



# **QUARTERLY ENVIRONMENTAL MONITORING REPORT (QEMR) MARCH 2023**

**DUNMORE RECYCLING & WASTE DEPOT  
44 BUCKLEYS ROAD,  
DUNMORE, NSW, 2529**

**ENVIRONMENT PROTECTION LICENCE (EPL) 5984**

Prepared For: **Shellharbour City Council**

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## ACKNOWLEDGEMENTS

The project was conducted through close liaison with Shellharbour City Council (SCC) and ALS Environmental.

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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 (QEMR) 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 March 2023 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 an Annual Environmental Monitoring Report.

The scope of work for this QEMR comprised the collation, assessment and reporting of Site data made available to ENRS from the March 2023 monitoring period 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 2021-2023 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.

Based on the findings obtained during the March 2023 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, sulphate and salinity (EC) within all groundwater bores. This was considered to be consistent with historical values;
- A single exceedance in the surface water of Rocklow Creek was reported for ammonia above the ecological stressor values of 0.2mg/L;
- On five (5) out of eight (8) occasions, flare operating temperatures were below operating threshold target of 760 degrees during the monitoring period. Operations taken by the operator to address the root causes of the low Flare Stack temperatures are outlined in the monthly LGI reports attached as **Appendix G**;
- Surface gas methane monitoring reported satisfactory results all within the adopted assessment criteria;
- Gas accumulation monitoring reported satisfactory results for all enclosures tested within 250m of emplaced waste or leachate storage facility;



- Dust deposition gauges recorded satisfactory results below the guidelines provided in AS3580.10.1. Monitoring should continue in accordance with EPL 5984 requirements;
- Based on this review of the March 2023 monitoring period, contaminants associated with the landfill cell, leachate dam/s and general site uses are considered to be relatively consistent with the range of historical results;
- 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

<b>EXECUTIVE SUMMARY .....</b>	<b>II</b>
<b>1.0 INTRODUCTION .....</b>	<b>1</b>
1.1 Project Background .....	1
1.1.1 Site History .....	1
1.1.2 EPL Requirements .....	1
1.2 Objectives .....	2
1.3 Scope of Work .....	2
<b>2.0 SITE DESCRIPTION .....</b>	<b>2</b>
2.1 Location .....	2
2.2 Surrounding Land use .....	3
2.2.1 Sensitive Receptors .....	4
2.3 Topography & Drainage .....	4
2.4 Soil Landscape .....	4
2.5 Geology .....	4
2.6 Hydrogeology .....	5
2.6.1 Existing Bores .....	5
2.6.2 Flow Regime .....	5
2.7 Surface Water .....	5
<b>3.0 ASSESSMENT CRITERIA .....</b>	<b>6</b>
3.1 Contaminants of Potential Concern .....	6
3.2 Water Quality Guidelines .....	6
3.2.1 ANZG Guidelines .....	6
3.2.2 National Environmental Protection Measure (NEPM) .....	7
3.3 Dust Deposition Assessment Criteria .....	7
3.4 Surface Methane GAS Assessment Criteria .....	8
3.5 Gas accumulation monitoring in enclosed structures .....	8
<b>4.0 SAMPLING METHODOLOGY .....</b>	<b>8</b>
4.1 Water Sampling .....	8
4.1.1 Location of Water Monitoring Points .....	8
4.1.2 Depth to Water .....	8
4.1.3 Sample Collection .....	9
4.1.4 Groundwater Sampling .....	9
4.1.5 Field Testing .....	9
4.2 Dust Deposition sampling .....	10
4.3 Surface Methane Gas Monitoring .....	10
4.4 Gas Accumulation Monitoring in enclosed structures .....	10

4.5	Laboratory Analysis .....	10
4.6	Flare Monitoring .....	10
<b>5.0</b>	<b>QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC) .....</b>	<b>11</b>
5.1	Data Quality Objectives .....	11
5.2	QA/QC Procedures .....	11
5.3	EPL Non-Compliance .....	12
<b>6.0</b>	<b>WATER QUALITY RESULTS .....</b>	<b>12</b>
6.1	Overflow Results.....	12
6.2	Field Testing .....	12
6.3	Physical Indicators .....	13
6.3.1	Depth .....	13
6.3.2	Temperature .....	13
6.3.3	Salinity (EC & TDS).....	13
6.3.4	Dissolved Oxygen .....	14
6.3.5	pH .....	14
6.3.6	Total Suspended Solids (TSS) .....	15
6.4	Inorganic Analytes .....	15
	Nutrients .....	15
6.4.1	Ammonia.....	16
6.4.2	Nitrate .....	16
6.4.3	Nitrite .....	17
	Anions 17	
6.4.4	Chloride.....	17
6.4.5	Fluoride .....	17
6.4.6	Sulphate.....	18
6.4.7	Total Alkalinity .....	18
6.4.8	Bicarbonate Alkalinity .....	18
	Metals & Metalloids.....	18
6.4.9	Manganese .....	18
6.4.10	Iron (Total Fe) .....	19
6.4.11	Iron (Dissolved Fe).....	19
6.4.12	Calcium .....	19
6.4.13	Potassium .....	20
6.5	Organic Analytes .....	20
6.5.1	Total Organic Carbon .....	20
<b>7.0</b>	<b>DUST GAUGE RESULTS .....</b>	<b>21</b>
<b>8.0</b>	<b>METHANE MONITORING.....</b>	<b>23</b>
8.1	Surface Gas Methane .....	23
8.2	Gas accumulation monitoring in enclosed structures.....	23



<b>9.0</b>	<b>ENVIRONMENTAL ASSESSMENT .....</b>	<b>23</b>
9.1	Monitoring Point Summary.....	23
9.2	Environmental Management.....	24
9.2.1	Landfill Operations .....	24
9.3	Environmental Safeguards.....	24
9.4	Monitoring Program .....	24
<b>10.0</b>	<b>CONCLUSIONS .....</b>	<b>25</b>
<b>11.0</b>	<b>LIMITATIONS.....</b>	<b>26</b>
<b>12.0</b>	<b>REFERENCES .....</b>	<b>27</b>

## **LIST OF TABLES, FIGURES & APPENDICES**

### **TABLES**

Table 1: Site Identification
Table 2: Surrounding Land use
Table 3: Groundwater Assessment Criteria
Table 4: Adopted Guideline Criteria
Table 5: Data Quality Objectives
Table 6: Summary Table of Overflow Events
Table 7: Summary of Dust Gauge Results
Table 8: Summary of Flare Operating Temperatures
Table 9: Water Quality Results Comparison of Quarterly Monitoring Results Against Site Assessment Criteria
Table 10: Ammonia Water Quality Results Compared against pH Modified Trigger Values
Table 11: Duplicate Groundwater Sample Results and QC Data
Table 12: Duplicate Surface Water Results and QC Data

### **FIGURES**

Figure 1: Site Location Map
Figure 2: Sampling Points & Site Plan
Figure 3: Surface Methane Gas Sample Transects
Figure 4: Regional Geology
Figure 5: Registered Bores

### **CHARTS**

Chart 1 - Monthly plot of Dust Deposition Gauge Results
Chart 2 - Weekly Flare Operating Temperatures
Chart 3 to Chart 18 – Groundwater Water Quality Results 2017-2023
Chart 19 to Chart 34 – Onsite Surface Water Quality Results 2017-2023
Chart 35 to Chart 46 – Rocklow Creek Surface Water Quality Results 2017-2023
Chart 47 to Chart 61 – Leachate Water Quality Results 2017-2023

### **APPENDICES**

Appendix A EPL 5984 Sampling Point Summary (NSW EPA, 10/02/2022)
Appendix B Laboratory Chain of Custody (COC) & Certificates of Analysis (COA) – Water Samples
Appendix C Laboratory Chain of Custody (COC) & Certificates of Analysis (COA) – Dust Samples
Appendix D Surface Gas (Methane) Field Sheets
Appendix E Laboratory Chain of Custody (COC) & Certificates of Analysis (COA) – Overflow Event
Appendix F Calibration Certificates
Appendix G Gas Flare Reports

## 1.0 INTRODUCTION

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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 (SCC) 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.

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## 1.3 SCOPE OF WORK

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## 2.0 SITE DESCRIPTION

### 2.1 LOCATION

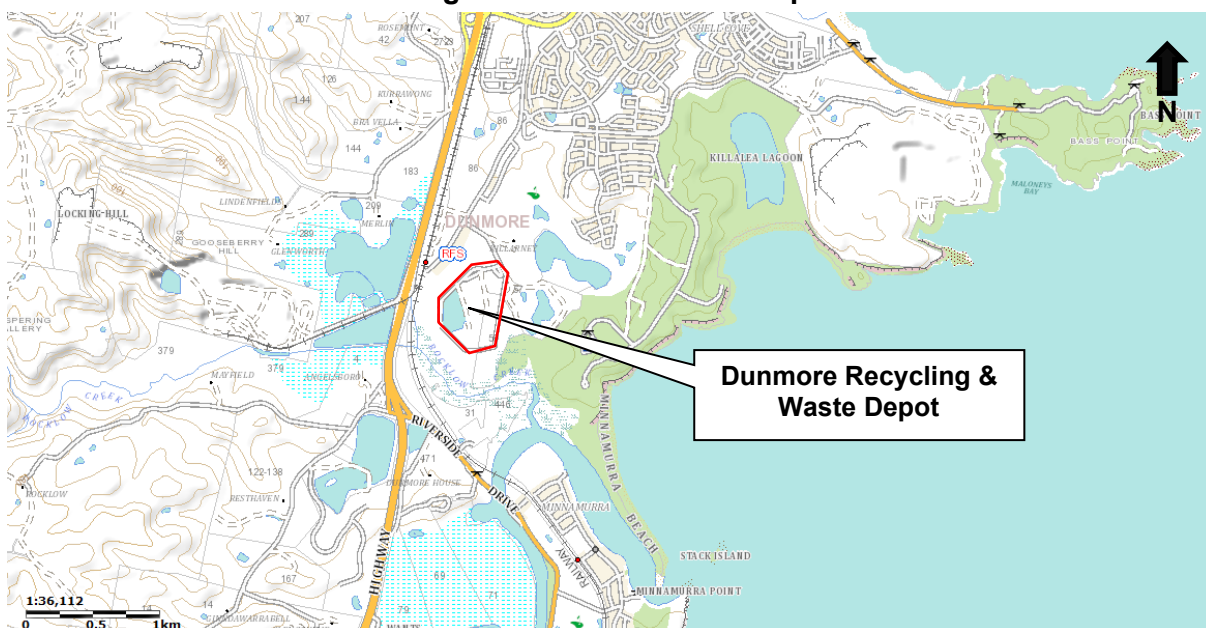
The Site is located at 44 Buckleys Road, Dunmore, NSW, 2529, legally defined as Lot 21 in Deposited Plan 653009 and Lot 1 Deposited Plan 419907. The Site is situated approximately three and a half (3.5) kilometres southwest of the Shellharbour town centre. The area's regional location is defined in **Figure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

are provided in the Site Plan (see **Figure 2**). The key features required to identify the Site are summarised in **Table 1**.

**Table 1: Site Identification**

Aspect	Description
<b>Site</b>	Dunmore Recycling and Waste Depot
<b>Street Address</b>	44 Buckleys Road, Dunmore, NSW 2529
<b>Site Area</b>	72.36 hectares
<b>Title Identifier</b>	Lot 21 DP 653009, Lot 1 DP 419907
<b>Zoning</b>	RU1 Primary Production
<b>Local Government Area</b>	Shellharbour City Council

**Figure 1: Site Location Map**



Source: SIX Maps (<https://maps.six.nsw.gov.au/>) (cited 16/01/2020)

## 2.2 SURROUNDING LAND USE

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

**Table 2: Surrounding Land use**

Direction	Land Use
<b>North:</b>	Buckleys Road, commercial infrastructure and open grassland. Residential dwellings along the northwest border of the Site. Golf course further to the northeast.

Direction	Land Use
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;
- Down gradient stakeholders; and
- Down gradient alluvial aquifers, swamps, Rocklow Creek, Minnamurra River and Groundwater Dependent Ecosystems (GDE) near discharge zones.

## 2.3 TOPOGRAPHY & DRAINAGE

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

The previous annual monitoring report (Environmental Earth Sciences 2018) reported the soil profile at the Site as 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 (ASS).

## 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.

## 3.0 ASSESSMENT CRITERIA

### 3.1 CONTAMINANTS OF POTENTIAL CONCERN

This section of the report provides a summary of the Contaminants of Potential Concern (CoPC) associated with the Site. CoPC's are identified in the Sites EPL/s which document the CoPC and water quality indicators required to be monitored. Analytical requirements for all water sampling are provided in **Appendix A**.

### 3.2 WATER QUALITY GUIDELINES

Nationally developed guidelines are provided in the National Water Quality Management Strategy (NWQMS): Guidelines for Groundwater Protection in Australia (ARMCANZ & ANZECC 1995). For the purpose of this assessment, the relevant criteria selected to protect environmental values are summarised in **Table 3** below:

**Table 3: Groundwater Assessment Criteria**

Environmental Value	Relevant Guideline
Ecosystems / Health Screening Levels	ANZG (2018) (Australian and New Zealand Guidelines for Fresh and Marine Water Quality).
	National Environment Protection Measure (NEPM) (2013).
Drinking Water	Australian Drinking Water Guidelines (ADWG) (2018)

#### 3.2.1 ANZG Guidelines

The relevant criteria for this water quality assessment are the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG;2018). The ANZG (2018) provide Default Guideline Values (DGVs) for four (4) levels of protection categorised by the percentage of species possibly affected, being 80%, 90%, 95% or 99% of species. Values for a level of protection for 95% of species in a marine environment have been adopted and are displayed in **Table 4**. Where DGVs are not available reference is made against the ANZECC (2000) Trigger Values (TVs). 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**.

**Table 4: Adopted Guideline Criteria**

Parameter	Groundwater Guideline	Surface water Guideline
Ammonia	0.9 mg/L (pH 8)	0.9 mg/L (pH 8)
Nitrate	10.6 mg/L	10.6 mg/L
pH	6.5-8.5 pH units	6.5-8.5 pH units

Parameter	Groundwater Guideline	Surface water Guideline
Soluble Iron	0.3 mg/L	0.3 mg/L
Manganese	1.9 mg/L	1.9 mg/L
Electrical Conductivity	125-2200 µS/cm	125-2200 µS/cm

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.

Additional pH dependant trigger values for total ammonia were also adopted when water was outside of 8 pH units in accordance with Table 8.3.7 of the ANZECC (2000). Criteria and results are presented in **Table 10** attached.

### 3.2.2 National Environmental Protection Measure (NEPM)

The NSW EPA has endorsed the use of the Groundwater Investigation Levels (GILs) given in the 2013 ASC NEPM 'Schedule B(1) Guideline on the Investigation Levels for Soil and Groundwater'. The latest NEPM provide a framework for risk-based assessment of groundwater contamination.

Groundwater Health Screening Levels (HSLs) are provided for four (4) land use categories for vapour intrusion (Table 1A[4]) associated with Total Recoverable Hydrocarbons TRH (F1 & F2) and BTEX compounds.

NEPM	Description of Land use Categories
HIL A	Residential A with garden/accessible soil also includes children's day care centres, preschools and primary schools.
HIL B	Residential B with minimal opportunities for soil access; includes buildings with fully and permanently paved yard space such as high-rise buildings and apartments.
HIL C	Recreational C includes public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and unpaved footpaths.
HIL D	Commercial/industrial D includes premises such as shops, offices, factories and industrial sites.
GILs	Groundwater Investigation Levels (GILs) should be applied based on the receiving environment and groundwater resources. GILs are provided in NEPM Table 1C for; Fresh Waters; Marine Waters; and Drinking Water;
EILs	Ecological Investigation Levels (EILs) for common contaminants in the top two (2) metres of soil based on three (3) generic land use settings: <ul style="list-style-type: none"> <li>• Areas of ecological significance;</li> <li>• Urban residential areas and public open space; and</li> <li>• Commercial and industrial land uses.</li> </ul>

### 3.3 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/m<sup>2</sup>/month.

### 3.4 SURFACE METHANE GAS ASSESSMENT CRITERIA

The NSW EPA Solid Waste Landfill Guidelines 2<sup>nd</sup> 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.

### 3.5 GAS ACCUMULATION MONITORING IN ENCLOSED STRUCTURES

The NSW EPA Solid Waste Landfill Guidelines 2<sup>nd</sup> 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).

## 4.0 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.

### 4.1 WATER SAMPLING

#### 4.1.1 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.

#### 4.1.2 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 identified in monitoring Wells.***

#### **4.1.3 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.

#### **4.1.4 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.

#### **4.1.5 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).

## 4.2 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 period between the dates; **1<sup>st</sup> February** and **1<sup>st</sup> March 2023**. A total of four (4) dust monitoring locations were considered adequate to assess site conditions.

## 4.3 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 2<sup>nd</sup> 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.

## 4.4 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 2<sup>nd</sup> 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.

## 4.5 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.

## 4.6 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**.

## 5.0 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

### 5.1 DATA QUALITY OBJECTIVES

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 by Australian Standard: AS 4482.1-2005 and referenced by the National Environment Protection (Assessment of Site Contamination) Measure (NEPC;2013). The DQO's for the investigation were to obtain representative data to allow assessment of:

- groundwater quality;
- The risks posed to human health and the environment, including potential future users of the Site; and
- The requirements for any further investigative works.

The assessment was conducted to a standard consistent with generally accepted and current professional consulting practice for such an investigation. The evaluation criteria adopted for the investigation are summarised in **Table 5**.

**Table 5: Data Quality Objectives**

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 areas of environmental concern at the Site, and selection of representative samples.
Precision and accuracy for sampling and analysis	Use properly trained and qualified field personnel and achieve field and laboratory QA/ QC criteria.

### 5.2 QA/QC PROCEDURES

It should be noted that whilst the EPL does not require field duplicates, ENRS recommend sampling include rinseate samples and field duplicates at the standard rate of 1 in 10, or field QA/QC is conducted in accordance with *ALS* procedures.

