analyser									

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH1C	BH3	BH4	BH9	BH12R
				Sampling date / time	04-Jun-2024 10:10	04-Jun-2024 14:00	04-Jun-2024 13:20	04-Jun-2024 09:23	04-Jun-2024 12:05
Compound	CAS Number	LOR	Unit		EW2402552-001	EW2402552-002	EW2402552-003	EW2402552-004	EW2402552-005
					Result	Result	Result	Result	Result
EK058G: Nitrate as N by Discrete Analyser - Continued									
Nitrate as N	14797-55-8	0.01	mg/L		<0.10	**4.83**	**0.06**	**0.02**	**1.20**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.10	**4.85**	**0.06**	**0.03**	**1.25**
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**183**	**14**	**11**	**69**	**30**
QWI-EN 67.11 Sampling of Groundwaters									
Standing Water Level	----	0.01	m AHD		**2.75**	**2.83**	**4.15**	**2.75**	**4.04**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH13	BH14	BH15	BH19R	BH18
				Sampling date / time	04-Jun-2024 12:25	04-Jun-2024 12:55	04-Jun-2024 11:38	04-Jun-2024 13:40	04-Jun-2024 08:25
Compound	CAS Number	LOR	Unit		EW2402552-006	EW2402552-007	EW2402552-008	EW2402552-009	EW2402552-010
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		6.8	6.8	6.9	7.4	6.9
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		1900	1450	1090	683	328
EA116: Temperature									
Temperature	----	0.5	°C		22.0	21.6	16.6	18.7	20.5
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		652	464	347	326	181
Total Alkalinity as CaCO3	----	1	mg/L		652	464	347	326	181
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		85	50	60	38	<10
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		206	158	147	37	11
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		182	160	54	92	46
Potassium	7440-09-7	1	mg/L		25	22	89	42	7
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		0.440	0.211	0.121	0.054	0.030
Iron	7439-89-6	0.05	mg/L		2.08	0.92	3.81	0.53	0.54
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		0.2	0.4	0.2	0.2	0.2
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		14.0	1.50	7.15	1.24	0.54
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		0.01	0.24	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH13	BH14	BH15	BH19R	BH18
				Sampling date / time	04-Jun-2024 12:25	04-Jun-2024 12:55	04-Jun-2024 11:38	04-Jun-2024 13:40	04-Jun-2024 08:25
Compound	CAS Number	LOR	Unit		EW2402552-006	EW2402552-007	EW2402552-008	EW2402552-009	EW2402552-010
					Result	Result	Result	Result	Result
EK058G: Nitrate as N by Discrete Analyser - Continued									
Nitrate as N	14797-55-8	0.01	mg/L		**5.68**	**19.3**	<0.01	**0.04**	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**5.69**	**19.5**	<0.01	**0.04**	<0.01
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**35**	**33**	**29**	**12**	**9**
QWI-EN 67.11 Sampling of Groundwaters									
Standing Water Level	----	0.01	m AHD		**3.90**	**4.22**	**0.75**	**4.33**	**1.99**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH21	BH22	Duplicate	----	----
				Sampling date / time	04-Jun-2024 11:10	04-Jun-2024 10:38	04-Jun-2024 08:25	----	----
Compound	CAS Number	LOR	Unit		EW2402552-011	EW2402552-012	EW2402552-013	--------	--------
					Result	Result	Result	----	----
EA005FD: Field pH									
pH	----	0.1	pH Unit		7.2	6.6	6.9	----	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		2230	1160	328	----	----
EA116: Temperature									
Temperature	----	0.5	°C		22.3	18.9	20.5	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		729	356	180	----	----
Total Alkalinity as CaCO3	----	1	mg/L		729	356	180	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		126	52	<10	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		299	162	14	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		124	84	46	----	----
Potassium	7440-09-7	1	mg/L		14	7	7	----	----
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		0.450	0.334	0.029	----	----
Iron	7439-89-6	0.05	mg/L		2.57	21.8	0.54	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		0.4	0.3	0.3	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		4.07	5.41	0.54	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	<0.01	----	----
EK058G: Nitrate as N by Discrete Analyser									

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH21	BH22	Duplicate	----	----
				Sampling date / time	04-Jun-2024 11:10	04-Jun-2024 10:38	04-Jun-2024 08:25	----	----
Compound	CAS Number	LOR	Unit		EW2402552-011	EW2402552-012	EW2402552-013	--------	--------
					Result	Result	Result	----	----
EK058G: Nitrate as N by Discrete Analyser - Continued									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	<0.01	<0.01	**----**	**----**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	<0.01	<0.01	**----**	**----**
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**31**	**38**	**9**	**----**	**----**
QWI-EN 67.11 Sampling of Groundwaters									
Standing Water Level	----	0.01	m AHD		**2.70**	**2.06**	**1.99**	**----**	**----**

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) ED093F: Dissolved Major Cations

(WATER) EP005: Total Organic Carbon (TOC)

(WATER) EK055G: Ammonia as N by Discrete Analyser

(WATER) EG020F: Dissolved Metals by ICP-MS

(WATER) EK057G: Nitrite as N by Discrete Analyser

(WATER) EK058G: Nitrate as N by Discrete Analyser

(WATER) EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser

(WATER) ED045G: Chloride by Discrete Analyser

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) EK040P: Fluoride by PC Titrator

(WATER) ED041G: Sulfate (Turbidimetric) as SO4 2- by DA

CHAIN OF CUSTODY

Mandatory Fields

Page ___of___

CoC #: *(if applicable)*

CLIENT CODE:	**SHECIT**	***PROJECT MANAGER:**	**Ryan Stirling**	SAMPLER:	**SAMPLED BY ALS**
***CLIENT:**	**Shellharbour City Council**	***PM MOBILE:**		SAMPLER MOBILE:	**02 4225 3125**
OFFICE: *(Invoiced Office)*	**Shellharbour**	ALS QUOTE # *(Client PL if blank)*	**WO/030/19 TENDER**	PURCHASE ORDER NO.:	**156810**
PROJECT NO./PROJECT:	**Dunmore Quarterly Surface Waters EPL**			SITE:	**Dunmore**
***INVOICE TO:** *(client default if nil)*	Financial@shellharbour.nsw.gov.au			☐ CC Invoice to PM	
*EMAIL **REPORTS TO:** *(default to PM if blank)*	Ryan.stirlingshellharbour.nsw.gov.au, Glenn.holdenshellharbour.nsw.gov.au, Mitchell.copasshellharbour.nsw.gov.au, lab@enrs.com.au				

BIOSECURITY

Country of Origin: *(if not Australia)*

Environmental Division Wollongong
Work Order Reference
EW2402546

Telephone : 02 42253125

*** STORAGE REQUIREMENTS** *Please check box.* →
Standard Storage time from receipt of samples:
Waters - 3 weeks
Soils - 2 months

☐ Standard Storage
☐ Extended Storage
Specify Disposal Date:
Note: Extended storage incurs a fee and requires a signed agreement.

*** TURNAROUND** *Please check box.* →
(Not all tests can be expedited, contact Client Services for more information)

☐ 5+ days (no surcharge)
☐ 3 day (+15%)
☐ 2 day (+30%)
☐ 1 day (+50%)

***ANALYSIS REQUIRED**
(NB. ALS Quote No. and/or Analysis Suite Codes must be listed to attract suite/quoted price)
Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).
Mark an X in the boxes below analysis to indicate the parameter listed above to be tested on that sample.

Comments:

ALS Use Only Lab ID	Sample ID	Depth	Date/Time	No. Bottles	MATRIX: Soil/Solid(S) Water(W) Sediments (SD), Dust (D), Product (P), Biota (B), Biosolid (BS)	TSS	NT-1, NT-2A (Ionic Balance)	TOC, NT-4, NH3, Total Mn	Dissolved and Total Fe	Turbidity	NH3, NH4 & NO3	TSS, TDS, TOC, Total Mn	Field Test pH, EC, DO & Temp	Lab QC (additional bottles req.) Dup	Lab QC (additional bottles req.) MS	Additional Information (Comment on hazards - e.g., asbestos, known high contamination)
	SWP1		3.6.24 10:10	4		X	X	X	X				X	☐	☐	
	SWC_2		11:45				X		X	X	X	X	X	☐	☐	
	SWC_UP		11:30				X		X	X	X	X	X	☐	☐	
	SWC_DOWN		10:40				X		X	X	X	X	X	☐	☐	
	SWC_DOWN_2		10:55				X		X	X	X	X	X	☐	☐	
	Duplicate		10:15				X		X	X	X	X	X	☐	☐	
														☐	☐	
														☐	☐	
														☐	☐	
														☐	☐	
														☐	☐	

Receipt Detail (Lab Use ONLY)
Chilling Method: Ice: Frozen / Melted — Ice Bricks: (Frozen) / Thawed — None
Sample Temp at Receipt: 4.2°C 4.8°C 4.8°C
Security Seal Intact (circle): Yes / No / N/A(None)
Carrier Details: ☐ Courier/Post ☐ Client
Con Note #: ALS
Packaging: (Circle) Hard Esky Foam Esky Box/Bag/Other
Count # 1 # # #

Relinquished by: Robert Dahl
Signature:
Date/Time: 3.6.24
Relinquished by:
Signature:
Date/Time:

Received by: Anita
Signature
Date/Time: 3/6/24
Received by:
Signature
Date/Time:

CERTIFICATE OF ANALYSIS

Work Order	: **EW2402546**	Page	: 1 of 7
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Ryan Stirling	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Quarterly Surface Water EPL	Date Samples Received	: 03-Jun-2024 14:39
Order number	: 156810	Date Analysis Commenced	: 03-Jun-2024
C-O-C number	: ----	Issue Date	: 13-Jun-2024 17:43
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER SURFACE WATER CPI 2024		
No. of samples received	: 6		
No. of samples analysed	: 6		

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*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Robert DaLio	Sampler	Laboratory - Wollongong, NSW

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.

- **Analytical work for this work order will be conducted at ALS Sydney.**
- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/67.6 Rivers and Streams.
- Temperature performed by ALS Wollongong via in-house method EA116 and EN67 PK.
- Dissolved oxygen (DO) performed by ALS Wollongong via in-house method EP025FD and EN67 PK.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/67.4 Lakes and Reservoirs
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.

Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

Compound	CAS Number	LOR	Unit	Sample ID	SWP1 Point 1	SWC_2 Point 19	SWC_UP Point 20	SWC_Down Point 21	SWC_DOWN_2 Point 22
				Sampling date / time	03-Jun-2024 10:10	03-Jun-2024 11:45	03-Jun-2024 11:30	03-Jun-2024 10:40	03-Jun-2024 10:55
					EW2402546-001	EW2402546-002	EW2402546-003	EW2402546-004	EW2402546-005
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		**7.5**	**7.5**	**7.4**	**7.4**	**7.4**
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		**1120**	**6580**	**5890**	**13100**	**15200**
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**----**	**4990**	**4300**	**10200**	**11900**
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		<5	<5	**9**	<5	<5
EA045: Turbidity									
Turbidity	----	0.1	NTU		**3.4**	**10.6**	**11.3**	**8.3**	**7.6**
EA116: Temperature									
Temperature	----	0.5	°C		**12.6**	**13.3**	**13.5**	**13.6**	**13.7**
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**316**	**109**	**108**	**110**	**109**
Total Alkalinity as CaCO3	----	1	mg/L		**316**	**109**	**108**	**110**	**109**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**233**	**391**	**346**	**810**	**940**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**183**	**2780**	**2430**	**5440**	**6170**
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**70**	**76**	**69**	**136**	**155**
Magnesium	7439-95-4	1	mg/L		**44**	**180**	**161**	**371**	**442**
Sodium	7440-23-5	1	mg/L		**204**	**1500**	**1330**	**3140**	**3630**
Potassium	7440-09-7	1	mg/L		**11**	**59**	**52**	**116**	**134**
EG020F: Dissolved Metals by ICP-MS									
Iron	7439-89-6	0.05	mg/L		<0.05	**0.06**	**0.07**	<0.05	<0.05

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SWP1 Point 1	SWC_2 Point 19	SWC_UP Point 20	SWC_Down Point 21	SWC_DOWN_2 Point 22
				Sampling date / time	03-Jun-2024 10:10	03-Jun-2024 11:45	03-Jun-2024 11:30	03-Jun-2024 10:40	03-Jun-2024 10:55
Compound	CAS Number	LOR	Unit		EW2402546-001	EW2402546-002	EW2402546-003	EW2402546-004	EW2402546-005
					Result	Result	Result	Result	Result
EG020T: Total Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		0.038	0.072	0.072	0.059	0.057
Iron	7439-89-6	0.05	mg/L		0.11	0.86	0.88	0.61	0.54
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		0.5	0.3	0.3	0.4	0.5
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		2.10	0.16	0.12	0.10	0.10
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	0.01	mg/L		2.08	0.16	0.12	0.10	0.10
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		0.14	0.01	0.02	0.02	0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.45	0.41	0.34	0.27	0.25
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.59	0.42	0.36	0.29	0.26
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		16.3	88.7	77.9	172	196
ø Total Cations	----	0.01	meq/L		16.3	85.4	75.9	177	205
ø Ionic Balance	----	0.01	%		0.18	1.94	1.32	1.24	2.40
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		19	8	8	8	7
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		4.16	8.81	8.89	8.70	7.78

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	Duplicate	----	----	----	----
			Sampling date / time	03-Jun-2024 10:15	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2402546-006	--------	--------	--------	--------
				Result	----	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	**7.5**	----	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	**1130**	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**990**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	----	----	----	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	**3.3**	----	----	----	----
EA116: Temperature								
Temperature	----	0.5	°C	**12.5**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**314**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**314**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**231**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**176**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**70**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**45**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**208**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**11**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Duplicate	----	----	----	----
				Sampling date / time	03-Jun-2024 10:15	----	----	----	----
Compound	CAS Number	LOR	Unit		EW2402546-006	--------	--------	--------	--------
					Result	----	----	----	----
EG020T: Total Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		**0.038**	----	----	----	----
Iron	7439-89-6	0.05	mg/L		**0.12**	----	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.5**	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**1.87**	----	----	----	----
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	0.01	mg/L		**1.86**	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		**0.14**	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**0.45**	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**0.59**	----	----	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**16.0**	----	----	----	----
ø Total Cations	----	0.01	meq/L		**16.5**	----	----	----	----
ø Ionic Balance	----	0.01	%		**1.46**	----	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**18**	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		**4.10**	----	----	----	----

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EA045: Turbidity
(WATER) EP005: Total Organic Carbon (TOC)
(WATER) EG020F: Dissolved Metals by ICP-MS
(WATER) EG020T: Total Metals by ICP-MS
(WATER) EK057G: Nitrite as N by Discrete Analyser
(WATER) EK058G: Nitrate as N by Discrete Analyser
(WATER) EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser
(WATER) EA025: Total Suspended Solids dried at 104 ± 2°C
(WATER) EK055G-NH4: Ammonium as N by DA
(WATER) EK055G: Ammonia as N by Discrete Analyser
(WATER) EN055: Ionic Balance
(WATER) ED045G: Chloride by Discrete Analyser
(WATER) ED041G: Sulfate (Turbidimetric) as SO4 2- by DA
(WATER) EK040P: Fluoride by PC Titrator
(WATER) ED037P: Alkalinity by PC Titrator
(WATER) ED093F: Dissolved Major Cations
(WATER) EA015: Total Dissolved Solids dried at 180 ± 5 °C

Appendix C:
Laboratory Chain of Custody (COC) & Certificates of Analysis (COA) – Dust Samples

CHAIN OF CUSTODY

Mandatory Fields

CLIENT CODE:	**SHECIT**	***PROJECT MANAGER:**	**Ryan Stirling**	SAMPLER:	**SAMPLED BY ALS**
***CLIENT:**	**Shellharbour City Council**	***PM MOBILE:**		SAMPLER MOBILE:	**02 4225 3125**
OFFICE: *(Invoiced Office)*	**Shellharbour**	ALS QUOTE # *(Client PL if blank)*	**WO/030/19 TENDER**	PURCHASE ORDER NO.:	**156810**
PROJECT NO./PROJECT:	**Dunmore Dust**			SITE:	**Dunmore**
***INVOICE TO:** *(client default if nil)*	Financial@shellharbour.nsw.gov.au			☐ CC Invoice to PM	
***EMAIL REPORTS TO:** *(default to PM if blank)*	Ryan.stirlingshellharbour.nsw.gov.au, Glenn.holdenshellharbour.nsw.gov.au, Mitchell.copasshellharbour.nsw.gov.au, lab@enrs.com.au				

Page ___of___

CoC #: *(if applicable)*

BIOSECURITY

Country of Origin: *(if not Australia)*

Environmental Division
Wollongong
Work Order Reference
EW2402542

Telephone : 02 42253125

*** STORAGE REQUIREMENTS**
Please check box. →
Standard Storage time from receipt of samples:
Waters - 3 weeks
Soils - 2 months

☐ Standard Storage
☐ Extended Storage
Specify Disposal Date:
Note: Extended storage incurs a fee and requires a signed agreement.

*** TURNAROUND**
Please check box. →
(Not all tests can be expedited, contact Client Services for more information)

☐ 5+ days (no surcharge)
☐ 3 day (+15%)
☐ 2 day (+30%)
☐ 1 day (+50%)

***ANALYSIS REQUIRED**
(NB. ALS Quote No. and/or Analysis Suite Codes must be listed to attract suite/quoted price)
Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).
Mark an X in the boxes below analysis to indicate the parameter listed above to be tested on that sample.

Comments:

ALS Use Only Lab ID	Sample ID	Depth	Date/Time	No. Bottles	MATRIX: Soil/Solid(S) Water(W) Sediments (SD), Dust (D), Product (P), Biota (B), Biosolid (BS)	A04 (Ash, CM TIS)											Lab QC (additional bottles req.) Dup	Lab QC (additional bottles req.) MS	Additional Information (Comment on hazards - e.g., asbestos, known high contamination)
1	DDG1		3.6.24 9:21	1	D	X											☐	☐	
2	DDG2		9:15	1	D	X											☐	☐	
3	DDG3		9:39	1	D	X											☐	☐	
4	DDG4		13:15	1	D	X											☐	☐	
																	☐	☐	
																	☐	☐	
																	☐	☐	
																	☐	☐	
																	☐	☐	
																	☐	☐	

Receipt Detail (Lab Use ONLY)
Chilling Method: Ice: Frozen / Melted; Ice Bricks: Frozen / Thawed; (None)
Sample Temp at Receipt: N/A °C °C
Security Seal Intact (circle): Yes / No (NA(None))
Carrier Details: ☐ Courier/Post ☐ Client
Con Note #: ACS
Packaging: (Circle) Hard Esky Foam Esky Box/Bag/Other
Count # # # 1

Relinquished by: Robert Dahw Signature: Date/Time: 3.6.24
Received by: Aneta Signature: Date/Time: 3/6/24
Relinquished by: Signature: Date/Time:
Received by: Signature: Date/Time:

CERTIFICATE OF ANALYSIS

Work Order	: **EW2402542**	Page	: 1 of 3
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Ryan Stirling	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Landfill Dust	Date Samples Received	: 03-Jun-2024 14:54
Order number	: 156810	Date Analysis Commenced	: 11-Jun-2024
C-O-C number	: ----	Issue Date	: 13-Jun-2024 16:38
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER DUST		
No. of samples received	: 4		
No. of samples analysed	: 4		

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*
Thomas Regan	Laboratory Technician	Newcastle - Inorganics, Mayfield West, NSW

General Comments

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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.

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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.