The majority of the QA/QC data provided for this report by SC was prepared by ALS and is included in the attached ALS QC and QCI reports. ALS is NATA accredited for field sampling and laboratory testing.

Relative Percent Difference (RPD) analysis of all duplicate and triplicate samples(s) results was performed by ENRS and is included in the report as **Table 10**, **Table 11** and **Table 12**. Results were generally reported within the acceptance criteria documented in Table 4 of AS4482.1-2005, the RPD for inorganics was set at <30% and for organics set at <50%.

Since all QA/QC results complied with the required standards, or showed variations that would have no significant effect on the quality of the data or the conclusions of this environmental assessment. Therefore, the data was considered acceptable for use in this assessment.

### 5.3 EPL NON-COMPLIANCE

Based on the information provided to ENRS, no non-compliances were noted during the March 2023 quarterly monitoring period.

## 6.0 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 9** with comparison against the relevant Site Assessment Criteria (SAC). The laboratory certificates of analysis are provided in Appendix B.

### 6.1 OVERFLOW RESULTS

Overflow samples were taken from SWP-1 on one (1) occasion during Q2 monitoring period. Summary results are included in **Table 6** and are consistent with EPA guidelines.

Where available, a full summary of results is provided in **Table 9** with comparison against the relevant Site Assessment Criteria (SAC). Laboratory certificates of analysis are provided in Appendix B and are discussed in detail within the relevant sections of this report.

**Table 6: Summary Table of Overflow Events**

Sample Date	pH	TSS	Ambient Temperature	Rainfall (mm) Previous 24Hrs
13/03/2023	7.9	17	24.7	38.2

### 6.2 FIELD TESTING

Field testing was conducted by ALS during sampling to record physical water parameters. A water quality meter is used to measure the following parameters in the field:

- Electrical Conductivity (Salinity);
- pH (Acidity) and

- Dissolved Oxygen (surface waters only).

## 6.3 PHYSICAL INDICATORS

### 6.3.1 Depth

#### *Groundwater*

Depth of ground water to top of casing (TOC) ranged between **0.53 mbgl** (BH-15, 02/03/2023) to **4.62 mbgl** (BH-14, 02/03/2023). Across the Site groundwater levels were generally consistent with historical data sets.

### 6.3.2 Temperature

#### *Groundwater*

Temperature of groundwater in the March 2023 monitoring period ranged between **18.3 degrees Celsius** (BH-4, 02/03/2023) and **24.8 degrees Celsius** (BH-1C, 02/03/2023).

Results are consistent with historical data.

#### *Surface Waters*

Surface water temperature at SWP-1 was **21.9 degrees Celsius** (01/03/2023). Results are consistent with historical data.

#### *Leachate*

Leachate Temperature at the leachate Tank (LP-1) was **24.8 degrees Celsius** (01/03/2023).

Results are consistent with historical data.

### 6.3.3 Salinity (EC & TDS)

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 ( $\mu\text{S/cm}$ ). Table 3.3.3 of the ANZECC (2000) guidelines document default TV for EC in lowland freshwater rivers between **125  $\mu\text{S/cm}$**  and **2,200  $\mu\text{S/cm}$**  (~1,500 mg/L).

#### *Groundwater*

During the March 2023 monitoring period, salinity ranged between; **601  $\mu\text{S/cm}$**  (BH-18, 02/03/2023) and **7,960  $\mu\text{S/cm}$**  (BH-1C, 02/03/2023). Four (4) monitoring points reported salinity values in excess of freshwater SAC of **2,200  $\mu\text{S/cm}$** , **7,960  $\mu\text{S/cm}$**  (BH-1c), **3,960  $\mu\text{S/cm}$**  (BH-9), **2,570  $\mu\text{S/cm}$**  (BH-15), **2,500  $\mu\text{S/cm}$**  (BH-21).

EC readings generally consistent with historical data.

#### *Surface Waters*

Electrical Conductivity results for onsite surface water (SWP-1, 01/03/2023) was **1,210  $\mu\text{S/cm}$**  which corresponds to a calculated Total Dissolved Solids result of **810 mg/L (Calculated Value)**. These results were below the TV.

Electrical conductivity for offsite surface waters ranged between **23,300  $\mu\text{S/cm}$**  (SWC-DOWN\_2, 01/03/2023) to **27,500  $\mu\text{S/cm}$**  (SWC-2, 01/03/2023).



Total Dissolved Solids (calculated) results for offsite surface waters located along Rocklow Creek ranged between **15,611 mg/L** (SWC-DOWN\_2, 01/03/2023) to **18,425 mg/L** (SWC- 2, 01/03/2023).

Results are consistent with historical data and typical of a tidal creek.

#### ***Leachate***

Salinity in leachate is expected to vary significantly with leachate concentration and stormwater dilution. Leachate salinity for March 2023 monitoring was **9,620 µS/cm** (LP1, 01/03/2023) which was above the TV. Results are consistent with previous data.

### **6.3.4 Dissolved Oxygen**

Levels of Dissolved Oxygen (DO) were measured in the field during sampling. 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 ANZECC (2000) 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.

#### ***Surface Waters***

Dissolved Oxygen at SWP-1 was **8.63 mg/L** (01/03/2023). SWP-1 was not discharging at the time of sampling and are consistent with previous data.

Dissolved Oxygen for the offsite surface waters at Rocklow Creek ranged from **4.16 mg/L** (SWC- 2, 01/03/2023) to **5.26 mg/L** (SWC-DOWN\_2, 01/03/2023). Results are generally consistent with a tidal creek passing through a mangrove swamp.

#### ***Leachate***

Dissolved oxygen at LP1 (Leachate Tank) was **5.66 mg/L** (01/03/2023). Results were consistent with previous data.

### **6.3.5 pH**

pH is a measure of hydrogen activity. pH determines the balance between positive hydrogen ions (H<sup>+</sup>) and negative hydroxyl ions (OH<sup>-</sup>) 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 marcasite grains (iron sulphide).

### **Groundwater**

Groundwater pH was reported between **pH 6.8** (BH-12r, BH-15 and BH-18, 02/03/2023) and **pH 7.5** (BH-19r 02/03/2023). All groundwater results were reported within the ANZECC recommended range of pH 6.5-8.0 and are generally consistent with historical data.

### **Surface Water**

The pH of the onsite surface water for the March 2023 monitoring period was reported at **pH 7.5** (SWP-1, 01/03/2023).

The pH of the offsite surface waters for the March 2023 monitoring period ranged between **pH 7.1**, (SWC\_UP, 01/03/2023) and **pH 7.3**, (SWC\_2 and SWC\_Down\_2, 01/02/2023) for sample locations associated with Rocklow Creek.

All surface water were reported within the ANZECC recommended range of pH 6.5-8.5 and are consistent with historical data.

### **Leachate**

Leachate pH was as reported as **pH 9.4** (LP-1, 01/03/2023). Results were reported above the ANZECC recommended range of pH 6.5-8.5. Leachate pH has generally been trending upward since September 2021.

## **6.3.6 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 reported for surface water only.

Concentrations for onsite surface waters during the March 2023 monitoring period were reported as **99 mg/L** (SWP\_1, 01/03/2023). Although the result is in breach of the EPA guideline of 50mg/L it should be noted that the sample point was not discharging at the time of sampling.

Concentrations for offsite surface waters during the March 2023 monitoring period were reported between **<5 mg/L** (for all sites, 01/03/2023).

With the exception of SWP-1, which was not discharging at the time of sampling, all TSS results were below the **50mg/L** TV and are generally consistent with historical results.

## **6.4 INORGANIC ANALYTES**

### **Nutrients**

Water samples were analysed for select nutrients including Ammonia, Ammonium, Nitrate and Nitrite. The most bio-available forms of Nitrogen are Ammonium (NH<sub>4</sub><sup>+</sup>) and Nitrate (NO<sub>3</sub><sup>-</sup>). 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.

### 6.4.1 Ammonia

A separate summary table for ammonia with a comparison against pH modified 95% trigger value is provided within **Table 10** attached.

#### **Groundwater**

Ammonia was measured within groundwater monitoring bores between **1.02 mg/L** (BH18, and **285 mg/L** (BH-1c). All groundwater wells exceeded the site assessment criteria for the March 2023 monitoring period. Results are generally consistent with historical values.

#### **Surface Water**

Ammonia in onsite surface water samples was reported as **0.03 mg/L** (SWP-1, 01/03/2023). The result for SWP-1 was below the adopted site assessment criteria.

Ammonia in offsite surface water samples associated with Rocklow Creek ranged from **0.07 mg/L** (SWC\_UP, 01/03/2023) to **0.25 mg/L** (SWC\_DOWN, 01/03/2023). All results were below the blanket ammonia TV of 0.91mg/L and pH modified TV's. However, the ammonia result for SWC\_DOWN was above the ecological stressor value of 0.2 mg/L.

#### **Leachate**

Ammonia in leachate was reported between **432mg/L** (LP1, 01/03/2023). Although high ammonia concentrations are expected in untreated leachate ammonia concentrations continue to trend down since the implementation of the new Leachate Treatment Plant and the subsequent disposal of treated leachate to sewer which commenced in July/August 2021.

### 6.4.2 Nitrate

#### **Groundwater**

Results for Nitrate in groundwater were reported between **<0.01 mg/L** in multiple bores and **9.68 mg/L** (BH-21, 02/03/2023). Although results generally continue to trend downward a total of two (2) groundwater wells reported exceedances above the TV of 0.7mg/L in the March 2023 monitoring period, including **3.2mg/L** (BH-3, 02/03/2023) and **9.68mg/L** (BH-14, 02/03/2023). It should be noted that the result for BH-14 is an unexpected outlier since the previous four (4) results were all **<0.001mg/L**.

#### **Surface Water**

The nitrate concentration of the onsite surface water SWP-1 in the March 2023 monitoring period was **<0.01 mg/L** (SWP-1; 01/03/2023).

Nitrate concentration for Rocklow Creek surface water samples in the March 2023 monitoring period ranged between **<0.01 mg/L** (SWC-2, SWC-DOWN, SWC-DOWN\_2, 01/03/2023) and **0.02 mg/L** (SWC\_UP; 01/03/2023).

All sites returned results below the 95% TV of **0.7mg/L** during the March 2023 monitoring period.

#### **Leachate**

The March 2023 Nitrate result of **<0.1mg/L** are typical of historical data and indicate that the higher results noted in both the September and March 2023 monitoring periods were likely due to matrix effects only as advised by the relevant ALS Laboratory report.

### 6.4.3 Nitrite

#### **Groundwater**

Results for Nitrate in groundwater were reported between **<0.01 mg/L** in multiple bores and **0.32 mg/L** (BH-21, 02/03/2023). Results generally continue to trend downward. No exceedances to the TV of 0.7mg/L in the March 2023 monitoring period.

#### **Surface Water**

During the March 2023 monitoring period surface water SWP-1 was reported as **<0.01 mg/L**. Results are generally consistent with previous data and below the accepted TV.

#### **Leachate**

The March 2023 result of **2.16 mg/L** appears to confirm that Leachate nitrite levels have been increasing since September 2022.

### Anions

### 6.4.4 Chloride

#### **Groundwater**

Results for Chloride in groundwater were reported between **29 mg/L** in (BH-19r, 02/03/2023) and **1,060 mg/L** (BH-1c, 02/03/2023). The results are consistent with historical data.

#### **Surface Water**

During the March 2023 monitoring period chloride results for surface water SWP-1 was **147 mg/L** (01/03/2023). The results are below the accepted TV and are generally consistent with historical data.

#### **Leachate**

Chloride at the Leachate Tank (LP-1) was **1,460 mg/L** (01/03/2023). Results are generally consistent with previous data.

### 6.4.5 Fluoride

#### **Groundwater**

Results for Fluoride in groundwater were reported between **<0.1 mg/L** (BH-4, 02/03/2023) and **0.6 mg/L** (BH-14, 02/03/2023). Results are consistent with historical data.

#### **Surface Water**

During the March 2023 monitoring period the fluoride result for Onsite surface water was **0.3 mg/L** (SWP-1, 2/12/2022). Results are generally consistent with historical data.

Offsite surface water results ranged from of **0.7 mg/L** (SWC\_UP and SWC\_DOWN\_2, 01/03/2023) and **0.8 mg/L** (SWC\_DOWN, SWC\_DOWN\_2, 2/12/2022). Results are generally consistent with historical data.

#### **Leachate**

The fluoride result at the Leachate tank (LP-1) was **0.2 mg/L** (01/03/2023). Results have been trending down since August 2018 and have stabilised at **0.2 mg/L**.

#### 6.4.6 Sulphate

##### **Groundwater**

Results for Sulphate in groundwater were reported between **10 mg/L** (BH-1C and BH-9, 02/03/2023) and **366 mg/L** (BH-15, 02/03/2023). Results are generally consistent with previous data.

##### **Surface Water**

Sulphate in onsite surface water was **53 mg/L** (SWP-1, 01/03/2023). Levels are consistent with previous data.

Sulphate in offsite surface water associated with Rocklow Creek ranged from **835 mg/L** (SWC\_DOWN\_2, 01/03/2023) and **1390 mg/L** (SWP\_2, 01/03/2023). Sulphate levels are generally consistent with previous data.

##### **Leachate**

Sulphate level at the leachate tank (LP-1) in the March 2023 monitoring period was **20 mg/L** (01/03/2023). Results are generally consistent with historical data.

#### 6.4.7 Total Alkalinity

##### **Surface Water**

Total Alkalinity at SWP-1 was **397 mg/L** (01/03/2023). Historical data indicates Alkalinity has been stable around a mean of **384.2 mg/L** with a variance of **167 mg/L** for the last five (5) quarters.

##### **Leachate**

Total Alkalinity in Leachate (LP-1) was **3,150 mg/L** (01/03/2023). Results are consistent with historical data.

#### 6.4.8 Bicarbonate Alkalinity

##### **Groundwater**

Bicarbonate in groundwaters ranged from **261 mg/L** (BH-4, 02/03/2023) to **2,650 mg/L** (BH-1C, 02/03/2023). Results are generally consistent with historical data.

#### Metals & Metalloids

#### 6.4.9 Manganese

##### **Groundwater**

Manganese was analysed as dissolved manganese in groundwater, total manganese in surface water and total manganese in leachate sampling points. Concentrations of dissolved manganese in groundwater for the March 2023 monitoring period were reported between **0.043 mg/L** (BH-22, 02/03/2023) and **0.663 mg/L** (BH-9, 02/03/2023). Results are generally consistent with historical data.

##### **Surface Water**

The total manganese concentration at SWP-1 was from **0.570 mg/L** (01/03/2023). Results are consistent with historical data.

### **Leachate**

Total Manganese concentrations in leachate was reported as **0.092 mg/L** (Leachate Tank LP-1, 01/03/2023).

Manganese concentrations for all samples are below the adopted TV (1.9 mg/L 95% of Species - freshwater) and are considered acceptable.

#### **6.4.10 Iron (Total Fe)**

Iron was measured as total Iron in selected surface water samples including SWP-1 and Leachate Tank.

##### **Surface Water**

Concentrations of total iron for onsite surface water was reported as **1.45 mg/L** (SWP-1, 01/03/2023). Results are generally consistent with historical data.

##### **Leachate**

Concentration of iron at the leachate Tank (LP-1) was reported between **1.24 mg/L** (01/03/2023). Results are generally consistent with historical data.

#### **6.4.11 Iron (Dissolved Fe)**

##### **Groundwater**

Dissolved iron was measured within selected groundwater and surface water sampling points. Groundwater results were reported between **0.06 mg/L** (BH22, 02/03/2023) and **12.4 mg/L** (BH1C, 02/03/2023). Results are generally consistent with historical data.

#### **6.4.12 Calcium**

Calcium was measured within selected groundwater and surface water sampling points.

##### **Groundwater**

Groundwater results were reported between **73 mg/L** (BH-19r, 02/03/2023) and **207 mg/L** (BH12r, 02/03/2023). Calcium levels are generally consistent with historical data.

##### **Surface Water**

Calcium in onsite surface was measured at **67 mg/L** (SWP-1, 01/03/2023). The result is generally consistent with previous data.

Calcium in offsite surface waters ranged from **180 mg/L** (SWC\_UP, 01/03/2023) to **201 mg/L** (SWC\_2, 01/03/2023). Although the Calcium levels in Rocklow Creek have been generally trending down since December 2019, all offsite surface water samples exhibited 3-5-fold increases in calcium levels during the December 2022 and March 2023 monitoring rounds.

##### **Leachate**

Calcium concentration in Leachate (LP-1) for the March 2023 monitoring period was **37 mg/L** (01/03/2023).

Historical observations indicate that calcium levels have been generally trending down since 2017.



### 6.4.13 Potassium

Potassium was measured within selected groundwater and surface water sampling points.

#### **Groundwater**

Groundwater results were reported between **11 mg/L** (BH-18, 02/03/2023) and **240 mg/L** (BH1c, 02/03/2023). The potassium levels for groundwaters are generally consistent with historical data.

#### **Surface Water**

During the March 2023 monitoring period potassium levels for the offsite groundwaters ex Rocklow Creek ranged from **159 mg/L** (SWC\_DOWN\_2, 01/03/2023) to **194 mg/L** (SWC\_2, 01/03/2023).

Potassium levels in the offsite surface waters remain consistent with the increased levels of December 2022.

## 6.5 ORGANIC ANALYTES

### 6.5.1 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.

TOC was reported during the March 2023 monitoring period at the following concentrations:

#### **Groundwater**

TOC levels ranged between **6 mg/L** (BH-19r; 02/03/2023) and **180 mg/L** (BH-1c; 02/03/2023). Results are consistent with historical data.

#### **Surface Water**

In the March 2023 monitoring period, the TOC levels in the onsite surface waters were determined as **24 mg/L** (SWP-1; 01/03/2023).

In the March 2023 monitoring period, the TOC levels in the offsite surface waters ranged between **<1 mg/L** (SWC-DOWN\_2; 01/03/2023) and **7 mg/L** (All other offsite surface water sites). The results are generally consistent with historical data.

#### **Leachate**

For the March 2023 monitoring period TOC concentration in leachate was **373 mg/L** (LP-1 Leachate Storage Tank 01/03/2023). The results are generally consistent with previous data

## 7.0 DUST GAUGE RESULTS

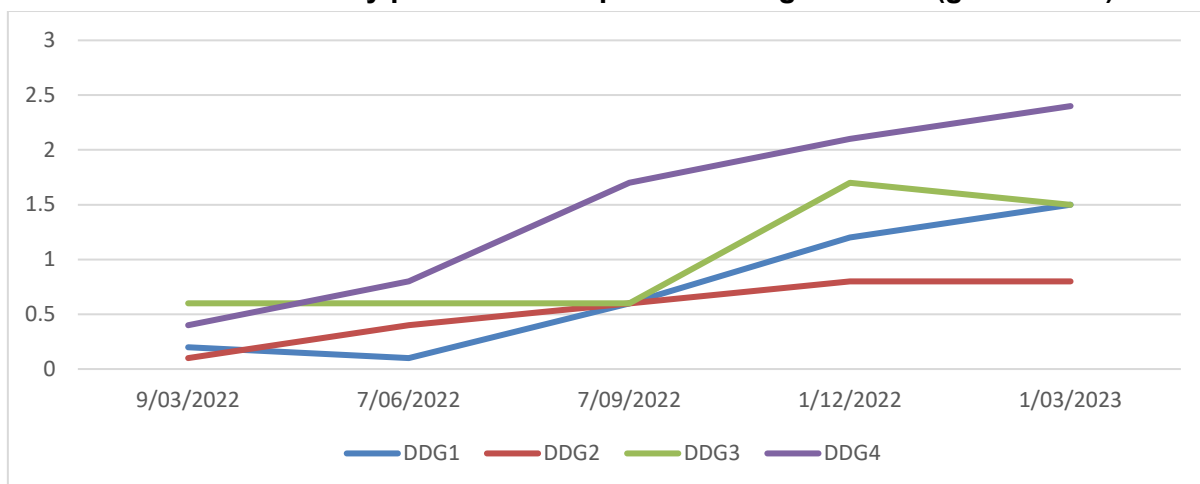
The below table provides the results of the dust depositions results. A total of four (4) dust collectors were onsite for one (1) month between **1<sup>st</sup> February 2023** and **1<sup>st</sup> March 2023**, in general accordance with AS3580.10.1. A summary of results is provided in **Table 7** below.

**Table 7: Summary of Dust Gauge Results**

Sample ID	Guideline Criteria (g/m <sup>2</sup> /month)	Total Insoluble Matter (g/m <sup>2</sup> /month)	Comments
DDG1	4	1.5	Satisfactory
DDG2		0.8	Satisfactory
DDG3		1.5	Satisfactory
DDG4		2.4	Satisfactory

Results for depositional dust during the March 2023 quarterly monitoring period reported levels of dust below the adopted assessment criteria of **4 g/m<sup>2</sup>/month**.

**Chart 1: Monthly plot of Dust Deposition Gauge Results (g.m<sup>2</sup>.month)**



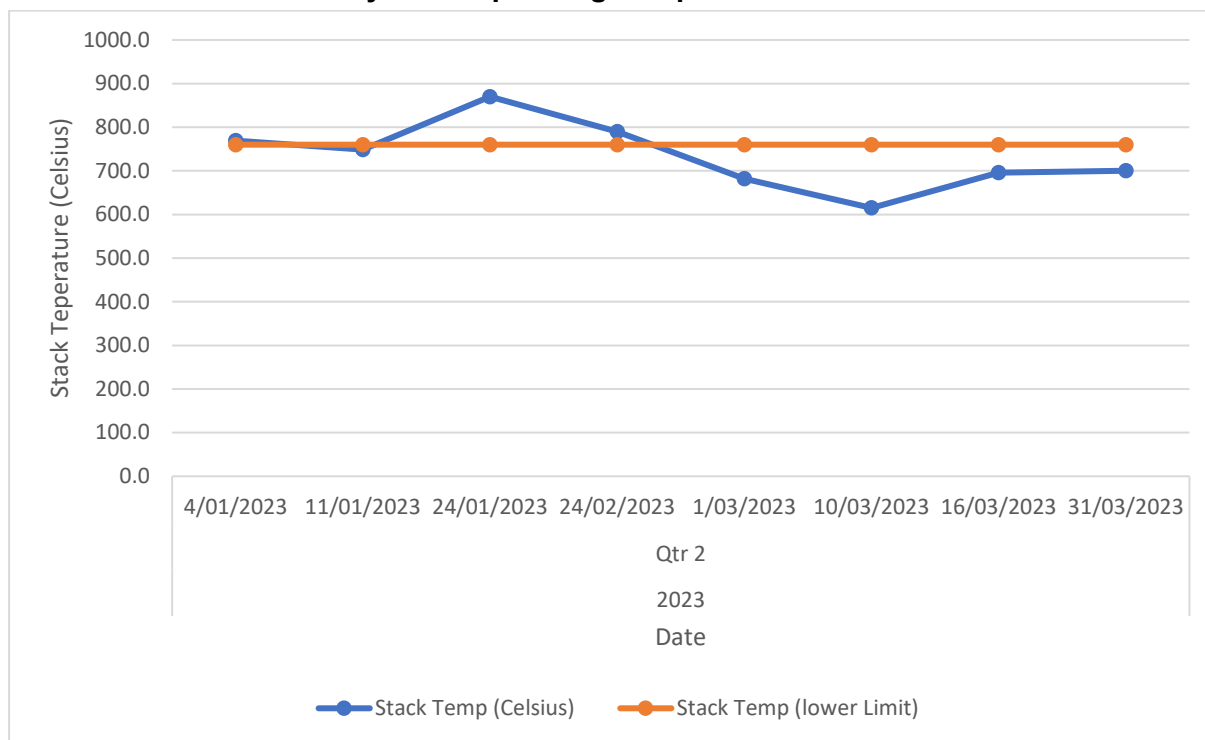
The results were considered satisfactory. Dust gauge locations are provided in **Figure 2** attached. It is recommended that monitoring is continued in accordance with EPL 5984.

**Table 8: Summary of Flare Operating Temperatures**

Years	Quarter	Date	Stack Temp (Celsius)	Stack Temp (lower Limit)
2023	Qtr 2	4/01/2023	769.0	760
		11/01/2023	749.0	760
		24/01/2023	870.0	760
		24/02/2023	790.0	760
		1/03/2023	682.0	760
		10/03/2023	615.0	760
		16/03/2023	696.0	760
		31/03/2023	700.0	760
2023 Q2 Total			5871.0	-

Data source: LGI (Jan-March 2023). Biogas Monthly Reports – Dunmore.

**Chart 2: Weekly Flare Operating Temperatures June Quarter 2022**



Data source: LGI (Jan-March 2023). Biogas Monthly Reports – Dunmore.

Weekly average operating temperatures supplied by LGI displayed typical variation associated with a continuous process. Weekly operating temperatures at the Flare fell below the Operational temperature Limit of 760 degrees on five (5) out of eight (8) occasions during the January-March 2023 monitoring period based on weekly summarise data.

The actions taken to address the root causes are outlined in the LGI Gas Flare reports included as **Appendix G**.

## 8.0 METHANE MONITORING

### 8.1 SURFACE GAS METHANE

The surface gas monitoring for the March 2023 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 March 2023 monitoring period *DID NOT* detect any levels of methane above the EPA license limits of 1% V/V. The results were considered satisfactory. A table of results is provided in Appendix D.

## 9.0 ENVIRONMENTAL ASSESSMENT

### 9.1 MONITORING POINT SUMMARY

Field measurements and NATA laboratory results for dust and methane results for the March 2023 monitoring period reported satisfactory results. Water results including leachate, groundwater, onsite and offsite surface water reported concentrations of analytes within the range historical values.

Data from the last four (4) years have been tabulated and presented **Charts 3-61** attached.

Groundwater and surface water within the Site boundary generally reported multiple high levels of analytes considered to be characteristic of landfill and leachate. Offsite sample locations within Rocklow Creek generally reported results consistent with previous monitoring events with a single exceedance of the stressor values for ammonia.

All dust gauges reported satisfactory results over the March 2023 monitoring period.

Results of surface methane gas monitoring recorded satisfactory results. The landfill surface cap was therefore considered intact and effective during the monitoring period.

Gas accumulation monitoring reported satisfactory results for all enclosed structures within 250m of emplaced waste or leachate storage facility.

Results for flare monitoring reported consistent temperature exceedances throughout the March 2023 monitoring period.

## **9.2 ENVIRONMENTAL MANAGEMENT**

### **9.2.1 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).

## **9.3 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 prior to each quarterly sampling events. Continue to review annual 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.

## **9.4 MONITORING PROGRAM**

The water, dust and surface methane monitoring program are required to demonstrate that Site activities are not generating any off-site pollution. The Site’s EPL’s and monitoring regime should be reviewed annually.

Review of the March 2023 monitoring results indicate no significant change in environmental conditions at the Site during the past 3 months. Future sampling events should continue to monitor the key indicators of leachate within surface and ground 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 holding time.

## 10.0 CONCLUSIONS

Based on the findings obtained during the March 2023 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, sulphate and salinity (EC) within all groundwater bores. This was considered to be consistent with historical values;
- A single exceedance in the surface water of Rocklow Creek was reported for ammonia above the ecological stressor values of 0.2mg/L;
- On five (5) out of eight (8) occasions, flare operating temperatures were below operating threshold target of 760 degrees during the monitoring period. Operations taken by the operator to address the root causes of the low Flare Stack temperatures are outlined in the monthly LGI reports attached as **Appendix G**;
- Surface gas methane monitoring reported satisfactory results all within the adopted assessment criteria;
- Gas accumulation monitoring reported satisfactory results for all enclosures tested within 250m of emplaced waste or leachate storage facility;
- Dust deposition gauges recorded satisfactory results below the guidelines provided in AS3580.10.1. Monitoring should continue in accordance with EPL 5984 requirements;
- Based on this review of the March 2023 monitoring period, contaminants associated with the landfill cell, leachate dam/s and general site uses are considered to be relatively consistent with the range of historical results;
- 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.



## 11.0 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 the site.

ENRS derived the data in this report primarily from visual inspections, examination of available records, interviews with individuals with information about the site, and if requested, 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 the 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.

This report has been prepared on behalf of and for the exclusive use of the Client, and is subject to and issued in connection with the provisions of the agreement between ENRS and the Client. ENRS accepts no liability or responsibility whatsoever and expressly disclaims any responsibility for or in respect of any use of or reliance upon this report by any third party or parties.

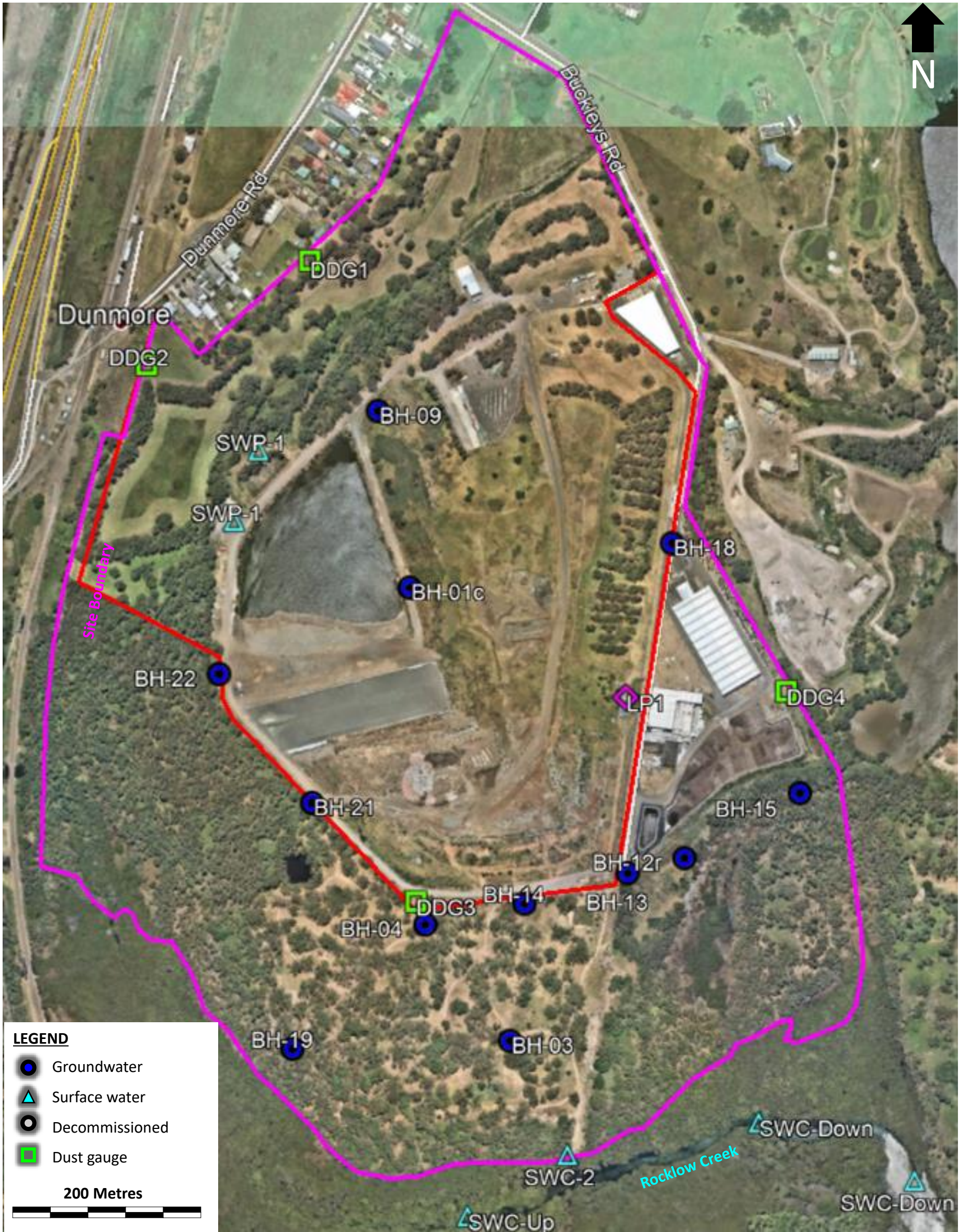
It is the responsibility of the Client to accept if the Client so chooses any recommendations contained within and implement them in an appropriate, suitable and timely manner.

## 12.0 REFERENCES

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# FIGURES





**LEGEND**

- Groundwater
- ▲ Surface water
- Decommissioned
- Dust gauge

**200 Metres**

<b>ENRS</b> Environment & Natural Resource Solutions 108 Jerry Bailey Road, Shoalhaven Heads, NSW, 2535 Tel: 02 4448 5490 Fax: 02 90374708 projects@enrs.com.au www.enrs.com.au	Client:	Shellharbour City Council	Drawn:	PL	Figure:	2
	Project:	ENRS0033	Source:	NearMaps	Date:	21/05/2021
	Location:	Dunmore Recycling & Waste Depot 44 Buckleys Rd, Dunmore, NSW	Scale:	NA	Title:	Site Plan
			Status:	Rev 2		





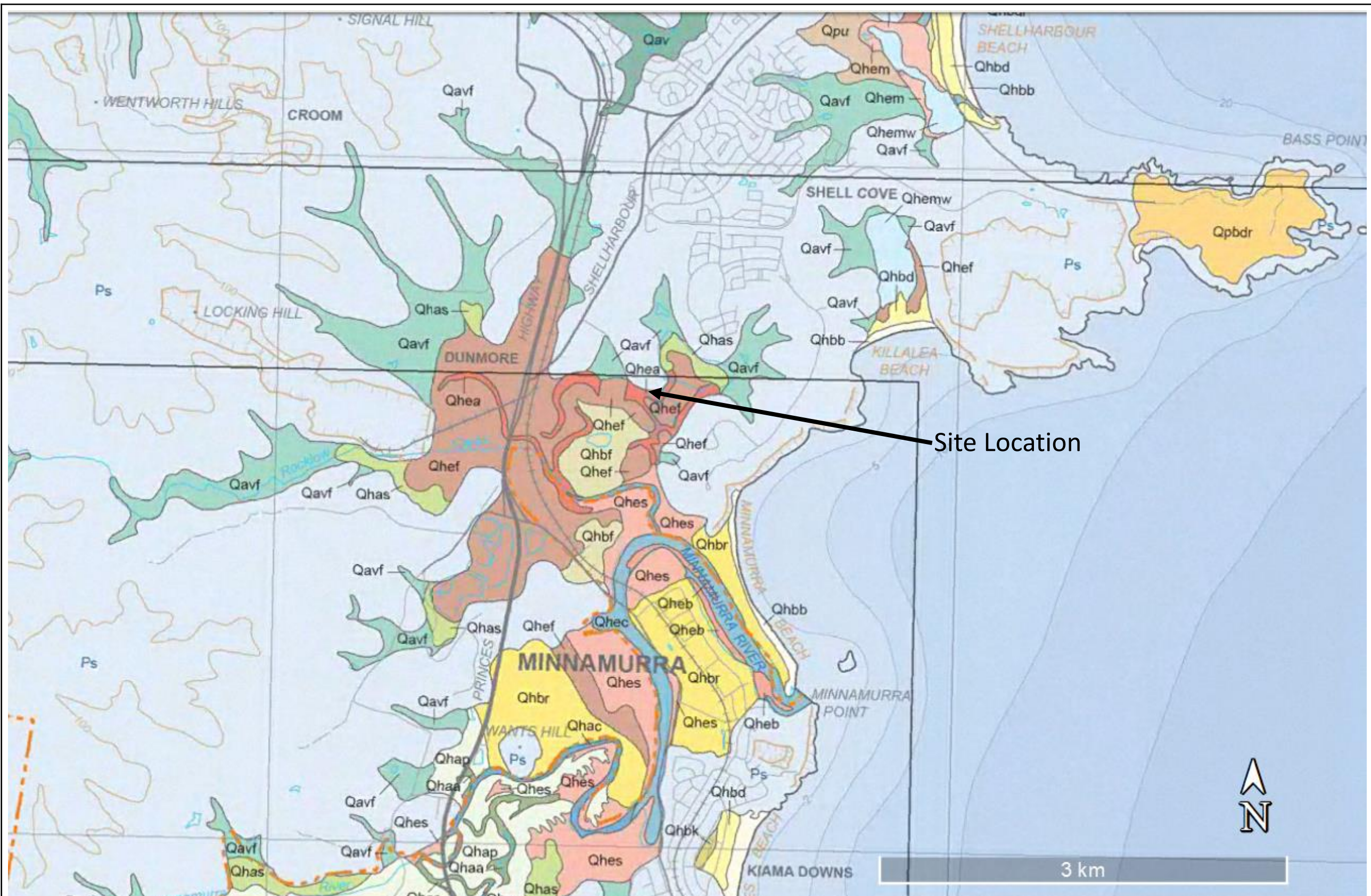
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Client:	Shellharbour City Council	Drawn:	PL	Figure:	3
Project:	ENRS0033	Source:	SixMaps	Date:	16/01/2020
Location:	Dunmore Recycling & Waste Depot 44 Buckleys Rd, Dunmore, NSW, 2529	Scale:	NA	Title:	Surface Gas Sample transects
		Status:	Rev 1		