- **Analytical work for this work order will be conducted at ALS Newcastle.**
- Dust analysis as per AS3580.10.1-2016. Samples passed through a 1mm sieve prior to analysis. NATA accreditation does not apply for results reported in deposition units e.g., g/m².mth where the sampling procedure is not NATA accredited. ALS Mudgee laboratory is NATA accredited for dust sampling, therefore ALS Mudgee reported deposition units are accredited.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/66.1 Sampling and Siting of Dust Deposition Gauges.
- The dust gauges for samples 001-003 were full when received by the laboratory. They may have overflowed in the field. Results for these gauges are thus reported on an 'as received' basis. No algaecide correction has been applied to EA139 Soluble Matter or EA142 Total Solids results (where applicable).
- For dust analysis, the Limit of Reporting (LOR) referenced in the reports for deposited matter parameters represents the reporting increment rather than reporting limit.

Analytical Results

Sub-Matrix: DEPOSITIONAL DUST (Matrix: AIR)			Sample ID	DDG1 03/05/2024 - 03/06/2024	DDG2 03/05/2024 - 03/06/2024	DDG3 03/05/2024 - 03/06/2024	DDG4 03/05/2024 - 03/06/2024	----
			Sampling date / time	03-Jun-2024 09:21	03-Jun-2024 09:15	03-Jun-2024 09:39	03-Jun-2024 13:15	----
Compound	CAS Number	LOR	Unit	EW2402542-001	EW2402542-002	EW2402542-003	EW2402542-004	--------
				Result	Result	Result	Result	----
EA120: Ash Content								
Ash Content	----	0.1	g/m².month	**0.7**	**0.1**	**0.1**	**3.3**	**----**
Ash Content (mg)	----	2	mg	**13**	**2**	**3**	**62**	**----**
EA125: Combustible Matter								
Combustible Matter	----	0.1	g/m².month	**0.1**	<0.1	**0.1**	**1.8**	**----**
Combustible Matter (mg)	----	2	mg	**2**	<2	**2**	**34**	**----**
EA141: Total Insoluble Matter								
Total Insoluble Matter	----	0.1	g/m².month	**0.8**	**0.1**	**0.2**	**5.1**	**----**
Total Insoluble Matter (mg)	----	2	mg	**15**	**3**	**5**	**96**	**----**

Inter-Laboratory Testing

Analysis conducted by ALS Newcastle, NATA accreditation no. 825, site no. 1656 (Chemistry) 9854 (Biology).

(AIR) EA125: Combustible Matter

(AIR) EA120: Ash Content

(AIR) EA141: Total Insoluble Matter

Appendix D:
Surface Gas (Methane) Field Sheets

CHAIN OF CUSTODY

Mandatory Fields

Page ___of___

CoC #: *(if applicable)*

CLIENT CODE:	**SHECIT**	***PROJECT MANAGER:**	**Ryan Stirling**	SAMPLER:	**SAMPLED BY ALS**
***CLIENT:**	**Shellharbour City Council**	***PM MOBILE:**		SAMPLER MOBILE:	**02 4225 3125**
OFFICE: *(Invoiced Office)*	**Shellharbour**	ALS QUOTE # *(Client PL if blank)*	**WO/030/19 TENDER**	PURCHASE ORDER NO.:	**156810**
PROJECT NO./PROJECT:	**Dunmore Quarterly Surface Methane Testing**			SITE:	**Dunmore**

***INVOICE** TO: *(client default if nil)* Financial@shellharbour.nsw.gov.au ☐ CC Invoice to PM

***EMAIL REPORTS** TO: *(default to PM if blank)* Ryan.stirlingshellharbour.nsw.gov.au, Glenn.holdenshellharbour.nsw.gov.au, Mitchell.copasshellharbour.nsw.gov.au, lab@enrs.com.au

BIOSECURITY

Country of Origin: *(if not Australia)*

*** STORAGE REQUIREMENTS** *Please check box.* →

Standard Storage time from receipt of samples:
Waters - 3 weeks
Soils - 2 months

☐ Standard Storage
☐ Extended Storage
Specify Disposal Date:
Note: Extended storage incurs a fee and requires a signed agreement.

*** TURNAROUND** *Please check box.* →
(Not all tests can be expedited, contact Client Services for more information)

☐ 5+ days (no surcharge)
☐ 3 day (+15%)
☐ 2 day (+30%)
☐ 1 day (+50%)

***ANALYSIS REQUIRED**
(NB. ALS Quote No. and/or Analysis Suite Codes must be listed to attract suite/quoted price)
Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).
Mark an X in the boxes below analysis to indicate the parameter listed above to be tested on that sample.

Comments:

ALS Use Only Lab ID	Sample ID	Depth	Date/Time	No. Bottles	MATRIX: Soil/Solid(S) Water(W) Sediments (SD), Dust (D), Product (P), Biota (B), Biosolid (BS)	Surface Mthane											Lab QC (additional bottles req.) Dup	Lab QC (additional bottles req.) MS	Additional Information (Comment on hazards - e.g., asbestos, known high contamination)
	Mathane		14/6/24			X											☐	☐	
																	☐	☐	
																	☐	☐	
																	☐	☐	
																	☐	☐	
																	☐	☐	
																	☐	☐	
																	☐	☐	
																	☐	☐	
																	☐	☐	

Environmental Division Wollongong
Work Order Reference
EW2403130

Telephone : 02 42253125

Receipt Detail (Lab Use ONLY)
Chilling Method: Ice: Frozen / Melted Ice Bricks: Frozen / Thawed None
Sample Temp at Receipt °C °C °C
Security Seal Intact (circle) Yes / No / NA(None)
Carrier Details ☐ Courier/Post ☐ Client
Con Note #
Packaging: (Circle) Hard Esky Foam Esky Box/Bag/Other
Count # # #

Relinquished by: Michael Signature: MS Date/Time: 14/6/24
Received by: Aneta Signature: Date/Time: 14/6/24.

Relinquished by: Signature: Date/Time:
Received by: Signature: Date/Time:

ALS Landfill Emissions Report

Client: Shellharbour City Council
Site: Dunmore
Date: 19/06/2024
Sampler(s) Robert DaLio, Michael Santos

Transact / Location	Point	GPS North	GPS East	CH4 Conc (ppm)	Comments
A					**No Safe Access**
B	1	6168 225	302 436	5.0	
B	2	6168 245	302 438	3.5	
B	3	6168 273	302 439	2.6	
B	4	6168 296	302 439	2.7	
C	1	6168 434	302 375	2.8	
C	2	6168 362	302 394	2.8	
C	3	6168 318	302 406	2.8	
C	4	6167 265	302 418	2.8	
C	5	6167 196	302 425	2.8	
C	6	6168 106	302 413	2.7	
C	7	6168 048	302 406	2.7	
D	1	6168 148	302 398	3.5	
D	2	6168 160	302 400	3.6	
D	3	6168 170	302 400	3.2	
D	4	6168 177	302 390	3.2	
D	5	6168 186	302 388	3.1	
E	1	6168 228	302 333	4.5	
E	2	6168 221	302 335	6.1	
E	3	6168 212	302 336	6.3	
E	4	6168 206	302 342	12.1	
E	5	6168 194	302 351	4.2	
E	6	6168 181	302 357	5.3	
E	7	6168 161	302 369	6.1	
E	8	6168 145	302 384	3.4	
F	1	6168 146	302 349	10.8	
F	2	6168 157	302 343	10.1	
F	3	6168 166	302 339	8.2	
F	4	6168 174	302 337	5.7	
F	5	6168 181	302 331	6.2	
F	6	6168 194	302 327	4.6	
G	1	6168 408	302 248	2.6	
G	2	6168 426	302 292	2.5	
G	3	6168 449	302 326	2.6	
G	4	6168 469	302 357	2.6	
H	1	6168 487	302 329	2.5	
H	2	6168 444	302 370	2.6	
H	3	6168 412	302 329	2.6	
H	4	6168 374	302 203	2.6	
H	5	6168 331	302 157	2.5	
H	6	6168 301	302 127	2.4	
H	7	6168 266	301 096	2.5	
H	8	6168 189	301 079	2.6	
H	9	6168 141	302 068	2.5	
H	10	6168 071	302 062	2.5	
H	11	6168 013	302 121	4.8	
H	12	6167 972	302 162	2.8	
H	13	6167 949	302 181	2.7	
H	14	6167 893	302 243	2.8	
H	15	6167 871	302 312	2.8	
H	16	6167 879	302 369	2.7	
H	17	6167 894	302 444	2.8	
H	18	6167 190	302 529	2.8	
H	19	6167 140	302 548	2.7	
H	20	6167 107	302 568	2.7	
H	21	6167 076	302 584	3.0	
H	22	6167 085	302 625	2.6	
H	23	6167 113	302 625	3.1	
H	24	6168 148	302 605	3.4	
H	25	6168 187	302 585	3.6	
H	26	6168 226	302 557	3.9	
H	27	6168 289	302 542	3.0	

H	28	6168 327	302 454	2.8	
H	29	6168 357	302 543	2.7	
I	1	6168 147	302 072	8.3	
I	2	6168 150	302 098	7.6	
I	3	6168 153	302 142	4.0	
I	4	6168 181	302 242	3.2	
J	1	6168 349	302 194	2.5	
J	2	6168 317	302 209	2.6	
J	3	6168 276	302 227	2.5	
J	4	6167 236	302 241	2.5	
J	5	6167 194	302 255	2.5	
K	1	6168 529	302 393	2.6	
K	2	6168 542	302 428	2.5	
K	3	6168 559	302 460	2.5	
K	4	6168 595	302 432	2.6	
K	5	6168 571	302 370	2.6	
L	1	6168 757	302 339	2.5	
L	2	6168 735	302 327	2.5	
L	3	6168 704	302 307	2.5	
L	4	6168 679	302 284	2.5	
L	5	6168 664	302 268	2.5	
L	6	6168 642	302 241	2.5	
Compressor Shed	1			2.6	
Office	1			3.3	
Community Recycling Centre	1			3.7	
OLD Weighbridge	1			2.7	
OLD Weighbridge Toilet	1			2.7	
Revolve Shop	1			3.1	
Building Truckwash	1			2.6	
New Weighbridge	1			3.4	
Methane Blank (Pre testing)				2.7	Taken at entrance to Dunmore site before main gate
Methane Blank (Post testing)				2.5	Taken at entrance to Dunmore site before main gate

Comments:

Sampling performed in accordance to EPA Environmental Guidelines Solid Waste Landfills, Second Edition, 2016
Gas concentrations are reported as raw values without correction for background concentration.

Appendix E:
Laboratory Chain of Custody (COC) & Certificates of Analysis (COA) – Overflow Events

CHAIN OF CUSTODY

Mandatory Fields

Page ___of___

CoC #: *(if applicable)*

CLIENT CODE:	**SHECIT**	***PROJECT MANAGER:**	**Ryan Stirling**	SAMPLER:	**SAMPLED BY ALS**
***CLIENT:**	**Shellharbour City Council**	***PM MOBILE:**		SAMPLER MOBILE:	**02 4225 3125**
OFFICE: *(Invoiced Office)*	**Shellharbour**	ALS QUOTE # *(Client PL if blank)*	**WO/030/19 TENDER**	PURCHASE ORDER NO.:	**156810**
PROJECT NO./PROJECT:	**Dunmore Landfill Overflow Full Testing**			SITE:	**Dunmore**
***INVOICE** TO: *(client default if nil)*	Financial@shellharbour.nsw.gov.au			☐ CC Invoice to PM	
*EMAIL **REPORTS** TO: *(default to PM if blank)*	Ryan.stirlingshellharbour.nsw.gov.au, Glenn.holdenshellharbour.nsw.gov.au, Mitchell.copasshellharbour.nsw.gov.au, lab@enrs.com.au				

BIOSECURITY

Country of Origin: *(if not Australia)*

*** STORAGE REQUIREMENTS** *Please check box.* →

Standard Storage time from receipt of samples:
Waters - 3 weeks
Soils - 2 months

☐ Standard Storage
☐ Extended Storage

Specify Disposal Date:

Note: Extended storage incurs a fee and requires a signed agreement.

*** TURNAROUND** *Please check box.* →

(Not all tests can be expedited, contact Client Services for more information)

☐ 5+ days (no surcharge)
☐ 3 day (+15%)
☐ 2 day (+30%)
☐ 1 day (+50%)

***ANALYSIS REQUIRED**

(NB. ALS Quote No. and/or Analysis Suite Codes must be listed to attract suite/quoted price)
Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).
Mark an X in the boxes below analysis to indicate the parameter listed above to be tested on that sample.

Environmental Division
Wollongong
Work Order Reference
EW2402690

Telephone : 02 42253125

Comments:

ALS Use Only Lab ID	Sample ID	Depth	Date/Time	No. Bottles	MATRIX: Soil/Solid(S) Water(W) Sediments (SD), Dust (D), Product (P), Biota (B), Biosolid (BS)	TSS	NT-1, NT-2A (Ionic Balance)	TOC, NT-4, NH3, Total Mn	Dissolved and Total Fe	Field Test pH, EC, DO & Temp							Lab QC (additional bottles req.) Dup	Lab QC (additional bottles req.) MS	Additional Information (Comment on hazards - e.g., asbestos, known high contamination)
	SWP1		7.6.24 9:10	1	W	X	X	X	X	X							☐	☐	
																	☐	☐	
																	☐	☐	
																	☐	☐	
																	☐	☐	
																	☐	☐	
																	☐	☐	
																	☐	☐	
																	☐	☐	
																	☐	☐	

Receipt Detail (Lab Use ONLY)
Chilling Method: Ice: Frozen / Melted Ice Bricks: Frozen / Thawed None
Sample Temp at Receipt: 11.3 °C 12.3 °C 10.1 °C
Security Seal Intact *(circle)*: Yes / No / NA(None)
Carrier Details: ☐ Courier/Post ☐ Client
Con Note #:
Packaging: *(Circle)* Hard Esky Foam Esky Box/Bag/Other
Count # # #

Relinquished by: Robert Dahle Signature: R. Dahle Date/Time: 7.6.24.
Received by: Michael Santos Signature: Date/Time: 7-6-24 14:40

Relinquished by: Signature: Date/Time:
Received by: Signature: Date/Time:

CERTIFICATE OF ANALYSIS

Work Order	: **EW2402690**	Page	: 1 of 5
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Surface Water SWP01 Overflow	Date Samples Received	: 07-Jun-2024 14:45
Order number	: 156810	Date Analysis Commenced	: 07-Jun-2024
C-O-C number	: ----	Issue Date	: 19-Jun-2024 13:14
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER SURFACE WATER CPI 2024		
No. of samples received	: 1		
No. of samples analysed	: 1		

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*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Robert DaLio	Sampler	Laboratory - Wollongong, NSW

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.

- **Analytical work for this work order will be conducted at ALS Sydney.**
- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- Temperature performed by ALS Wollongong via in-house method EA116 and EN67 PK.
- Dissolved oxygen (DO) performed by ALS Wollongong via in-house method EP025FD and EN67 PK.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/67.4 Lakes and Reservoirs
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	SWP1 Point 1	----	----	----	----
			Sampling date / time	07-Jun-2024 09:10	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2402690-001	--------	--------	--------	--------
				Result	----	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	**7.7**	----	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	**806**	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**622**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**61**	----	----	----	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	**110**	----	----	----	----
EA116: Temperature								
Temperature	----	0.1	°C	**8.2**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**240**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**240**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**154**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**96**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**49**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**27**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**132**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**7**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SWP1 Point 1	----	----	----	----
				Sampling date / time	07-Jun-2024 09:10	----	----	----	----
Compound	CAS Number	LOR	Unit		EW2402690-001	--------	--------	--------	--------
					Result	----	----	----	----
EG020T: Total Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		**0.195**	----	----	----	----
Iron	7439-89-6	0.05	mg/L		**4.33**	----	----	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.3**	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**3.06**	----	----	----	----
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	0.01	mg/L		**3.04**	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		**0.13**	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**1.02**	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**1.15**	----	----	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**10.7**	----	----	----	----
ø Total Cations	----	0.01	meq/L		**10.6**	----	----	----	----
ø Ionic Balance	----	0.01	%		**0.57**	----	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**14**	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		**13.9**	----	----	----	----

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EA045: Turbidity
(WATER) EP005: Total Organic Carbon (TOC)
(WATER) EG020F: Dissolved Metals by ICP-MS
(WATER) EG020T: Total Metals by ICP-MS
(WATER) EK057G: Nitrite as N by Discrete Analyser
(WATER) EK058G: Nitrate as N by Discrete Analyser
(WATER) EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser
(WATER) EA025: Total Suspended Solids dried at 104 ± 2°C
(WATER) EK055G-NH4: Ammonium as N by DA
(WATER) EK055G: Ammonia as N by Discrete Analyser
(WATER) EN055: Ionic Balance
(WATER) ED045G: Chloride by Discrete Analyser
(WATER) ED041G: Sulfate (Turbidimetric) as SO4 2- by DA
(WATER) EK040P: Fluoride by PC Titrator
(WATER) ED037P: Alkalinity by PC Titrator
(WATER) ED093F: Dissolved Major Cations
(WATER) EA015: Total Dissolved Solids dried at 180 ± 5 °C

Appendix F:
Calibration Certificates

CERTIFICATION OF CALIBRATION

Issued by: QED Environmental Systems Ltd.

Calibration certificate number 19254 H-07052

Instrument Laser One **Serial Number** 19254

Description of the calibration procedure:

The calibration is verified with certified gas bottle. The maximum error of the instrument as specified in the datasheet.

Gas verification from 0-1000ppm CH4

Full scale (ppm)	Gas concentration (ppm)	Response 1 (ppm)	Response 2 (ppm)	Response 3 (ppm)	Average response (ppm)	Maximum error (ppm)	Maximum error (% F.s.)	Maximum error %
1000	0.0	0	0	0	0.00	0.00	0.00	0.00
1000	3	3.1	3.1	3.1	3.10	0.10	0.01	0.01
1000	10.3	10.3	10.3	10.3	10.30	0.00	0.00	0.00
1000	102.0	101	101	101	101.00	1.00	0.10	0.10
1000	1001	1000	1000	1000	1000.00	1.00	0.10	0.10

Uncertainty	0.10	%
Max % error	0.10	% FS

Gas verification from 0-100% vol CH4

Full scale (%vol)	Gas concentration (%vol)	Response 1 (%vol)	Response 2 (%vol)	Response 3 (%vol)	Average response (%vol)	Maximum error (%vol)	Maximum error (% F.s.)	Maximum error %
100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	2.20	2.20	2.20	2.20	2.20	0.00	0.00	0.00
100.00	5.00	5.00	5.00	5.00	5.00	0.00	0.00	0.00
100.00	15.00	15.00	15.00	15.00	15.00	0.00	0.00	0.00
100.00	50.00	49.90	49.90	49.90	49.90	0.10	0.10	0.10
100.00	100.00	99.90	99.90	99.90	99.90	0.10	0.10	0.10

Uncertainty	0.10	%
Max % error	0.10	% FS

Gas verification from 0-100% CH4 LEL (0-4.4% VOL)

Full scale (%vol)	Gas concentration (LEL%)	Response 1 (LEL%)	Response 2 (LEL%)	Response 3 (LEL%)	Average response (%vol)	Maximum error (LEL%)	Maximum error (% F.s.)	Maximum error %
100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100.00	2.00	0.00	2.00	2.00	1.33	2.00	2.00	2.00
100.00	50.00	0.00	0.00	0.00	0.00	50.00	50.00	50.00

Uncertainty	50.00	%
Max % error	50.00	% FS

CERTIFICATION OF CALIBRATION

Issued by: QED Environmental Systems Ltd.