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Client:	Shellharbour City Council	Drawn:	PL	Figure:	4
Project:	ENRS0033	Source:	Geological Survey of NSW	Date:	16/01/2020
Location:	Dunmore Recycling & Waste Depot 44 Buckleys Rd, Dunmore, NSW, 2529	Scale:	See figure	Title:	Site Geology
		Status:	Rev 1		





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Client:	Shellharbour City Council	Drawn:	PL	Figure:	5
Project:	ENRS0033	Source:	NSW Office of Water	Date:	16/01/2020
Location:	Dunmore Recycling & Waste Depot 44 Buckleys Rd, Dunmore, NSW, 2529	Scale:	NA	Title:	Registered Bores
		Status:	Rev 1		

# TABLES

**TABLE 9: Total Concentration Results**  
Quarterly Water Monitoring Results - March 2023: Dunmore Recycling and Waste Depot

GILs -Trigger Values for Freshwater (Protection of 95% of Species) <sup>A</sup>					-	-	-	-	-	1.9	-	-	-	0.9 (pH 8)	-	0.7	-	-	-	-	-	-	-	-	6.5 - 8.5	2200	-	-	
GILs -Trigger Values for Marine Water (Protection of 95% of Species) <sup>A</sup>					-	-	-	-	-	-	-	-	-	0.91 (pH 8)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Australian Drinking Water Guidelines (2018) <sup>C</sup>				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	-	-	-
ANZG (2018) 95% Stressor Value					-	-	-	-	-	-	-	-	-	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
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	-
EW2300850001	BH1c	Groundwater	3	2/03/2023	1,060	148			240	0.11		12.40	0.4	285	< 0.01	< 0.01	180	2,650	2,650	< 10					7.10	7,960	24.8	3.02	
EW2300850002	BH3	Groundwater	5	2/03/2023	140	134			36	0.07		0.18	0.2	11	0.14	3.20	17	318	318	143					7.30	1,230	18.5	3.10	
EW2300850003	BH4	Groundwater	6	2/03/2023	51	92			16	0.10		2.19	0.1	2	0.01	< 0.01	11	261	261	51					7.40	688	18.3	4.32	
EW2300850004	BH9	Groundwater	18	2/03/2023	382	183			88	0.66		0.81	0.4	122	< 0.01	0.02	64	1,760	1,760	< 10					7.20	3,690	18.8	3.09	
EW2300850005	BH12r	Groundwater	17	2/03/2023	174	207			28	0.55		9.67	0.2	4	< 0.01	< 0.01	20	619	619	208					6.80	1,670	19.7	4.23	
EW2300850006	BH13	Groundwater	10	2/03/2023	245	206			21	0.42		3.45	0.2	5	< 0.01	< 0.01	28	744	744	58					6.90	1,930	20.7	4.19	
EW2300850007	BH14	Groundwater	11	2/03/2023	30	96			14	0.11		0.55	0.6	1	< 0.01	< 0.01	13	359	359	73					7.00	762	20.0	4.62	
EW2300850008	BH15	Groundwater	7	2/03/2023	476	137			174	0.27		9.33	0.2	8	0.03	0.17	34	471	471	366					6.80	2,570	18.5	0.53	
EW2300850010	BH18	Groundwater	25	2/03/2023	31	80			11	0.14		2.02	0.2	1	< 0.01	< 0.01	14	272	272	< 10					6.80	601	20.8	2.10	
EW2300850009	BH19r	Groundwater	16	2/03/2023	29	73			41	0.06		0.89	0.2	2	0.02	< 0.01	6	339	339	26					7.50	638	18.3	4.52	
EW2300850011	BH21	Groundwater	23	2/03/2023	339	169			23	0.51		0.26	0.4	3	0.32	9.68	33	851	851	145					7.20	2,480	21.7	2.97	
EW2300850012	BH22	Groundwater	24	2/03/2023	240	113			39	0.04		0.06	0.4	35	< 0.01	< 0.01	29	651	651	223					7.50	2,250	18.5	2.60	
EW2300849001	SWP1	Surfacewater	1	2/03/2023	147	67	33	161	13	0.57	1.45	0.20	0.3	0.03	< 0.01	< 0.01	24	397	397	53	8.53		99	40.00	7.50	1,210	21.9		
EW2300849003	SWC_up	Surfacewater	20	2/03/2023	8,150	180	552	4,750	173	0.20	0.61	0.10	0.7	0.07	< 0.01	0.02	7	138	138	913	4.79		< 5	3.20	7.10	24,200	22.3		
EW2300849002	SWC_2	Surfacewater	19	2/03/2023	9,180	201	633	5,460	194	0.18	0.46	0.08	0.8	0.19	0.01	< 0.01	7	114	114	1,390	4.16		< 5	2.20	7.30	27,500	22.9		
EW2300849004	SWC_down	Surfacewater	21	2/03/2023	7,720	170	522	4,510	163	0.22	0.59	0.05	0.8	0.25	0.01	0.01	7	131	131	886	4.92		< 5	2.90	7.20	23,800	23.8		
EW2300849005	SWC_down_2	Surfacewater	22	2/03/2023	7,640	170	513	4,340	159	0.22	0.58	< 0.05	0.7	0.12	0.01	0.01	< 1	127	127	835	5.26		< 5	2.90	7.30	23,300	23.7		
EW2300847001	Leachate Storage Tank LP1	Leachate	2	2/03/2023	1,460	37			393	0.09	1.24		0.2	432	2.16	< 0.10	373	2,060	3,150	< 20	5.66	70.5			9.40	9,260	24.8		
EW2300849001	SWP1	Surfacewater	1	13/03/2023																			17		7.90				

**TABLE 10: Ammonia Results**  
**March 2023 Quarter: Dunmore Recycling and Waste Depot**

Ammonia Results compared against the pH Modified Trigger Values - ANZACC (2000) Table 8.3.7			pH	Assessment Criteria		Result	Comment
			pH (lab)	pH Modified Trigger Values - 95% Freshwater	pH Modified Trigger Values - 95% Marine Water	Ammonia As N	
Total Concentrations - PQL			0.1	-	-	0.01	
Lab Report No.	Sample ID.	Date	pH	mg/L	mg/L	mg/L	
EW2300850001	BH1c	2/03/2023	7.1	2.26	3.56	285	> TV
EW2300850002	BH3	2/03/2023	7.3	1.88	2.84	10.6	> TV
EW2300850003	BH4	2/03/2023	7.4	1.75	2.49	2	> TV
EW2300850004	BH9	2/03/2023	7.2	1.99	3.2	122	> TV
EW2300850005	BH12r	2/03/2023	6.8	2.33	4.55	4.24	> TV
EW2300850006	BH13	2/03/2023	6.9	2.26	4.24	5.31	> TV
EW2300850007	BH14	2/03/2023	7	2.18	3.91	1.18	< TV
EW2300850008	BH15	2/03/2023	6.8	2.33	4.55	8.12	> TV
EW2300850010	BH18	2/03/2023	6.8	2.33	4.55	1.02	< TV
EW2300850009	BH19r	2/03/2023	7.5	1.61	2.15	2.28	> TV
EW2300850011	BH21	2/03/2023	7.2	1.99	3.2	2.64	> TV
EW2300850012	BH22	2/03/2023	7.5	1.61	2.15	35	> TV
EW2300849001	SWP1	2/03/2023	7.5	1.61	2.15	0.03	< TV
EW2300849003	SWC_up	2/03/2023	7.1	2.09	3.56	0.07	< TV
EW2300849002	SWC_2	2/03/2023	7.3	1.88	2.84	0.19	< TV
EW2300849004	SWC_down	2/03/2023	7.2	1.99	3.2	0.25	< TV
EW2300849005	SWC_down_2	2/03/2023	7.3	1.88	2.84	0.12	< TV
EW2300847001	Leachate Storage Tank LP1	2/03/2023	9.4	0.21*	1.7	432	> TV

\* No guideline is provided for a pH of above 8.9. Therefore the TV for pH 8.9 was adopted.

**TABLE 11: Duplicate Groundwater Sample Results and QC Data**

Lab Report No.				EW2300850010	EW2300850013	RPD
Sample No.				BH18	GWDuplicate	
Sample type				Groundwater	GWQC	
EPA No,				25	QC1	
Date Sampled				2/03/2023	2/03/2023	
Analyte	Units	PQL	5 x PQL	Result	Result	
Chloride	mg/L	1	5	31	32	✓ 3.17
Calcium	mg/L	1	5	80	81	✓ 1.24
Potassium	mg/L	1	5	11	11	✓ 0.00
Manganese	mg/L	0.001	0.005	0.139	0.142	✓ 2.14
Dissolved Iron	mg/L	0.05	0.25	2.02	2.02	✓ 0.00
Fluoride	mg/L	0.1	0.5	0.20	0.20	✓ 0.00
Ammonia as N	mg/L	0.01	0.05	1.02	1.10	✓ 7.55
Nitrite as N	mg/L	0.01	0.05	< 0.01	< 0.01	✓ 0.00
Nitrate as N	mg/L	0.01	0.05	< 0.01	< 0.01	✓ 0.00
Nitrite + Nitrate as N	mg/L	0.01	0.05	< 0.01	< 0.01	✓ 0.00
Total Organic Carbon	mg/L	1	5	14	14	✓ 0.00
Bicarbonate Alkalinity as CaCO <sub>3</sub>	mg/L	1	5	272	281	✓ 3.25
Total Alkalinity as CaCO <sub>3</sub>	mg/L	1	5	272	281	✓ 3.25
Sulfate as SO <sub>4</sub> - Turbidimetric	mg/L	1	5	< 10	< 10	✓ 0.00
pH	pH	0.01	0.05	6.80	6.80	✓ 0.00
Electrical Conductivity (Non Compensated)	µS/cm	1	5	601	601	✓ 0.00
Temperature	°C	0.1	0.5	20.8	20.8	✓ 0.00
Standing Water Level	mbgl	-		2.10	2.10	✓ 0.00

**TABLE 12: Duplicate Surface Water Results and QC Data**

Lab Report No.				EW2300849001	EW2300849006	RPD
Sample No.				SWP1	SWDuplicate	
Sample type				Surfacewater	OffSiteSWQC	
EPA No,				1	QC2	
Date Sampled				1/03/2023	1/03/2023	
Analyte	Units	PQL	5 x PQL	Result	Result	
Chloride	mg/L	1	5	147	154	✓ 4.65
Calcium	mg/L	1	5	67	66	✓ 1.50
Potassium	mg/L	1	5	13	13	✓ 0.00
Manganese	mg/L	0.001	0.005	0.570	0.426	✓ 28.92
Total Iron	mg/L	0.05	0.25	1.45	1.33	✓ 8.63
Dissolved Iron	mg/L	0.05	0.25	0.20	0.19	✓ 5.13
Fluoride	mg/L	0.1	0.5	0.3	0.3	✓ 0.00
Ammonia as N	mg/L	0.01	0.05	0.03	0.01	✗ 100.00
Nitrite as N	mg/L	0.01	0.05	< 0.01	< 0.01	✓ 0.00
Nitrate as N	mg/L	0.01	0.05	< 0.01	0.01	✓ 0.00
Nitrite + Nitrate as N	mg/L	0.01	0.05	< 0.01	0.01	✓ 0.00
Total Organic Carbon	mg/L	1	5	24	16	✗ 40.00
Bicarbonate Alkalinity as CaCO <sub>3</sub>	mg/L	1	5	397	435	✓ 9.13
Total Alkalinity as CaCO <sub>3</sub>	mg/L	1	5	397	435	✓ 9.13
Sulfate as SO <sub>4</sub> - Turbidimetric	mg/L	1	5	53	54	✓ 1.87
Dissolved Oxygen	mg/L	0.01	0.05	8.53	8.51	✓ 0.23
pH	pH	0.01	0.05	7.50	7.70	✓ 2.63
Electrical Conductivity (Non Compensated)	µS/cm	1	5	1,210	1,210	✓ 0.00
Temperature	°C	0.1	0.5	21.9	21.9	✓ 0.00



# CHARTS

## Charts 3-18: Groundwater Charts

Chart 3: Ammonia as N (mg/L)

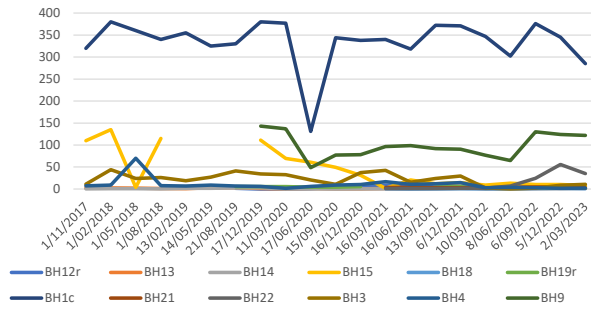


Chart 4: Bicarbonate Alkalinity as CaCO<sub>3</sub> (mg/L)

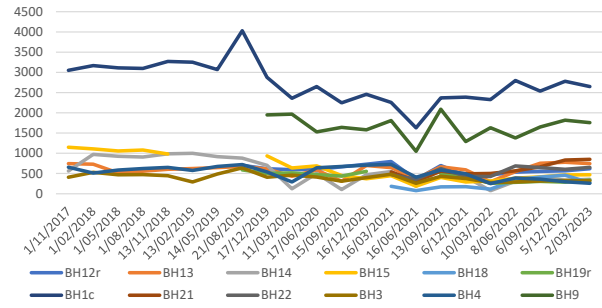


Chart 5: Calcium (mg/L)

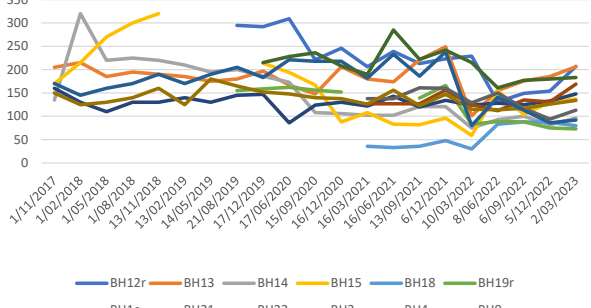


Chart 6: Chloride (mg/L)

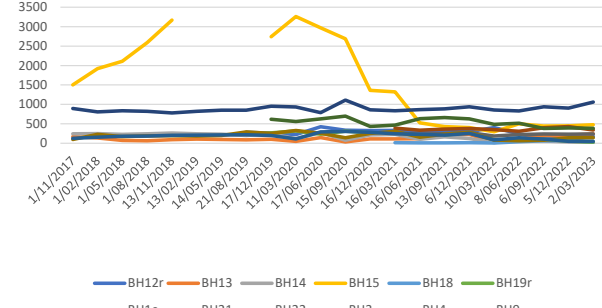


Chart 7: Depth to Water (mbgl TOC)

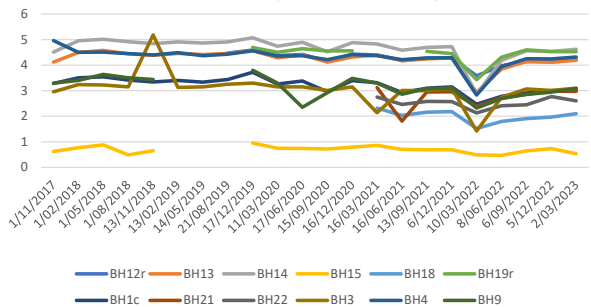


Chart 8: Dissolved Iron (mg/L)

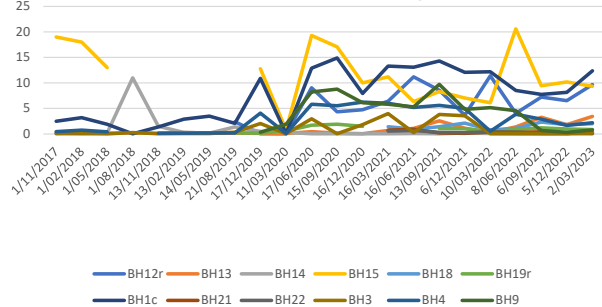


Chart 9: Electrical Conductivity (Us/cm)

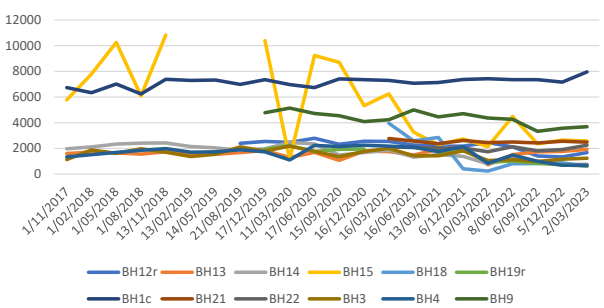


Chart 10: Fluoride (mg/L)