Environmental conditions during calibration

Temp.	19.9	C
Pressure	1009	mBar

Gas bottles used for calibration

Gas	Cylinder number	Expiry date	Gas
N2	S1261680T	16/05/2024	N2
3 ppm	131394SG	21/11/2025	CH4
10 ppm	119779SG	11/04/2024	CH4
100 ppm	S1385429W	18/01/2026	CH4
1000 ppm	1490137	23/08/2026	CH4
1.0% Vol	S1198415S	10/04/2024	CH4
2.2% vol	S1672767FF	18/07/2026	CH4
5.0% vol	217147	03/12/2024	CH4
15% vol	269223	07/11/2023	CH4
50% vol	189051SG	23/02/2024	CH4
100% vol	S1182097S	15/11/2025	CH4

Calibration results: Pass

Next scheduled calibration: 28/02/2025

Calibration date: 28/02/2022

Issued by: Laura McBride

Appendix G:
Gas Flare Reports

PEOPLE ENGINEERING
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PROJECT PROFILE: DUNMORE, NSW

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Results Achieved since the Project Commenced*

BIOGAS CAPTURED	CARBON ABATEMENT	ACCUs CREATED	SEEDLINGS PLANTED	CARS OFF THE ROAD
27.5 million m3	261 thousand tonnes (t CO2e - environmental benefit)	92 thousand Australian Carbon Credit Units (ACCUs)	4.4 million seedlings planted for 10 years (t CO2e)	5,285 for the last 12 months of carbon abatement (t CO2e)

BIOGAS CAPTURE AND CARBON ABATEMENT FROM LANDFILL

- Long-term contract with Shellharbour City Council to recover and beneficially use biogas and abate carbon from this regional landfill in Dunmore. This improves air quality, reduces greenhouse gas emissions and contributes to the local economy.
- No regulatory requirement to capture biogas, however ACCUs enable additional carbon abatement (above its **30% baseline**) from a commercially viable flaring project under the Emissions Reduction Fund (ERF).
- Since 2013, LGI has installed a bespoke biogas management system with an LGI made 1000 m³/hr ERF compliant biogas flare. Council benefits from this bespoke system at minimal cost.
- LGI collaborates closely with the Council regarding the design, installation, operations and maintenance of the biogas management system, including the monitoring and reporting services provided.

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Saving the planet one landfill, one megawatt, one solar panel, one battery at a time

*Results achieved to 1 May 2024

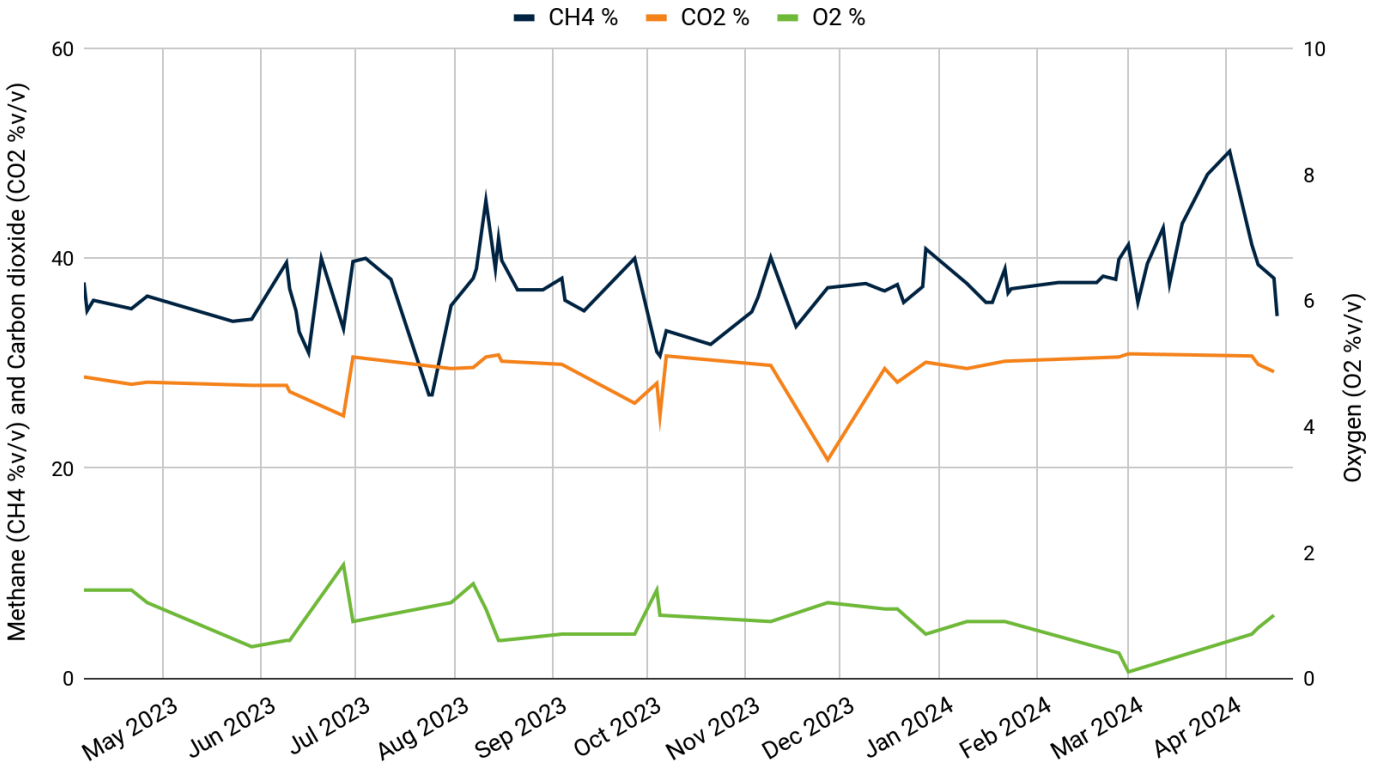
Site:	Dunmore	**Report issue date:**	21/05/2024
Report month:	April 2024	**Prepared by:**	Nusrat Habib
Prepared for:	Shellharbour City Council	**Checked by:**	Tom O'Connor

Comments on changes to existing system:	• **May 2023** - LGI installed a series of 3 pneumatic bore pumps at various wells with evacuated leachate being returned into sump 5. • **June 2023** - LGI installed a series of 2 pneumatic bore pumps at various wells with evacuated leachate being returned into sump 5. **- October 2023** - LGI replaced the flare with a brand new flare of identical capacity. The new flare has improved control systems, reliability and performance, and will be compliant with current Type B Gas and Hazardous Area Zoning regulations.
Comments on operation / maintenance:	Availability - 98.51 % Down Time: 10.75 h 10.75h - Forced Outage Internal Field tuned: - 29/04/2024
Recommendations:	LGI recommends continued regular communication with Council regarding leachate management, site performance and future planning.

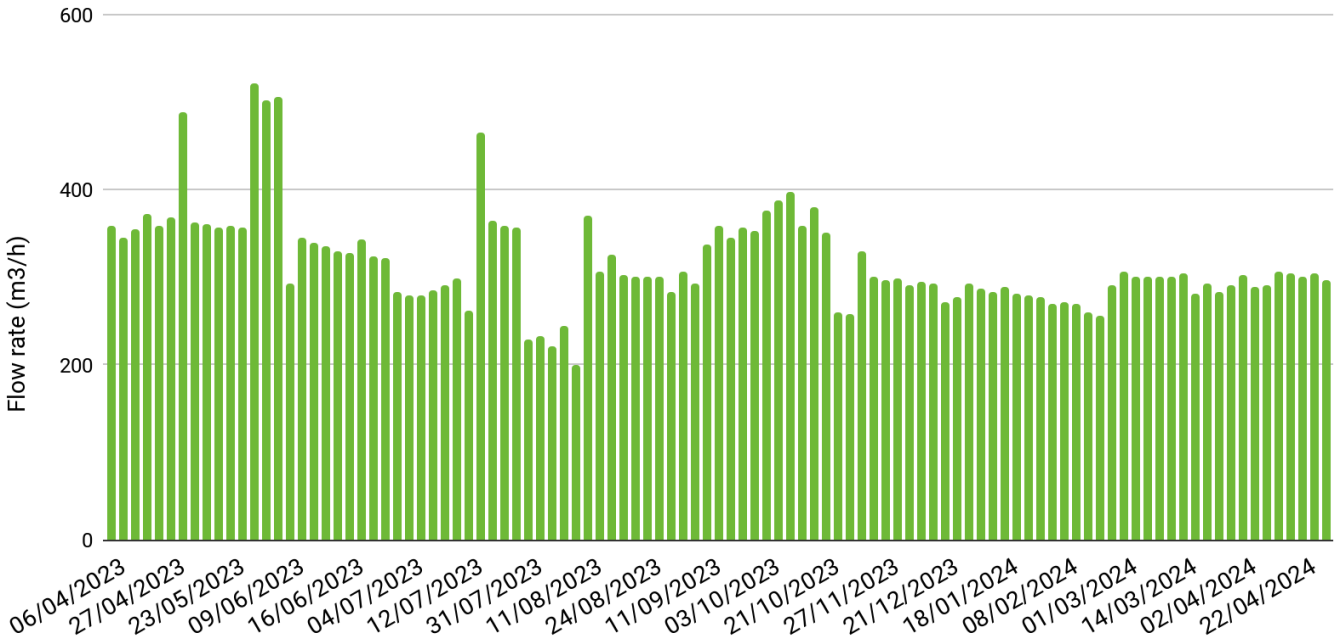
Flare Operational Data:

Date	CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	FLOW (m3/h)	STACK TEMP (°C)	CUMULATIVE FLOW (m^3)
02/04/2024	50.2	-	-	302	507	27,276,513
09/04/2024	41.3	30.7	0.7	288	458	27,324,829
11/04/2024	39.4	29.9	0.8	290	450	27,338,790
16/04/2024	38.1	29.2	1	307	578	27,374,684
Average	42.25	29.93	0.83	297	498	-

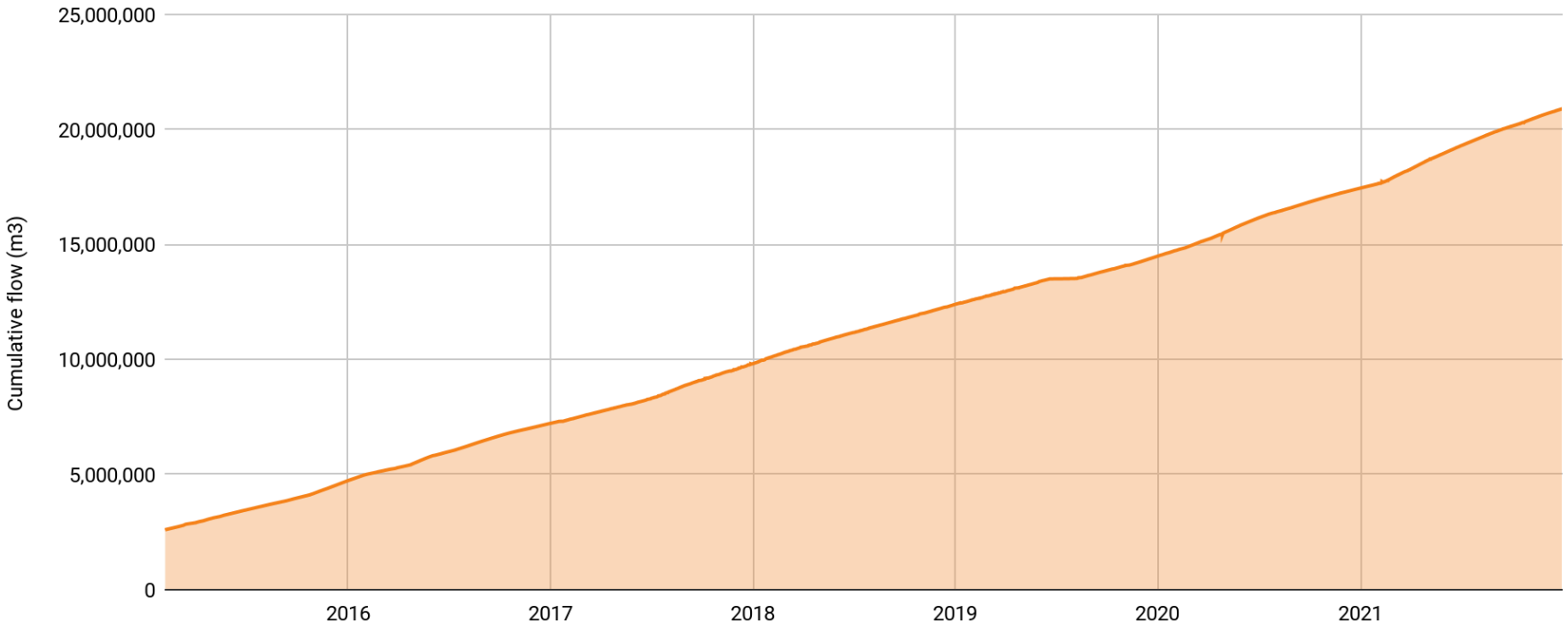
Dunmore- Methane, Carbon Dioxide & Oxygen



Dunmore - Flow Rate



Dunmore - Cumulative Flow



27,480,639 m3 of combusted landfill gas from the beginning of the project up to 1 May 2024 represents:

- 261,000 tonnes of CO2 equivalent (total methane abated by gas capture system to date).
- 4,350,002 seedlings planted for 10 years
- 5,285 (cars off the road for the last 12 months)
- 92,714 Australian Carbon Credit Units (ACCUs)

Biogas captured is the cumulative flow reading at the last day of the month.

Please note:

This report has been prepared by LGI Limited (LGI) with all reasonable skill, care and diligence, and taking account of the human power and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from LGI. LGI disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

Where LGI has been accorded gas rights under the terms and conditions of the agreement with the client, the data contained in this report represents confidential commercial information and should not be copied or disseminated in any form to a third party without prior consent from LGI.

Archived commentary:

Comments on changes to existing system:	• **January 2016** - LGI disconnected the 4 lateral wells and 8 vertical wells. • **April 2016** - LGI reconnected 8 vertical wells in the SE corner and 4 lateral wells. • **June 2016** - LGI disconnected the extended gas capture system to assist Council. • **September 2016** - LGI disconnected the extended gas capture system to assist Council. • **November 2016** - LGI commissioned the connection to leachate sump 6 as of 23-11-2016. • **May 2017** - LGI installed an additional 10 vertical wells to the existing LFG system • **November 2019** - LGI on site to move mainline up batter, and reconnected infrastructure that had been previously disconnected, including 4 wells on the dimple and a 160mm leachate riser. • **April 2020 -** LGI installed a flowline to sump 6 after earlier disconnection. • **February 2021** - LGI installed 13 new vertical wells, including a new submain • **March 2022** - LGI replaced the flare gas analyser panel with a Draeger model analyser for greater accuracy and reliability • **August 2022** - LGI repaired the 225mm mainline and and adjacent submain to allow for intermediate capping to continue across the top of cell 3 • **December 2022** - LGI installed a pneumatic bore pump in a j-trap, allowing for greater reliability of condensate management in the main gas line.

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Results Achieved since the Project Commenced*

BIOGAS CAPTURED	CARBON ABATEMENT	ACCUs CREATED	SEEDLINGS PLANTED	CARS OFF THE ROAD
27.7 million m3	263 thousand tonnes (t CO2e - environmental benefit)	92 thousand Australian Carbon Credit Units (ACCUs)	4.4 million seedlings planted for 10 years (t CO2e)	5,155 for the last 12 months of carbon abatement (t CO2e)

BIOGAS CAPTURE AND CARBON ABATEMENT FROM LANDFILL

- Long-term contract with Shellharbour City Council to recover and beneficially use biogas and abate carbon from this regional landfill in Dunmore. This improves air quality, reduces greenhouse gas emissions and contributes to the local economy.
- No regulatory requirement to capture biogas, however ACCUs enable additional carbon abatement (above its **30% baseline**) from a commercially viable flaring project under the Emissions Reduction Fund (ERF).
- Since 2013, LGI has installed a bespoke biogas management system with an LGI made 1000 m³/hr ERF compliant biogas flare. Council benefits from this bespoke system at minimal cost.
- LGI collaborates closely with the Council regarding the design, installation, operations and maintenance of the biogas management system, including the monitoring and reporting services provided.

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Saving the planet one landfill, one megawatt, one solar panel, one battery at a time

*Results achieved to 1 June 2024

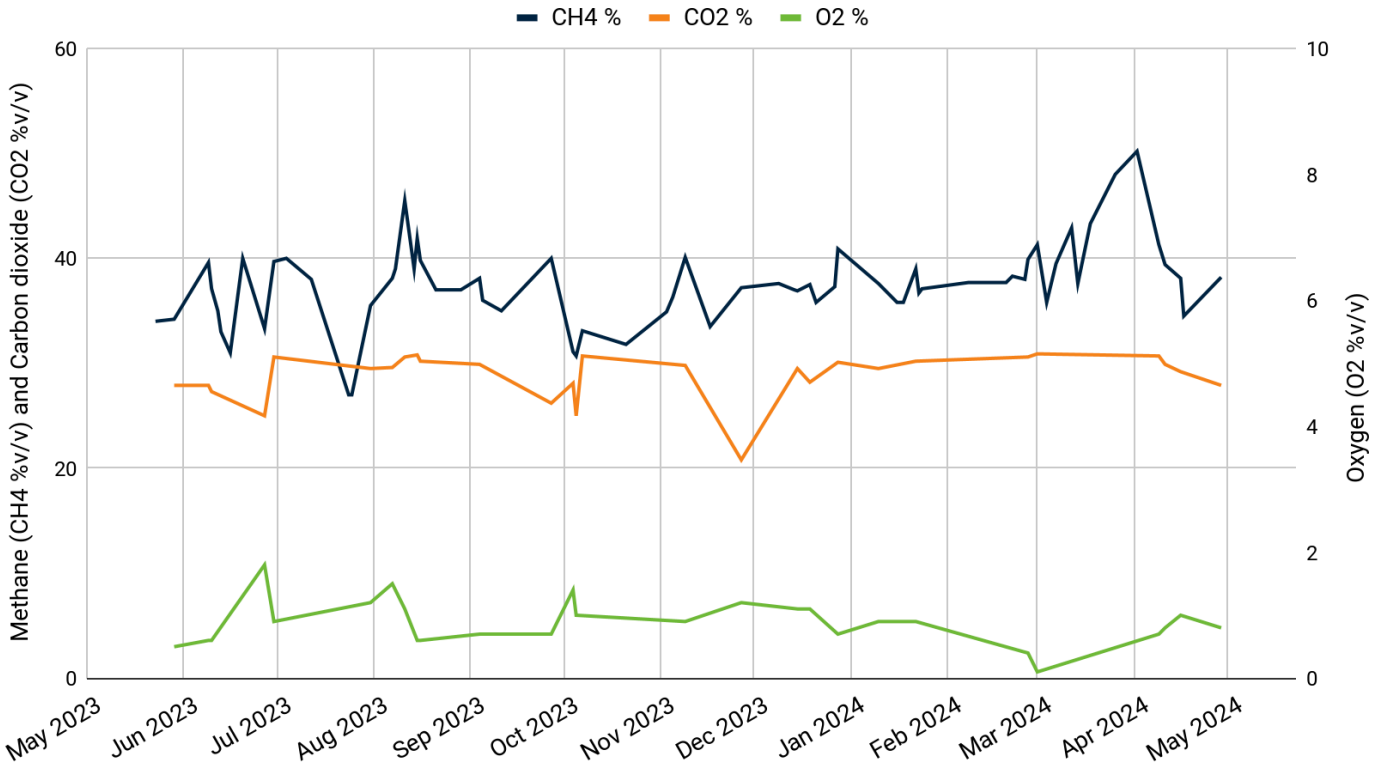
Site:	Dunmore	**Report issue date:**	14/06/2024
Report month:	May 2024	**Prepared by:**	Nusrat Habib
Prepared for:	Shellharbour City Council	**Checked by:**	Tom O'Connor

Comments on changes to existing system:	• **May 2023** - LGI installed a series of 3 pneumatic bore pumps at various wells with evacuated leachate being returned into sump 5. • **June 2023** - LGI installed a series of 2 pneumatic bore pumps at various wells with evacuated leachate being returned into sump 5. **- October 2023** - LGI replaced the flare with a brand new flare of identical capacity. The new flare has improved control systems, reliabilty and performance, and will be compliant with current Type B Gas and Hazardous Area Zoning regulations.
Comments on operation / maintenance:	Availability - 99.81 % Down Time: 1.42 h 1.42h - Planned Outage Field tuned: - 31/05/2024
Recommendations:	LGI recommends continued regular communication with Council regarding leachate management, site performance and future planning.