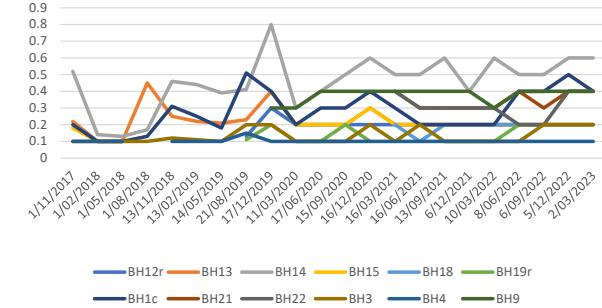


Chart 11: Manganese (mg/L)

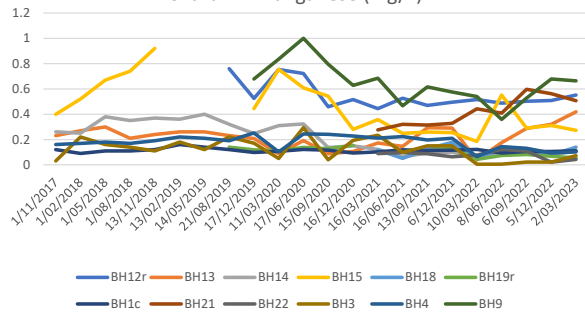


Chart 12: Nitrate as N (mg/L)

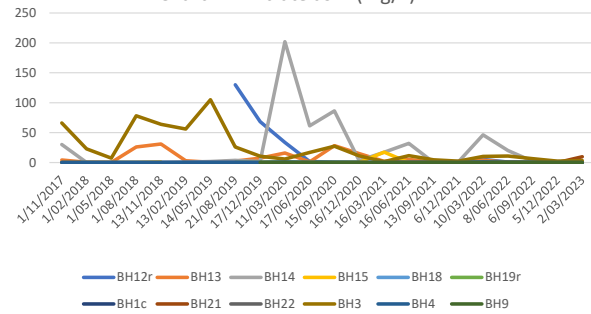


Chart 13: Nitrite as N (mg/L)

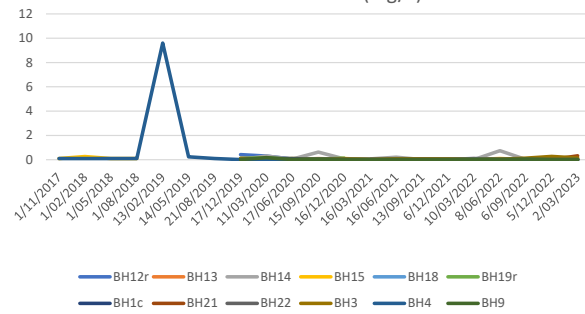


Chart 14: pH

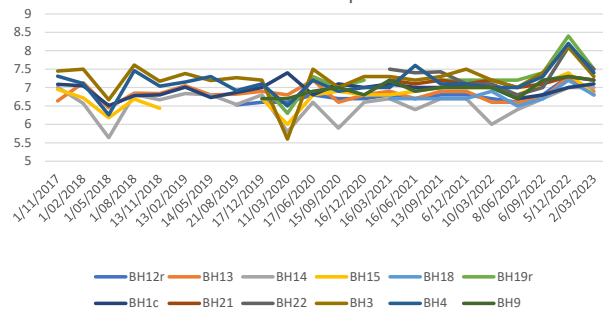


Chart 15: Potassium (mg/L)

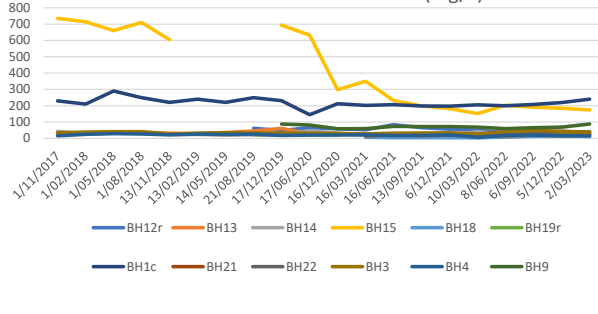


Chart 16: Sulphate (mg/L)

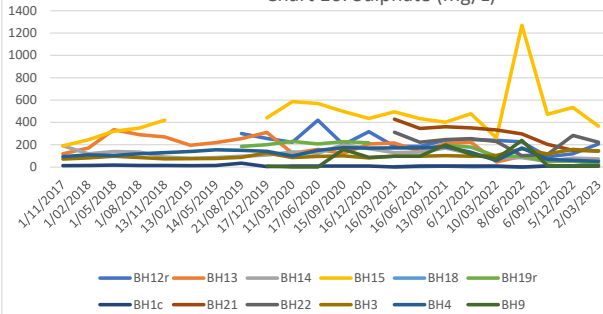


Chart 17: Temperature (Celsius)

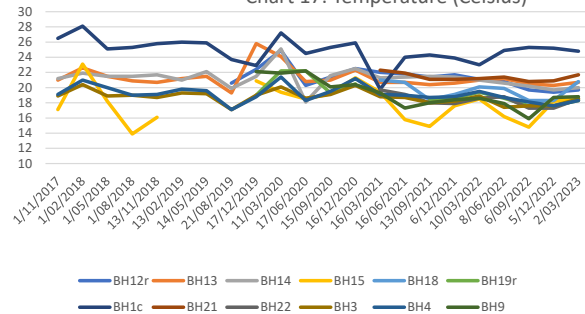
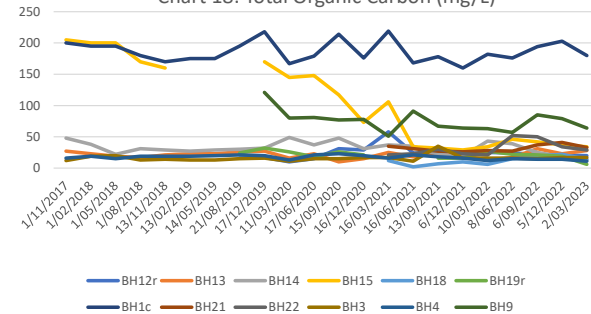


Chart 18: Total Organic Carbon (mg/L)



## Charts 19-34: Onsite Surface Water Charts

Chart 19: Ammonia as N (mg/L)

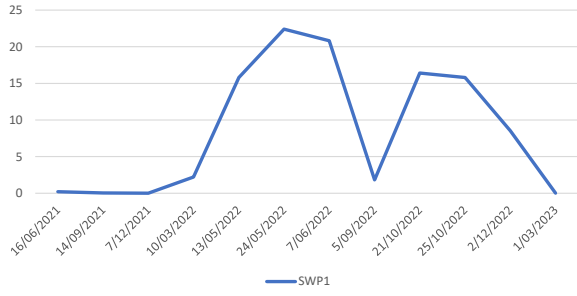


Chart 20: Calcium (mg/L)

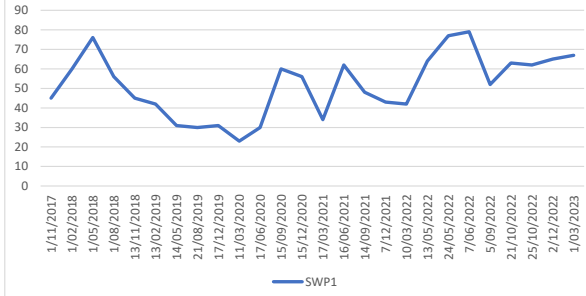


Chart 21: Chloride (mg/L)

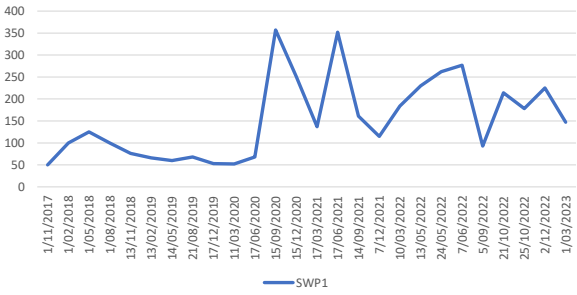


Chart 22: Fluoride (mg/L)

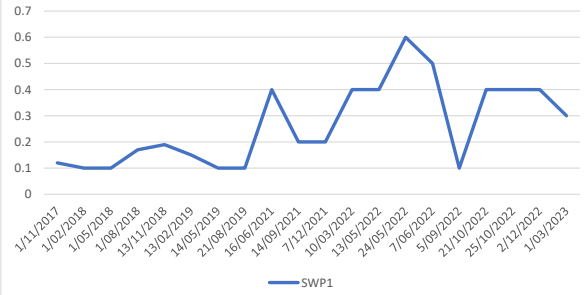


Chart 23: Dissolved Oxygen (mg/L)

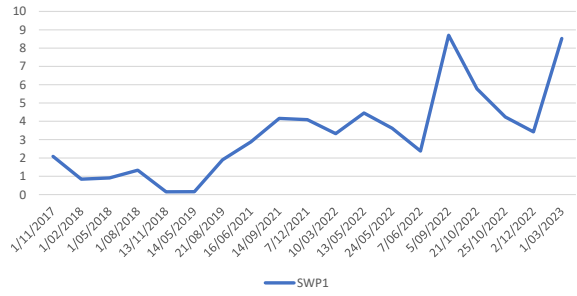


Chart 24: Electrical Conductivity (Us/cm)

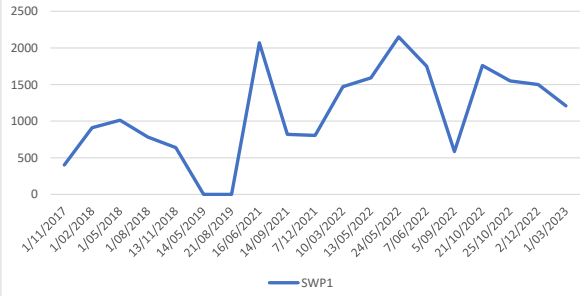


Chart 25: Manganese (mg/L)

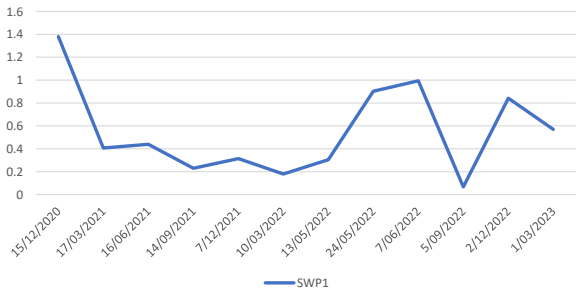
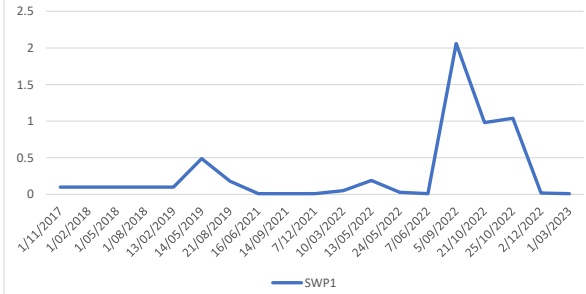
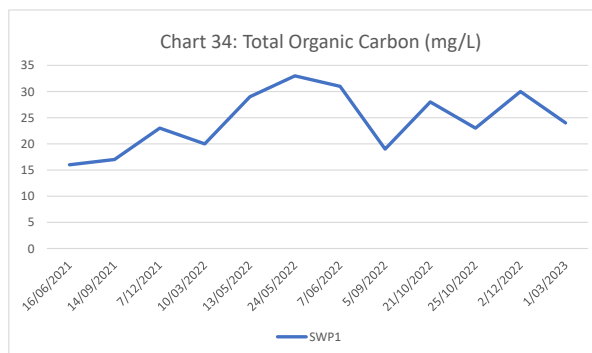
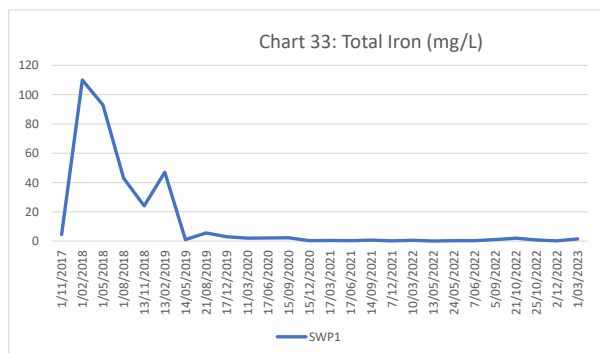
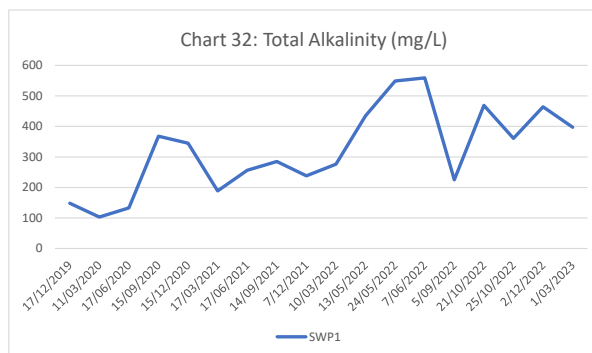
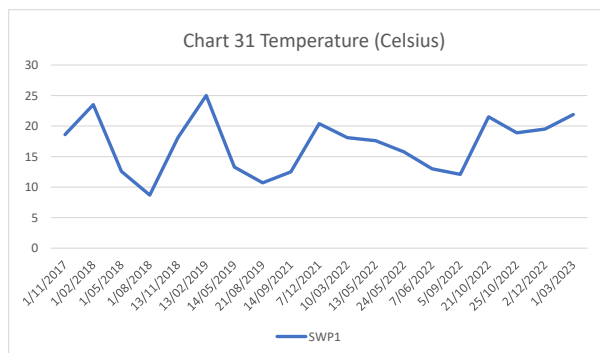
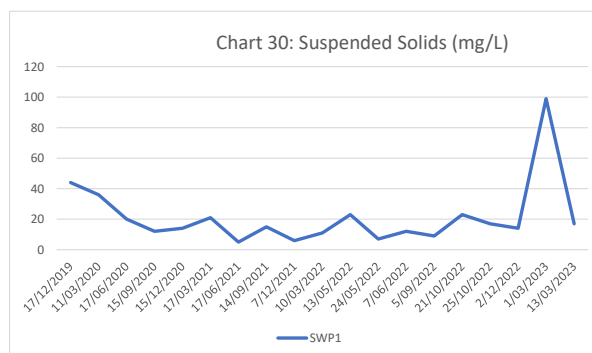
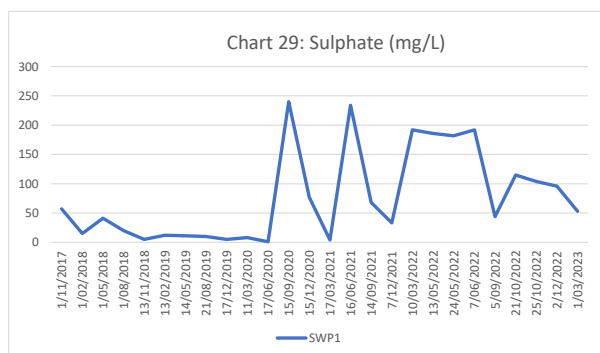
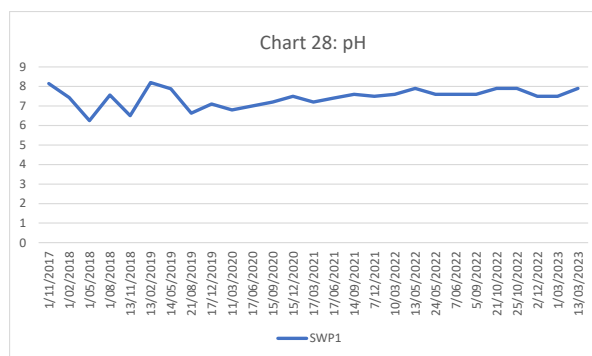
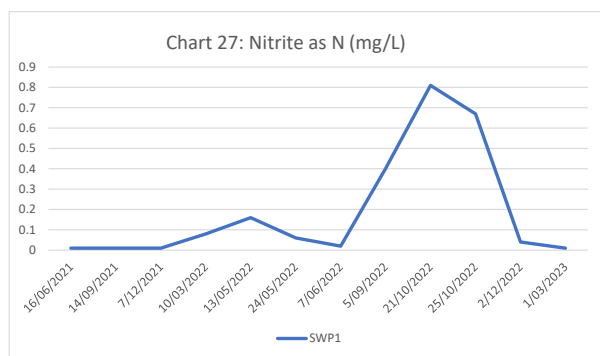


Chart 26: Nitrate as N (mg/L)





## Charts 35-46: Rocklow Creek Surface Water Charts

Chart 35: Ammonia as N (mg/L)

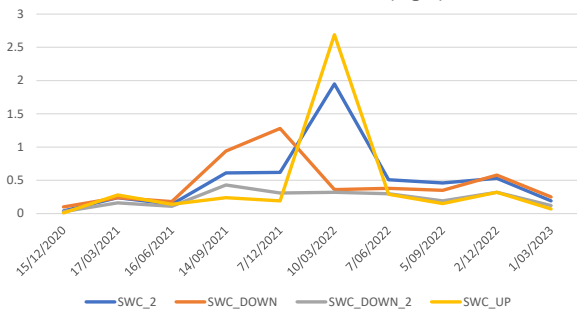


Chart 36: Calcium (mg/L)