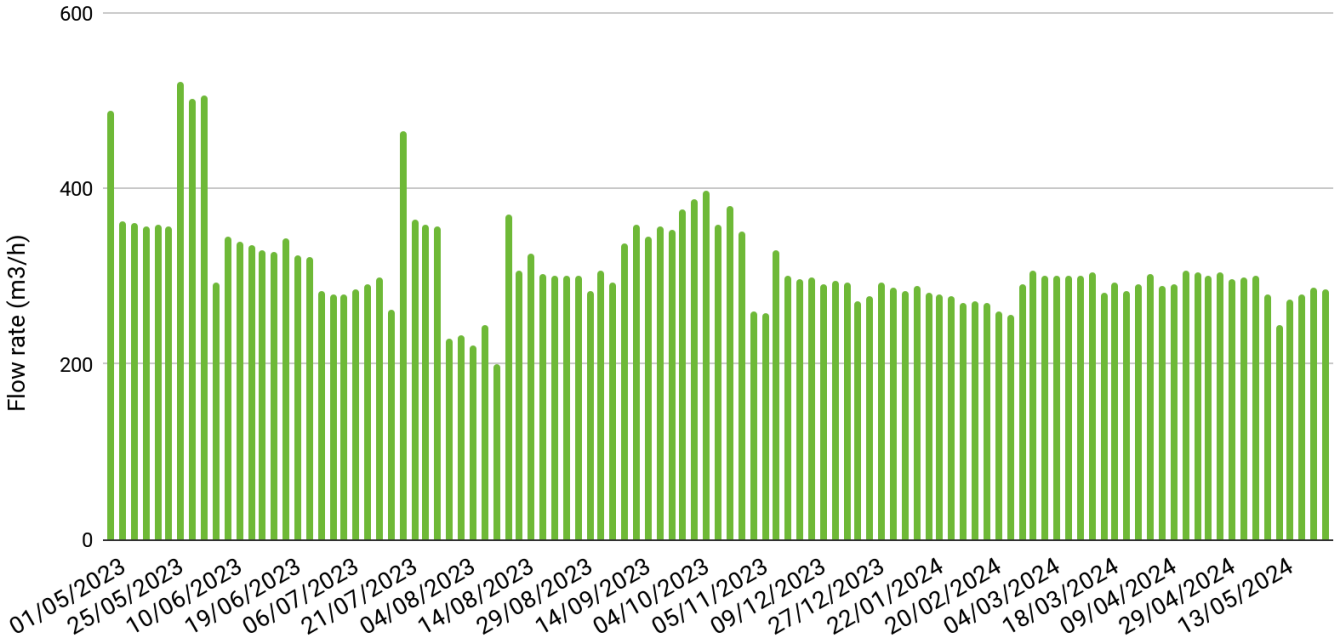
Flare Operational Data:

Date	CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	FLOW (m3/h)	STACK TEMP (°C)	CUMULATIVE FLOW (m^3)
03/05/2024	-	-	-	299.14	537	27,497,311
07/05/2024	-	-	-	301	209	27,525,925
16/05/2024	-	-	-	273	535	27,582,754
31/05/2024	42.2	30.4	0.7	285	560	27,685,920
Average	42.20	30.40	0.70	290	460	-

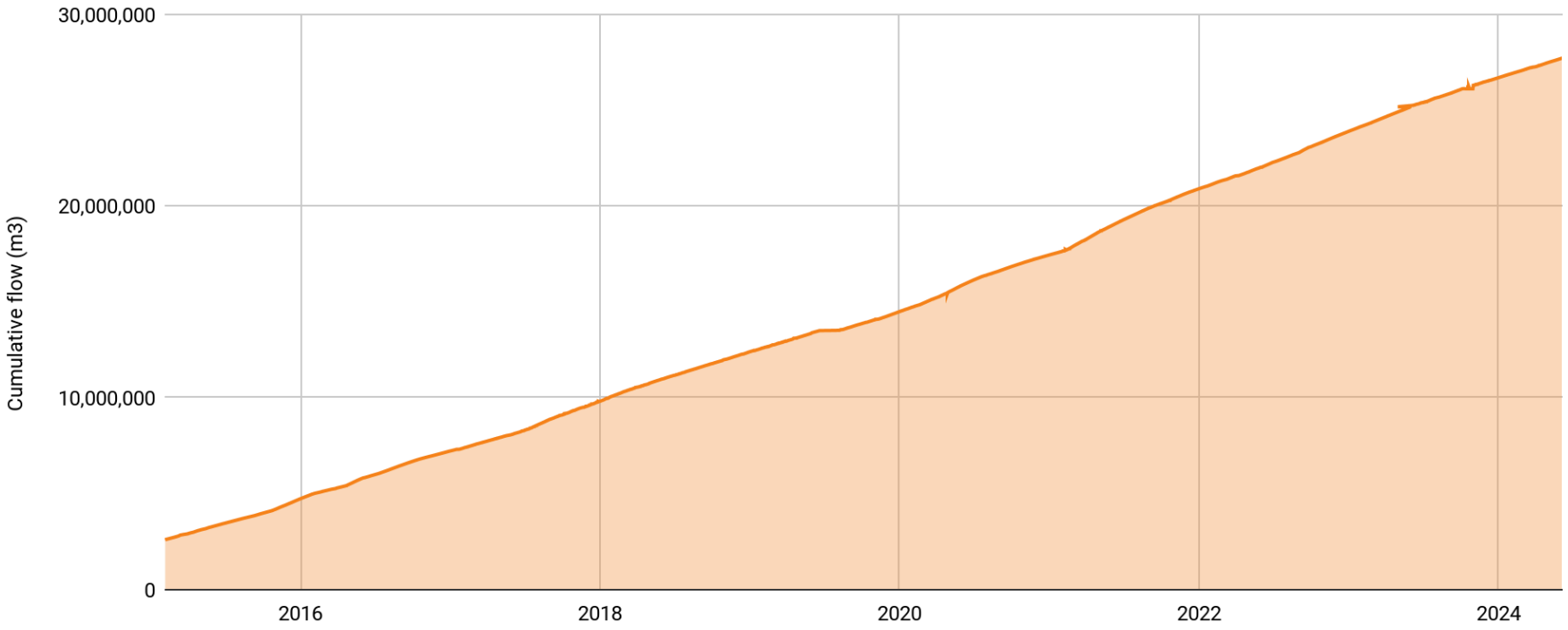
Dunmore- Methane, Carbon Dioxide & Oxygen



Dunmore - Flow Rate



Dunmore - Cumulative Flow



27,689,259 m3 of combusted landfill gas from the beginning of the project up to 1 June 2024 represents:

- 262,982 tonnes of CO2 equivalent (total methane abated by gas capture system to date).
- 4,383,025 seedlings planted for 10 years
- 5,155 (cars off the road for the last 12 months)
- 92,714 Australian Carbon Credit Units (ACCUs)

Biogas captured is the cumulative flow reading at the last day of the month.

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BIOGAS CAPTURED	CARBON ABATEMENT	ACCUs CREATED	SEEDLINGS PLANTED	CARS OFF THE ROAD
27.9 million m3	265 thousand tonnes (t CO2e - environmental benefit)	92 thousand Australian Carbon Credit Units (ACCUs)	4.4 million seedlings planted for 10 years (t CO2e)	5,118 for the last 12 months of carbon abatement (t CO2e)

BIOGAS CAPTURE AND CARBON ABATEMENT FROM LANDFILL

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*Results achieved to 1 July 2024

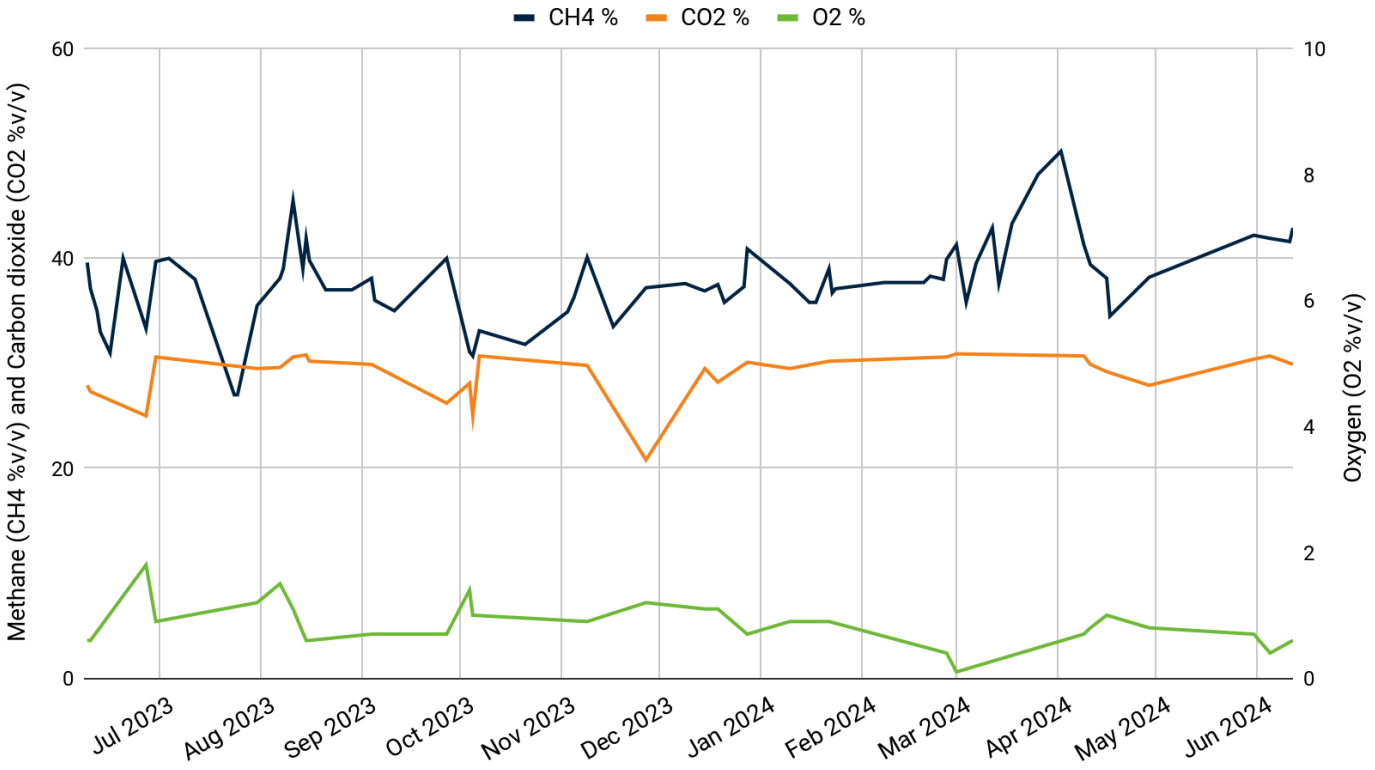
Site:	Dunmore	**Report issue date:**	23/07/2024
Report month:	June 2024	**Prepared by:**	Nusrat Habib
Prepared for:	Shellharbour City Council	**Checked by:**	Tom O'Connor

Comments on changes to existing system:	• **May 2023** - LGI installed a series of 3 pneumatic bore pumps at various wells with evacuated leachate being returned into sump 5. • **June 2023** - LGI installed a series of 2 pneumatic bore pumps at various wells with evacuated leachate being returned into sump 5. **- October 2023** - LGI replaced the flare with a brand new flare of identical capacity. The new flare has improved control systems, reliability and performance, and will be compliant with current Type B Gas and Hazardous Area Zoning regulations.
Comments on operation / maintenance:	Availability - 99.70 % Down Time: 2.17 h 2.17h - Planned Outage
Recommendations:	LGI recommends continued regular communication with Council regarding leachate management, site performance and future planning.

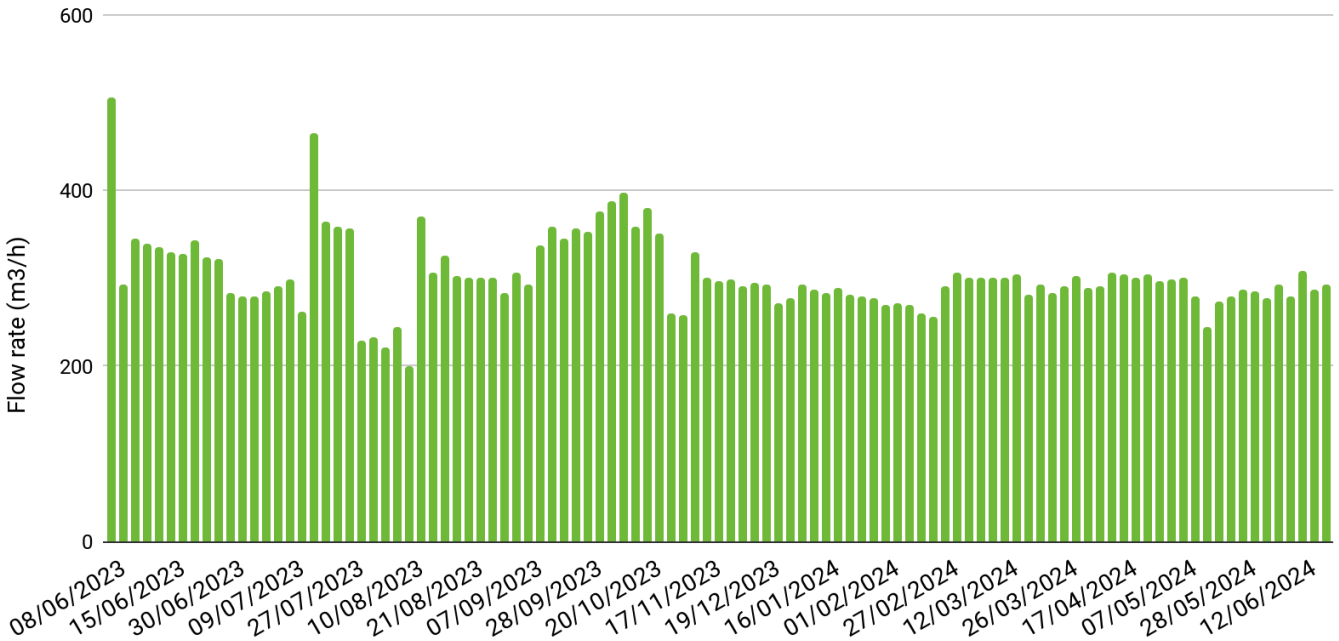
Flare Operational Data:

Date	CH4 (%v/v)	CO2 (%v/v)	O2 (%v/v)	FLOW (m3/h)	STACK TEMP (°C)	CUMULATIVE FLOW (m^3)
05/06/2024	41.9	30.7	0.4	292	546	27,718,675
12/06/2024	42.9	29.9	0.6	309	580	27,765,593
25/06/2024	39.6	-	-	287	534	27,855,001
28/06/2024	39.8	28.6	1	293	542	27,876,987
Average	41.05	29.73	0.67	295	551	-

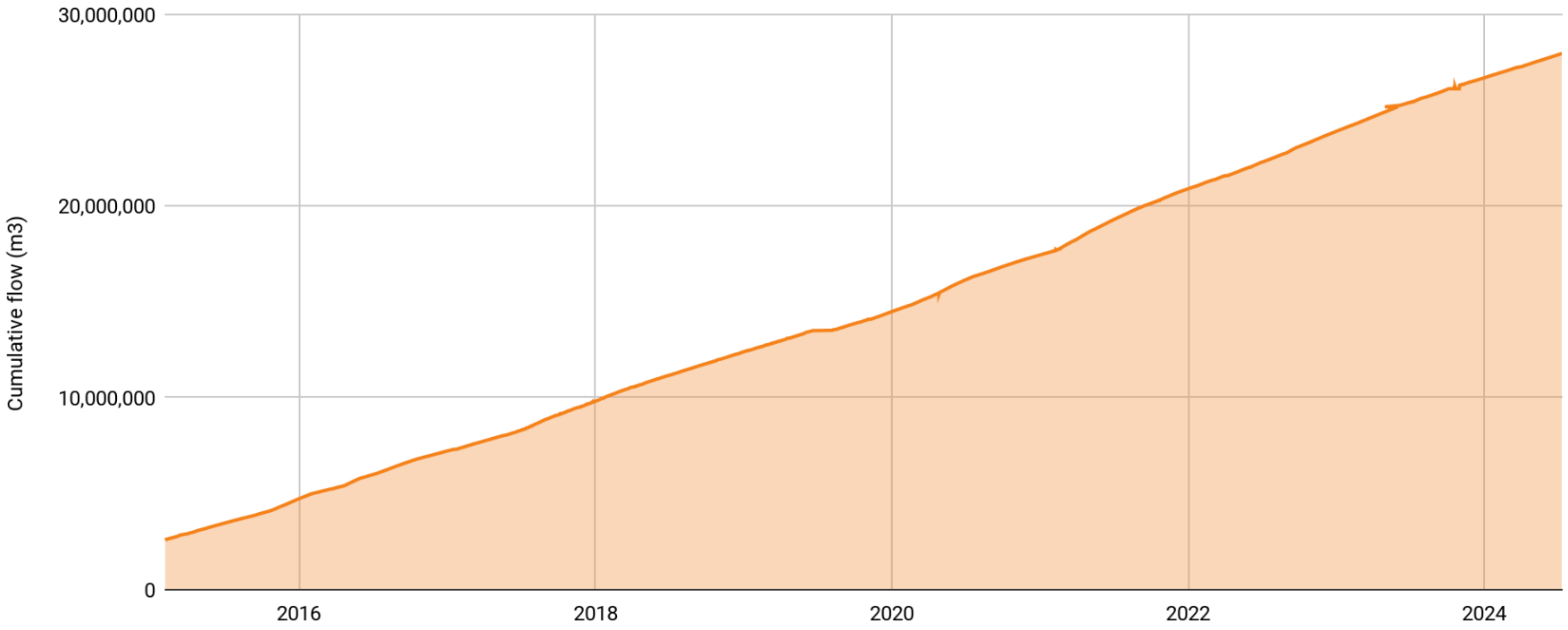
Dunmore- Methane, Carbon Dioxide & Oxygen



Dunmore - Flow Rate



Dunmore - Cumulative Flow



27,894,757 m3 of combusted landfill gas from the beginning of the project up to 1 July 2024 represents:

- 264,933 tonnes of CO2 equivalent (total methane abated by gas capture system to date).
- 4,415,554 seedlings planted for 10 years
- 5,118 (cars off the road for the last 12 months)
- 92,714 Australian Carbon Credit Units (ACCUs)

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