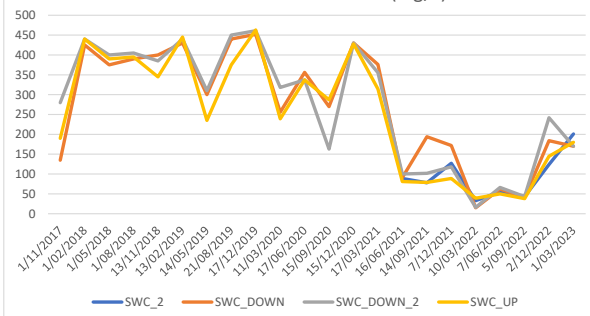


Chart 37: Dissolved Oxygen (mg/L)

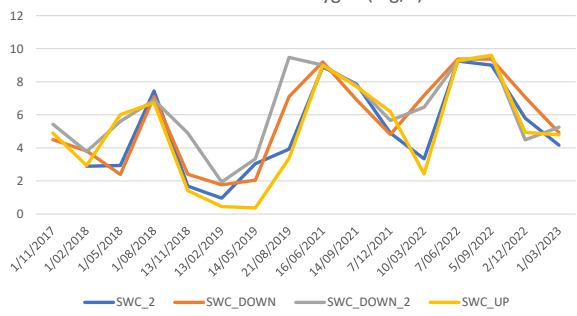


Chart 38: Electrical Conductivity (Us/cm)

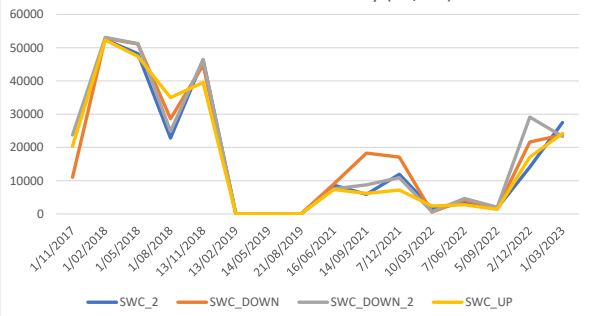


Chart 39: Fluoride (mg/L)

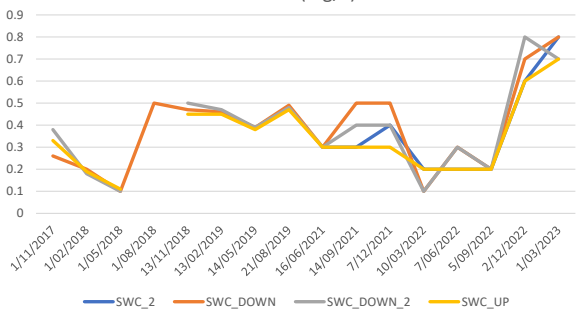


Chart 40: Nitrate as N (mg/L)

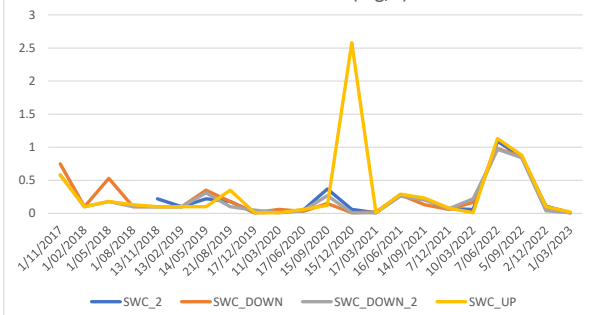


Chart 41: pH

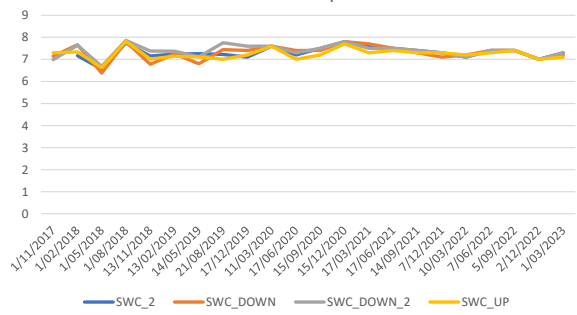
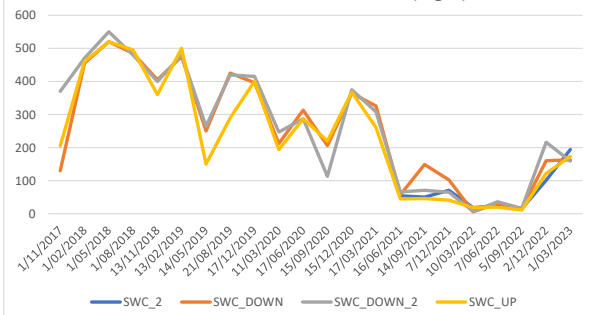
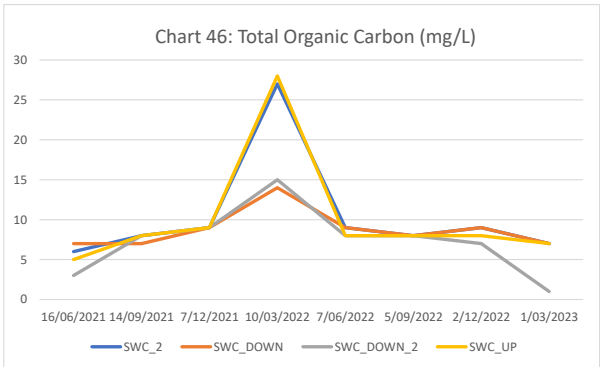
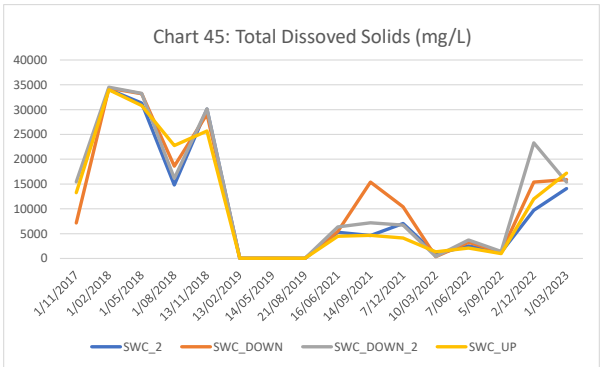
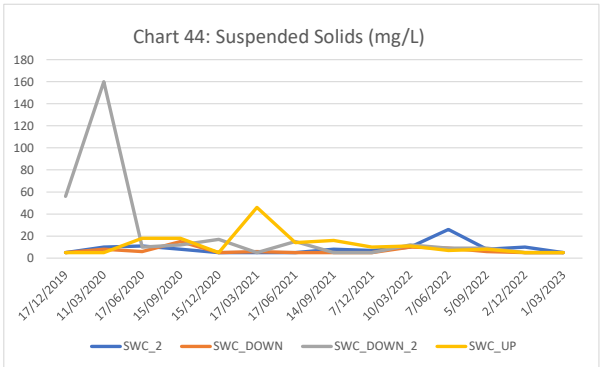
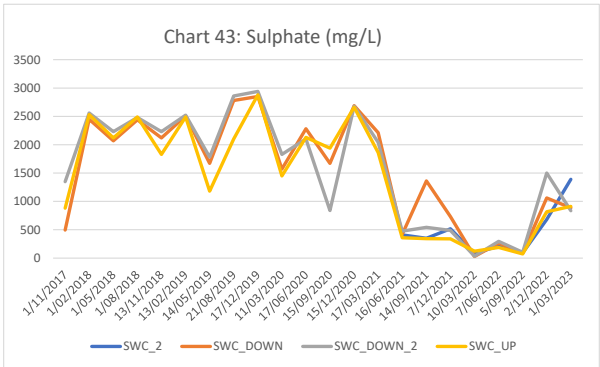


Chart 42: Potassium (mg/L)







## Charts 47-61 Leachate Water Quality Charts

Chart 47: Ammonia as N (mg/L)

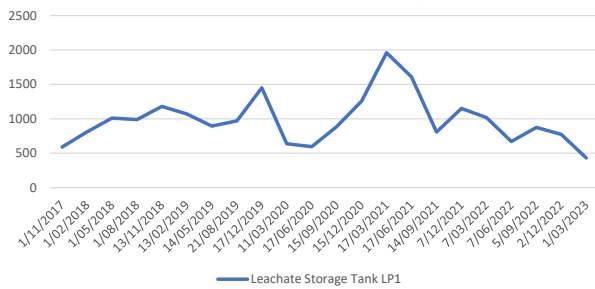


Chart 48: Calcium (mg/L)

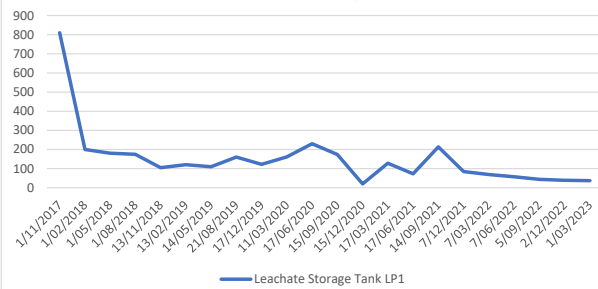


Chart 49: Chloride (mg/L)

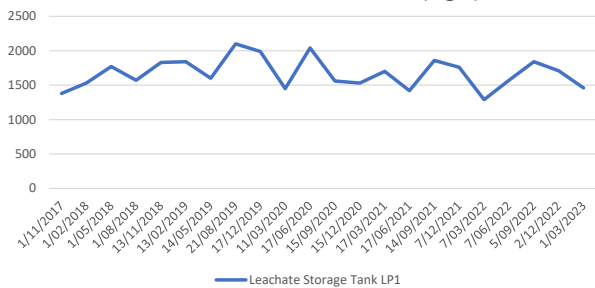


Chart 50: Dissolved Oxygen (mg/L)

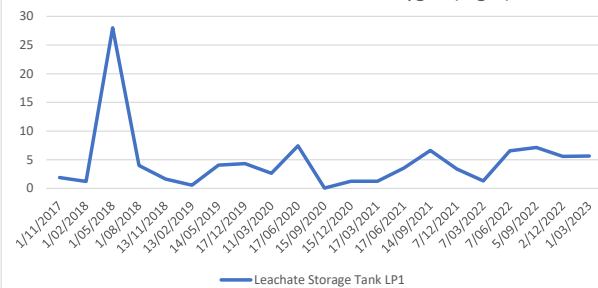


Chart 51: Electrical Conductivity (Us/cm)

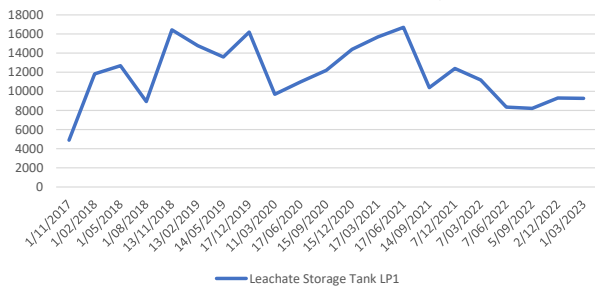


Chart 52: Fluoride (mg/L)

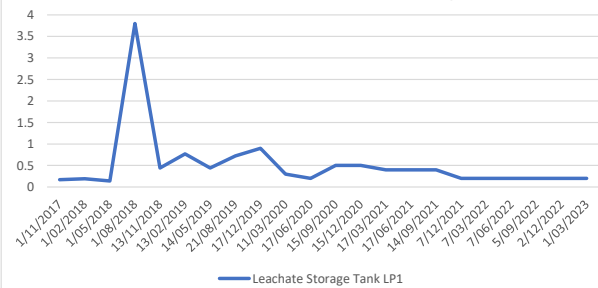


Chart 53: Manganese (mg/L)

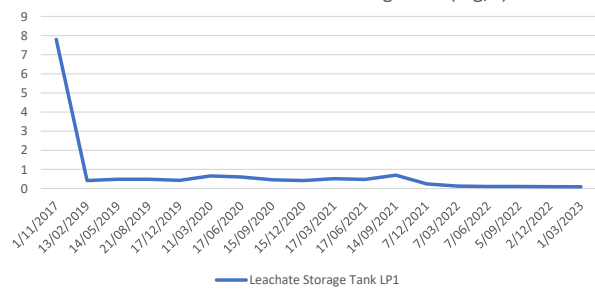
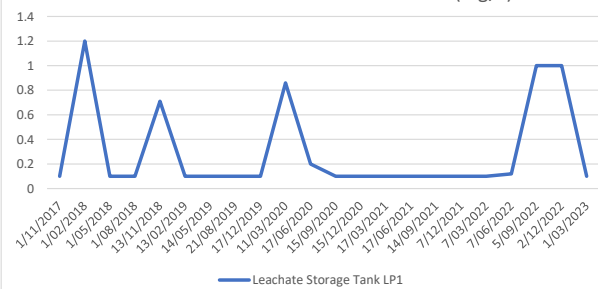
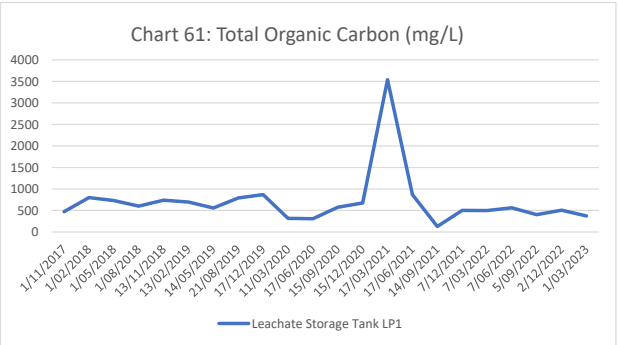
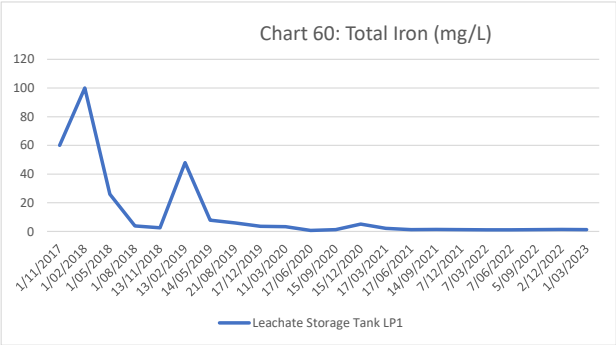
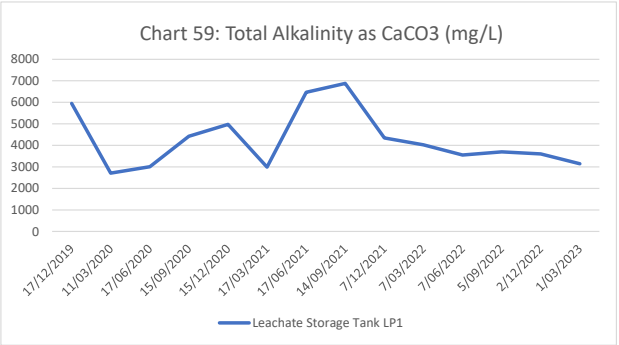
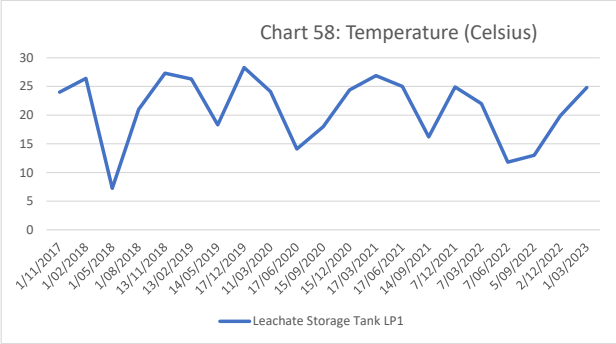
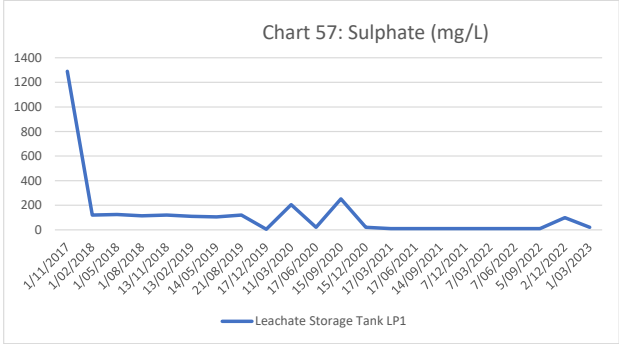
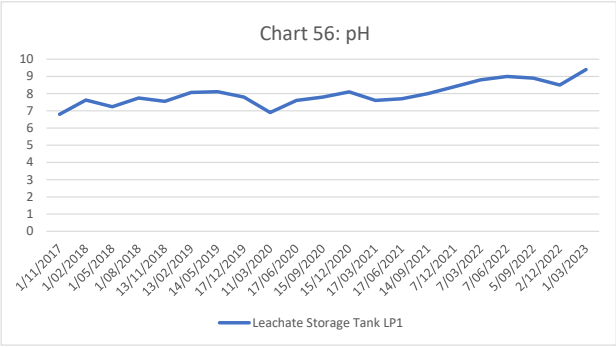
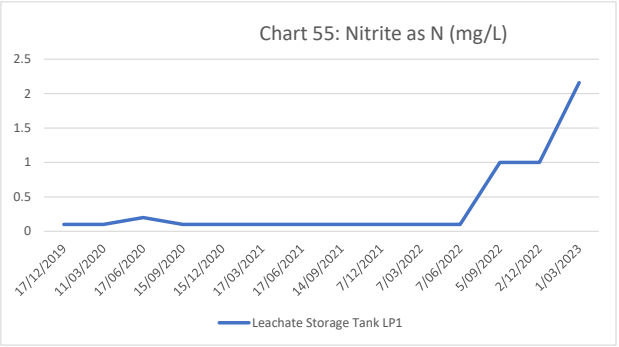


Chart 54: Nitrate as N (mg/L)





# APPENDICES

# Appendix A

## EPL 5984 Sampling Point Summary (NSW EPA, 10/02/2022)

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

ALS Laboratory: please tick →

☐ Sydney: 277 Woodpark Rd, Smithfield NSW 2176  
 Ph: 02 8794 8555 E: samples.sydney@alsenviro.com  
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304  
 Ph: 02 4969 0433 E: samples.newcastle@alsenviro.com

☐ Brisbane: 32 Shield St, Stafford QLD 4059  
 Ph: 07 3243 7232 E: samples.brisbane@alsenviro.com  
☐ Townsville: 14-15 Deanna Ct, Bohle QLD 4816  
 Ph: 07 4756 0500 E: townsville.environmental@alsenviro.com

☐ Melbourne: 2-4 Westall Rd, Springvale VIC 3171  
 Ph: 03 8549 9600 E: samples.melbourne@alsenviro.com  
☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5005  
 Ph: 08 8359 0896 E: adelaide@alsenviro.com

☐ Perth: 10 Hed Way, Molega WA 8009  
 Ph: 08 9239 7895 E: samples.perth@alsenviro.com  
☐ Launceston: 27 Wellington St, Launceston TAS 7250  
 Ph: 03 6331 2159 E: launceston@alsenviro.com

<b>CLIENT:</b>	Shellharbour City Council	<b>TURNAROUND REQUIREMENTS:</b>	<input type="checkbox"/> Standard TAT (List due date): <input type="checkbox"/> Non Standard or urgent TAT (List due date):
<b>OFFICE:</b>	41 Burrelli St WOLLONGONG NSW 2500	(Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	
<b>PROJECT:</b>	Dunmore Quarterly Ground Waters EPL	<b>ALS QUOTE NO.:</b>	WO/030/19 TENDER
<b>ORDER NUMBER:</b>		<b>COC SEQUENCE NUMBER (Circle)</b>	
<b>PROJECT MANAGER:</b>	Ryan Stirling	COC: 1 2 3 4 5 6 7	OF: 1 2 3 4 5 6 7
<b>SAMPLER:</b>	Robert Delia	<b>SAMPLER MOBILE:</b>	
<b>COC emailed to ALS? (YES / NO)</b>		<b>EDD FORMAT (or default):</b>	
<b>Email Reports to:</b>		<b>RELINQUISHED BY:</b>	Robert Delia
<b>Email Invoice to:</b>		<b>DATE/TIME:</b>	2.3.23
		<b>RECEIVED BY:</b>	Aneta
		<b>DATE/TIME:</b>	2.3.23
<b>COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:</b>	CC reports to:		


<b>FOR LABORATORY USE ONLY (Circle)</b>	
Custody Seal intact?	Yes No N/A
Free ice / frozen ice block present upon receipt?	Yes No N/A
Random Sample Temperature on Receipt:	5.7 °C
Other comment:	

Environmental Division  
 Wollongong  
 Work Order Reference  
**EW2300850**



Telephone : 02 42253125

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite pr Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).							
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	Ammonia	NT-2A (Alka, So4, Cl, F) Filtered Ca, K	TOC	Dissolved Fe & Mn	NT-4 (NO2, NO3)	Send to Eurofins		
	BH1C	2.3.23 11:40	W			✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	BH3	12:23	W			✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	BH4	13:15	W			✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	BH9	8:30	W			✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	BH12R	10:40	W			✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	BH13	10:55	W			✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	BH14	11:12	W			✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	BH15	10:05	W			✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	BH19R	12:55	W			✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp.& SWL
	BH18	9:00	W			✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	BH21	9:40	W			✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	BH22	12:10	W			✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	Duplicate	<del>18:05</del>	W	9:00		✓	✓	✓	✓	✓			Field Tests - pH, EC, Temp & SWL
	Triplicate	9:00	W	2nd							✓		
TOTAL					10								



Telephone : 02 42253125

**Water Container Codes:** P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic  
 V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;  
 Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

## CERTIFICATE OF ANALYSIS

**Work Order** : **EW2300850**  
**Client** : **SHELLHARBOUR CITY COUNCIL**  
**Contact** : Ryan Stirling  
**Address** : LAMERTON HOUSE, LAMERTON CRESCENT  
 SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529  
**Telephone** : ----  
**Project** : Dunmore Quarterly Groundwaters EPL  
**Order number** : 147649  
**C-O-C number** : ----  
**Sampler** : Robert DaLio  
**Site** : DUNMORE LANDFILL TENDER  
**Quote number** : WO/030/19 TENDER GROUNDWATERS  
**No. of samples received** : 14  
**No. of samples analysed** : 13

**Page** : 1 of 8  
**Laboratory** : Environmental Division NSW South Coast  
**Contact** : Aneta Prosaroski  
**Address** : 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia  
**Telephone** : +61 2 4225 3125  
**Date Samples Received** : 02-Mar-2023 15:40  
**Date Analysis Commenced** : 02-Mar-2023  
**Issue Date** : 14-Mar-2023 12:38



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
Aneta Prosaroski	Environmental Services Representative	Laboratory - Wollongong, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, 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 due to sample matrix
- It has been noted that Nitrite is greater than NOx, however this difference is within the limits of experimental variation sample #9
- EK057G/EK059G: It has been noted that Nitrite is greater than NOx on sample 3, however this difference is within the limits of experimental variation.
- 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 Via 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.



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH1C	BH3	BH4	BH9	BH12R
Sampling date / time					02-Mar-2023 01:40	02-Mar-2023 12:23	02-Mar-2023 13:15	02-Mar-2023 08:30	02-Mar-2023 10:40
Compound	CAS Number	LOR	Unit		EW2300850-001	EW2300850-002	EW2300850-003	EW2300850-004	EW2300850-005
					Result	Result	Result	Result	Result
<b>EA005FD: Field pH</b>									
pH	----	0.1	pH Unit		7.1	7.3	7.4	7.2	6.8
<b>EA010FD: Field Conductivity</b>									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		7960	1230	688	3690	1670
<b>EA116: Temperature</b>									
Temperature	----	0.5	°C		24.8	18.5	18.3	18.8	19.7
<b>ED037P: Alkalinity by PC Titrator</b>									
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		2650	318	261	1760	619
Total Alkalinity as CaCO3	----	1	mg/L		2650	318	261	1760	619
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		<10	143	51	<10	208
<b>ED045G: Chloride by Discrete Analyser</b>									
Chloride	16887-00-6	1	mg/L		1060	140	51	382	174
<b>ED093F: Dissolved Major Cations</b>									
Calcium	7440-70-2	1	mg/L		148	134	92	183	207
Potassium	7440-09-7	1	mg/L		240	36	16	88	28
<b>EG020F: Dissolved Metals by ICP-MS</b>									
Manganese	7439-96-5	0.001	mg/L		0.111	0.072	0.103	0.663	0.552
Iron	7439-89-6	0.05	mg/L		12.4	0.18	2.19	0.81	9.67
<b>EK040P: Fluoride by PC Titrator</b>									
Fluoride	16984-48-8	0.1	mg/L		0.4	0.2	0.1	0.4	0.2
<b>EK055G: Ammonia as N by Discrete Analyser</b>									
Ammonia as N	7664-41-7	0.01	mg/L		285	10.6	2.00	122	4.24
<b>EK057G: Nitrite as N by Discrete Analyser</b>									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	0.14	0.01	<0.01	<0.01
<b>EK058G: Nitrate as N by Discrete Analyser</b>									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	3.20	<0.01	0.02	<0.01
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	3.34	<0.01	0.02	<0.01
<b>EP005: Total Organic Carbon (TOC)</b>									
Total Organic Carbon	----	1	mg/L		180	17	11	64	20



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH1C	BH3	BH4	BH9	BH12R
Sampling date / time					02-Mar-2023 01:40	02-Mar-2023 12:23	02-Mar-2023 13:15	02-Mar-2023 08:30	02-Mar-2023 10:40
Compound	CAS Number	LOR	Unit		EW2300850-001	EW2300850-002	EW2300850-003	EW2300850-004	EW2300850-005
					Result	Result	Result	Result	Result
QWI-EN 67.11 Sampling of Groundwaters									
Standing Water Level	----	0.01	m AHD		3.02	3.10	4.32	3.09	4.23



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH13	BH14	BH15	BH19R	BH18
Sampling date / time					02-Mar-2023 10:55	02-Mar-2023 11:12	02-Mar-2023 10:05	02-Mar-2023 12:55	02-Mar-2023 09:00
Compound	CAS Number	LOR	Unit		EW2300850-006	EW2300850-007	EW2300850-008	EW2300850-009	EW2300850-010
				Result	Result	Result	Result	Result	Result
<b>EA005FD: Field pH</b>									
pH	----	0.1	pH Unit		6.9	7.0	6.8	7.5	6.8
<b>EA010FD: Field Conductivity</b>									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		1930	762	2570	638	601
<b>EA116: Temperature</b>									
Temperature	----	0.5	°C		20.7	20.0	18.5	18.3	20.8
<b>ED037P: Alkalinity by PC Titrator</b>									
Hydroxide Alkalinity as CaCO <sub>3</sub>	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO <sub>3</sub>	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO <sub>3</sub>	71-52-3	1	mg/L		744	359	471	339	272
Total Alkalinity as CaCO <sub>3</sub>	----	1	mg/L		744	359	471	339	272
<b>ED041G: Sulfate (Turbidimetric) as SO<sub>4</sub> 2- by DA</b>									
Sulfate as SO <sub>4</sub> - Turbidimetric	14808-79-8	1	mg/L		58	73	366	26	<10
<b>ED045G: Chloride by Discrete Analyser</b>									
Chloride	16887-00-6	1	mg/L		245	30	476	29	31
<b>ED093F: Dissolved Major Cations</b>									
Calcium	7440-70-2	1	mg/L		206	96	137	73	80
Potassium	7440-09-7	1	mg/L		21	14	174	41	11
<b>EG020F: Dissolved Metals by ICP-MS</b>									
Manganese	7439-96-5	0.001	mg/L		0.419	0.107	0.273	0.055	0.139
Iron	7439-89-6	0.05	mg/L		3.45	0.55	9.33	0.89	2.02
<b>EK040P: Fluoride by PC Titrator</b>									
Fluoride	16984-48-8	0.1	mg/L		0.2	0.6	0.2	0.2	0.2
<b>EK055G: Ammonia as N by Discrete Analyser</b>									
Ammonia as N	7664-41-7	0.01	mg/L		5.31	1.18	8.12	2.28	1.02
<b>EK057G: Nitrite as N by Discrete Analyser</b>									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	0.03	0.02	<0.01
<b>EK058G: Nitrate as N by Discrete Analyser</b>									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	<0.01	0.17	<0.01	<0.01
<b>EK059G: Nitrite plus Nitrate as N (NO<sub>x</sub>) by Discrete Analyser</b>									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	<0.01	0.20	0.01	<0.01
<b>EP005: Total Organic Carbon (TOC)</b>									
Total Organic Carbon	----	1	mg/L		28	13	34	6	14





Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH13	BH14	BH15	BH19R	BH18
Sampling date / time					02-Mar-2023 10:55	02-Mar-2023 11:12	02-Mar-2023 10:05	02-Mar-2023 12:55	02-Mar-2023 09:00
Compound	CAS Number	LOR	Unit		EW2300850-006	EW2300850-007	EW2300850-008	EW2300850-009	EW2300850-010
					Result	Result	Result	Result	Result
QWI-EN 67.11 Sampling of Groundwaters									
Standing Water Level	----	0.01	m AHD		4.19	4.62	0.53	4.52	2.10



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH21	BH22	Duplicate	----	----
Sampling date / time					02-Mar-2023 09:40	02-Mar-2023 12:10	02-Mar-2023 09:00	----	----
Compound	CAS Number	LOR	Unit		EW2300850-011	EW2300850-012	EW2300850-013	-----	-----
				Result	Result	Result	Result	----	----
<b>EA005FD: Field pH</b>									
pH	----	0.1	pH Unit		7.2	7.5	6.8	----	----
<b>EA010FD: Field Conductivity</b>									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		2480	2250	601	----	----
<b>EA116: Temperature</b>									
Temperature	----	0.5	°C		21.7	18.5	20.8	----	----
<b>ED037P: Alkalinity by PC Titrator</b>									
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		851	651	281	----	----
Total Alkalinity as CaCO3	----	1	mg/L		851	651	281	----	----
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		145	223	<10	----	----
<b>ED045G: Chloride by Discrete Analyser</b>									
Chloride	16887-00-6	1	mg/L		339	240	32	----	----
<b>ED093F: Dissolved Major Cations</b>									
Calcium	7440-70-2	1	mg/L		169	113	81	----	----
Potassium	7440-09-7	1	mg/L		23	39	11	----	----
<b>EG020F: Dissolved Metals by ICP-MS</b>									
Manganese	7439-96-5	0.001	mg/L		0.507	0.043	0.142	----	----
Iron	7439-89-6	0.05	mg/L		0.26	0.06	2.02	----	----
<b>EK040P: Fluoride by PC Titrator</b>									
Fluoride	16984-48-8	0.1	mg/L		0.4	0.4	0.2	----	----
<b>EK055G: Ammonia as N by Discrete Analyser</b>									
Ammonia as N	7664-41-7	0.01	mg/L		2.64	35.0	1.10	----	----
<b>EK057G: Nitrite as N by Discrete Analyser</b>									
Nitrite as N	14797-65-0	0.01	mg/L		0.32	<0.01	<0.01	----	----
<b>EK058G: Nitrate as N by Discrete Analyser</b>									
Nitrate as N	14797-55-8	0.01	mg/L		9.68	<0.01	<0.01	----	----
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>									
Nitrite + Nitrate as N	----	0.01	mg/L		10.0	<0.01	<0.01	----	----
<b>EP005: Total Organic Carbon (TOC)</b>									
Total Organic Carbon	----	1	mg/L		33	29	14	----	----



## Analytical Results

Sub-Matrix: <b>WATER</b> (Matrix: <b>WATER</b> )				Sample ID	BH21	BH22	Duplicate	----	----
Sampling date / time					02-Mar-2023 09:40	02-Mar-2023 12:10	02-Mar-2023 09:00	----	----
Compound	CAS Number	LOR	Unit		EW2300850-011	EW2300850-012	EW2300850-013	-----	-----
					Result	Result	Result	----	----
QWI-EN 67.11 Sampling of Groundwaters									
Standing Water Level				----	0.01	m AHD	2.97	2.60	2.10
								----	----

## 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

ALS Laboratory: please tick →

☐ Sydney: 277 Woodpark Rd, Smithfield NSW 2176  
Ph: 02 9754 8555 E: samples.sydney@alsenviro.com  
☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304  
Ph: 02 4968 9433 E: samples.newcastle@alsenviro.com

☐ Brisbane: 32 Shand St, Stafford QLD 4053  
Ph: 07 3243 7222 E: samples.brisbane@alsenviro.com  
☐ Townsville: 14-15 Desma Ct, Bohle QLD 4818  
Ph: 07 4796 0600 E: townsville.environmental@alsenviro.com

☐ Melbourne: 2-4 Westall Rd, Springvale VIC 3171  
Ph: 03 8549 9800 E: samples.melbourne@alsenviro.com  
☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5095  
Ph: 08 8359 0590 E: adelaide@alsenviro.com

☐ Perth: 10 Hod Way, Malaga WA 6090  
Ph: 08 9209 7655 E: samples.perth@alsenviro.com  
☐ Launceston: 27 Wellington St, Launceston TAS 7250  
Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT:	Shellharbour City Council	TURNAROUND REQUIREMENTS:	<input type="checkbox"/> Standard TAT (List due date): (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)		<input type="checkbox"/> Non Standard or urgent TAT (List due date):		FOR LABORATORY USE ONLY (Circle)	
OFFICE:	41 Burelli St WOLLONGONG NSW 2500	ALS QUOTE NO.:	WO/030/19 TENDER		COC SEQUENCE NUMBER (Circle)		Custody Seal Intact? Yes No	
PROJECT:	Dunmore Quarterly Surface Waters EPL				COC:		Free ice/frozen ice bricks present upon receipt? Yes No	
ORDER NUMBER:					OF:		Random Sample Temperature on Receipt: 10.4 °C	
PROJECT MANAGER:	Ryan Stirling						Other comments:	
SAMPLER:	Robert Dattis	SAMPLER MOBILE:			RELINQUISHED BY:	RECEIVED BY:		
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):			DATE/TIME:	DATE/TIME:		
Email Reports to:					1.3.23	1.3.23		
Email Invoice to:								
COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: CC reports to:								

ALS USE ONLY		SAMPLE DETAILS MATRIX: Solid(S) Water(W)		CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).							Additional Information	
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	TSS	NT-1, NT-2A (Tonic Balance)	TOC, NT-4, NH3, Total Mn	Dissolved and Total Fe	Turbidity	NH3, NH4 & NO3	TSS, TDS, TOC, Total Mn	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.	
	SWP1	1.3.23 10:05	W			✓	✓	✓	✓				Field Tests - pH, EC, DO & Temp	
	SWC_2	10:45	W				✓		✓	✓	✓	✓	Field Tests - pH, EC, DO & Temp	
	SWC_UP	11:00	W				✓		✓	✓	✓	✓	Field Tests - pH, EC, DO & Temp	
	SWC_DOWN	11:30	W				✓		✓	✓	✓	✓	Field Tests - pH, EC, DO & Temp	
	SWC_DOWN_2	11:40	W				✓		✓	✓	✓	✓	Field Tests - pH, EC, DO & Temp	
	Duplicate	10:05	W				✓		✓	✓	✓	✓	Field Tests - pH, EC, DO & Temp	
TOTAL						10								

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved; V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

Environmental Division  
Wollongong  
Work Order Reference  
**EW2300849**



ISS:

Telephone : 02 42263125

## CERTIFICATE OF ANALYSIS

**Work Order** : **EW2300849**  
**Client** : **SHELLHARBOUR CITY COUNCIL**  
**Contact** : Ryan Stirling  
**Address** : LAMERTON HOUSE, LAMERTON CRESCENT  
 SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529  
**Telephone** : ----  
**Project** : Dunmore Quarterly Surface Water EPL  
**Order number** : 147649  
**C-O-C number** : ----  
**Sampler** : Robert DaLio  
**Site** : DUNMORE LANDFILL TENDER  
**Quote number** : WO/030/19 TENDER SURFACE WATER  
**No. of samples received** : 6  
**No. of samples analysed** : 6

**Page** : 1 of 7  
**Laboratory** : Environmental Division NSW South Coast  
**Contact** : Aneta Prosaroski  
**Address** : 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia  
**Telephone** : +61 2 4225 3125  
**Date Samples Received** : 01-Mar-2023 15:39  
**Date Analysis Commenced** : 01-Mar-2023  
**Issue Date** : 14-Mar-2023 11:09



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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Aneta Prosaroski	Environmental Services Representative	Laboratory - Wollongong, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, 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<sup>+</sup> to the Cations and Nitrate, SiO<sub>2</sub> and Fluoride to the Anions.
- EG020: Total Manganese results for samples EW2300849-#001 and #006 confirmed by re-digestion and reanalysis.
- 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 EA025FD 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.

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				01-Mar-2023 00:00	01-Mar-2023 00:00	01-Mar-2023 00:00	01-Mar-2023 00:00	01-Mar-2023 00:00	
Compound	CAS Number	LOR	Unit	EW2300849-001	EW2300849-002	EW2300849-003	EW2300849-004	EW2300849-005	
				Result	Result	Result	Result	Result	
EA005FD: Field pH									
pH	----	0.1	pH Unit	7.5	7.3	7.1	7.2	7.3	
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	1210	27500	24200	23800	23300	
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L	----	14100	17200	15900	15400	
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L	99	----	----	----	----	
Suspended Solids (SS)	----	5	mg/L	----	<5	<5	<5	<5	
EA045: Turbidity									
Turbidity	----	0.1	NTU	40.0	2.2	3.2	2.9	2.9	
EA116: Temperature									
Temperature	----	0.5	°C	21.9	22.9	22.3	23.8	23.7	
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	397	114	138	131	127	
Total Alkalinity as CaCO3	----	1	mg/L	397	114	138	131	127	
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	53	1390	913	886	835	
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L	147	9180	8150	7720	7640	
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L	67	201	180	170	170	
Magnesium	7439-95-4	1	mg/L	33	633	552	522	513	
Sodium	7440-23-5	1	mg/L	161	5460	4750	4510	4340	
Potassium	7440-09-7	1	mg/L	13	194	173	163	159	
EG020F: Dissolved Metals by ICP-MS									
Iron	7439-89-6	0.05	mg/L	0.20	0.08	0.10	0.05	<0.05	
EG020T: Total Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L	0.570	0.180	0.204	0.218	0.219	
Iron	7439-89-6	0.05	mg/L	1.45	0.46	0.61	0.59	0.58	
EK040P: Fluoride by PC Titrator									





## 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				01-Mar-2023 00:00	01-Mar-2023 00:00	01-Mar-2023 00:00	01-Mar-2023 00:00	01-Mar-2023 00:00
Compound	CAS Number	LOR	Unit	EW2300849-001	EW2300849-002	EW2300849-003	EW2300849-004	EW2300849-005
				Result	Result	Result	Result	Result
<b>EK040P: Fluoride by PC Titrator - Continued</b>								
Fluoride	16984-48-8	0.1	mg/L	0.3	0.8	0.7	0.8	0.7
<b>EK055G: Ammonia as N by Discrete Analyser</b>								
Ammonia as N	7664-41-7	0.01	mg/L	0.03	0.19	0.07	0.25	0.12
<b>EK055G-NH4: Ammonium as N by DA</b>								
Ammonium as N	14798-03-9_N	0.01	mg/L	0.03	0.19	0.07	0.25	0.12
<b>EK057G: Nitrite as N by Discrete Analyser</b>								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.01	<0.01	0.01	0.01
<b>EK058G: Nitrate as N by Discrete Analyser</b>								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	<0.01	0.02	0.01	0.01
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.01	0.02	0.02	0.02
<b>EN055: Ionic Balance</b>								
∅ Total Anions	----	0.01	meq/L	13.2	290	252	239	235
∅ Total Cations	----	0.01	meq/L	13.4	304	265	252	244
∅ Ionic Balance	----	0.01	%	0.80	2.42	2.66	2.64	1.69
<b>EP005: Total Organic Carbon (TOC)</b>								
Total Organic Carbon	----	1	mg/L	24	7	7	7	<1
<b>EP025FD: Field Dissolved Oxygen</b>								
Dissolved Oxygen	----	0.01	mg/L	8.53	4.16	4.79	4.92	5.26



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Duplicate	----	----	----	----
Sampling date / time				01-Mar-2023 00:00	----	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2300849-006	-----	-----	-----	-----	-----
Result				----	----	----	----	----	----
<b>EA005FD: Field pH</b>									
pH	----	0.1	pH Unit	7.7	----	----	----	----	----
<b>EA010FD: Field Conductivity</b>									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	1210	----	----	----	----	----
<b>EA015: Total Dissolved Solids dried at 180 ± 5 °C</b>									
Total Dissolved Solids @180°C	----	10	mg/L	774	----	----	----	----	----
<b>EA025: Total Suspended Solids dried at 104 ± 2°C</b>									
Suspended Solids (SS)	----	5	mg/L	35	----	----	----	----	----
<b>EA045: Turbidity</b>									
Turbidity	----	0.1	NTU	18.7	----	----	----	----	----
<b>EA116: Temperature</b>									
Temperature	----	0.5	°C	21.9	----	----	----	----	----
<b>ED037P: Alkalinity by PC Titrator</b>									
Hydroxide Alkalinity as CaCO <sub>3</sub>	DMO-210-001	1	mg/L	<1	----	----	----	----	----
Carbonate Alkalinity as CaCO <sub>3</sub>	3812-32-6	1	mg/L	<1	----	----	----	----	----
Bicarbonate Alkalinity as CaCO <sub>3</sub>	71-52-3	1	mg/L	435	----	----	----	----	----
Total Alkalinity as CaCO <sub>3</sub>	----	1	mg/L	435	----	----	----	----	----
<b>ED041G: Sulfate (Turbidimetric) as SO<sub>4</sub> 2- by DA</b>									
Sulfate as SO <sub>4</sub> - Turbidimetric	14808-79-8	1	mg/L	54	----	----	----	----	----
<b>ED045G: Chloride by Discrete Analyser</b>									
Chloride	16887-00-6	1	mg/L	154	----	----	----	----	----
<b>ED093F: Dissolved Major Cations</b>									
Calcium	7440-70-2	1	mg/L	66	----	----	----	----	----
Magnesium	7439-95-4	1	mg/L	33	----	----	----	----	----
Sodium	7440-23-5	1	mg/L	167	----	----	----	----	----
Potassium	7440-09-7	1	mg/L	13	----	----	----	----	----
<b>EG020F: Dissolved Metals by ICP-MS</b>									
Iron	7439-89-6	0.05	mg/L	0.19	----	----	----	----	----
<b>EG020T: Total Metals by ICP-MS</b>									
Manganese	7439-96-5	0.001	mg/L	0.426	----	----	----	----	----
Iron	7439-89-6	0.05	mg/L	1.33	----	----	----	----	----
<b>EK040P: Fluoride by PC Titrator</b>									
Fluoride	16984-48-8	0.1	mg/L	0.3	----	----	----	----	----



## Analytical Results

Sub-Matrix: <b>WATER</b> (Matrix: <b>WATER</b> )				Sample ID	Duplicate	----	----	----	----
Sampling date / time				01-Mar-2023 00:00	----	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2300849-006	-----	-----	-----	-----	-----
Result				----	----	----	----	----	----
<b>EK055G: Ammonia as N by Discrete Analyser</b>									
Ammonia as N	7664-41-7	0.01	mg/L	0.01	----	----	----	----	----
<b>EK055G-NH4: Ammonium as N by DA</b>									
Ammonium as N	14798-03-9_N	0.01	mg/L	<0.01	----	----	----	----	----
<b>EK057G: Nitrite as N by Discrete Analyser</b>									
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	----	----	----	----	----
<b>EK058G: Nitrate as N by Discrete Analyser</b>									
Nitrate as N	14797-55-8	0.01	mg/L	0.01	----	----	----	----	----
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>									
Nitrite + Nitrate as N	----	0.01	mg/L	0.01	----	----	----	----	----
<b>EN055: Ionic Balance</b>									
∅ Total Anions	----	0.01	meq/L	14.2	----	----	----	----	----
∅ Total Cations	----	0.01	meq/L	13.6	----	----	----	----	----
∅ Ionic Balance	----	0.01	%	1.99	----	----	----	----	----
<b>EP005: Total Organic Carbon (TOC)</b>									
Total Organic Carbon	----	1	mg/L	16	----	----	----	----	----
<b>EP025FD: Field Dissolved Oxygen</b>									
Dissolved Oxygen	----	0.01	mg/L	8.51	----	----	----	----	----



### ***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 (NO<sub>x</sub>) by Discrete Analyser

(WATER) EA025: Total Suspended Solids dried at 104 ± 2 °C

(WATER) EK055G-NH<sub>4</sub>: 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 SO<sub>4</sub> 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

## CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ **Sydney:** 277 Woodpark Rd, Smithfield NSW 2176  
 Ph. 02 9704 9555 E [samples\\_sydney@aiserviro.com](mailto:samples_sydney@aiserviro.com)  
☐ **Newcastle:** 5 Rosegum Rd, Warabrook NSW 2304  
 Ph. 02 4988 9433 E [samples\\_newcastle@aiserviro.com](mailto:samples_newcastle@aiserviro.com)

☐ **Brisbane:** 32 Shand St, Stafford QLD 4053  
 Ph:07 3243 7222 E:samples@salcenviro.com  
☐ **Townsville:** 14-15 Deana Cr, Berle QLD 4818  
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☐ **Adelaide:** 2-1 Burma Rd, Pooraka SA 5006  
 Ph: 08 8359 0800 E: [adelaide@aisenviro.com](mailto:adelaide@aisenviro.com)

☐ Perth: 10 Had Way, Malaga WA 6090  
 Ph: 08 9209 7665 E: [samples.perth@alsenviro.com](mailto:samples.perth@alsenviro.com)  
☐ Launceston: 27 Wellington St Launceston TAS 7250  
 Ph: 03 6331 2158 E: [launceston@alsenviro.com](mailto:launceston@alsenviro.com)

CLIENT: Shellharbour City Council		TURNAROUND REQUIREMENTS : <input type="checkbox"/> Standard TAT (List due date):		FOR LABORATORY USE ONLY (Circle)	
OFFICE: 41 Burelli St WOLLONGONG NSW 2500		(Standard TAT may be longer for some tests e.g., Ultra Trace Organics) <input type="checkbox"/> Non Standard or urgent TAT (List due date):		Cordy Seal Intact? Yes No <input checked="" type="checkbox"/> NA	
PROJECT: Dunmore Quarterly Leachate		ALS QUOTE NO.: WO/030/19 TENDER		Free Ice / frozen ice bricks present upon receipt? <input checked="" type="checkbox"/> No <input type="checkbox"/> NA	
ORDER NUMBER:				Random Sample Temperature on Receipt: 10.4 °C	
PROJECT MANAGER: Ryan Stirling				Other comments:	
SAMPLER: Robert Dahio		SAMPLER MOBILE:		RELINQUISHED BY: Robert Dahio	
COC emailed to ALS? ( YES / NO)		EDD FORMAT (or default):		RECEIVED BY: Robert Dahio	
Email Reports to :		DATE/TIME: 1.3.23		DATE/TIME: 1.3.23	
Email Invoice to :					

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: CC reports to:

[illegible]

Environmental Division  
Wollongong  
Work Order Reference  
**EW2300846**



Telephone : 02 42253125

**Water Container Codes:** P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic  
V = VOA Vial Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;  
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

## CERTIFICATE OF ANALYSIS

**Work Order** : **EW2300846**  
**Client** : **SHELLHARBOUR CITY COUNCIL**  
**Contact** : Ryan Stirling  
**Address** : LAMERTON HOUSE, LAMERTON CRESCENT  
 SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529  
**Telephone** : ----  
**Project** : Dunmore Quarterly Leachate  
**Order number** : 147649  
**C-O-C number** : ----  
**Sampler** : Robert DaLio  
**Site** : DUNMORE LANDFILL TENDER  
**Quote number** : WO/030/19 TENDER LEACHATE  
**No. of samples received** : 1  
**No. of samples analysed** : 1

**Page** : 1 of 4  
**Laboratory** : Environmental Division NSW South Coast  
**Contact** : Aneta Prosaroski  
**Address** : 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia  
**Telephone** : +61 2 4225 3125  
**Date Samples Received** : 01-Mar-2023 15:40  
**Date Analysis Commenced** : 03-Mar-2023  
**Issue Date** : 10-Mar-2023 15:51



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
Aneta Prosaroski	Environmental Services Representative	Laboratory - Wollongong, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, 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.

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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 Sydney.**
- EK057G: LOR raised for sample 1 due to sample matrix.
- ED041G: LOR raised for Sulfate due to sample matrix
- EK059G: LOR raised for NOx 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.
- Temperature performed by ALS Wollongong via in-house method EA116 and EN67 PK.
- Dissolved oxygen (DO) performed by ALS Wollongong via in-house method EA025FD 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/67.10 Wastewaters
- 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.





## Analytical Results

Sub-Matrix: <b>WATER</b> (Matrix: <b>WATER</b> )		Sample ID		Leachate Sump	----	----	----	----
		Sampling date / time		01-Mar-2023 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2300846-001	-----	-----	-----	-----
Result				----	----	----	----	----
<b>EA005FD: Field pH</b>								
pH	----	0.1	pH Unit	8.9	----	----	----	----
<b>EA010FD: Field Conductivity</b>								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	10100	----	----	----	----
<b>EA015: Total Dissolved Solids dried at 180 ± 5 °C</b>								
Total Dissolved Solids @180°C	----	10	mg/L	5460	----	----	----	----
<b>EA116: Temperature</b>								
Temperature	----	0.1	°C	27.7	----	----	----	----
<b>ED037P: Alkalinity by PC Titrator</b>								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	967	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	2110	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	3070	----	----	----	----
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<20	----	----	----	----
<b>ED045G: Chloride by Discrete Analyser</b>								
Chloride	16887-00-6	1	mg/L	1540	----	----	----	----
<b>ED093F: Dissolved Major Cations</b>								
Calcium	7440-70-2	1	mg/L	40	----	----	----	----
Potassium	7440-09-7	1	mg/L	400	----	----	----	----
<b>EG020T: Total Metals by ICP-MS</b>								
Manganese	7439-96-5	0.001	mg/L	0.113	----	----	----	----
Iron	7439-89-6	0.05	mg/L	1.35	----	----	----	----
<b>EK040P: Fluoride by PC Titrator</b>								
Fluoride	16984-48-8	0.1	mg/L	0.3	----	----	----	----
<b>EK055G: Ammonia as N by Discrete Analyser</b>								
Ammonia as N	7664-41-7	0.01	mg/L	426	----	----	----	----
<b>EK057G: Nitrite as N by Discrete Analyser</b>								
Nitrite as N	14797-65-0	0.01	mg/L	<0.10	----	----	----	----
<b>EK058G: Nitrate as N by Discrete Analyser</b>								
Nitrate as N	14797-55-8	0.01	mg/L	<0.10	----	----	----	----
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.10	----	----	----	----



## Analytical Results

Sub-Matrix: <b>WATER</b> (Matrix: <b>WATER</b> )				Sample ID	Leachate Sump	----	----	----	----
Sampling date / time					01-Mar-2023 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		<b>EW2300846-001</b>	-----	-----	-----	-----
Result						----	----	----	----
<b>EP005: Total Organic Carbon (TOC)</b>									
Total Organic Carbon	----	1	mg/L		<b>384</b>	----	----	----	----
<b>EP025FD: Field Dissolved Oxygen</b>									
Dissolved Oxygen	----	0.01	mg/L		<b>2.14</b>	----	----	----	----
Dissolved Oxygen - % Saturation	----	0.1	% saturation		<b>28.1</b>	----	----	----	----

## 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) 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) EA015: Total Dissolved Solids dried at 180 ± 5 °C  
 (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

ALS Laboratory: please tick →

☐ **Sydney:** 377 Woodpark Rd, Smithfield NSW 2176  
 Ph: 02 8794 8555 E: [samples\\_sydney@alsenviro.com](mailto:samples_sydney@alsenviro.com)  
☐ **Newcastle:** 5 Rosegum Rd, Warabrook NSW 2304  
 Ph: 02 4963 9403 E: [samples\\_newcastle@alsenviro.com](mailto:samples_newcastle@alsenviro.com)

☐ **Brisbane:** 32 Shand St, Stafford QLD 4053  
 Ph.07 3243 7222 E: samples.brisbane@arsenwiro.com

☐ **Townsville:** 14-15 Desma Ct Bohle QLD 4816  
 Ph.07 4768 0600 E: townsville@arsenwiro.com.au

☐ **Melbourne:** 2-4 Wexall Rd, Springvale VIC 3171  
 Ph: 03 8544 5600 E: [samples.melbourne@a.senvio.com](mailto:samples.melbourne@a.senvio.com)  
 ☐ **Adelaide:** 2-1 Burns Rd, Pooraka SA 5096  
 Ph: 08 8384 0860 E: [adelaide@a.senvio.com](mailto:adelaide@a.senvio.com)

☐ Perth: 10 Hed Way, Maaga WA 6000  
 Ph: 08 9209 7655 E: [samples.perth@alsenviro.com](mailto:samples.perth@alsenviro.com)  
☐ Launceston: 27 Wellington St, Launceston TAS 7250  
 Ph: 03 6331 2158 E: [launceston@alsenviro.com](mailto:launceston@alsenviro.com)

CLIENT: Shellharbour City Council		TURNAROUND REQUIREMENTS : <input type="checkbox"/> Standard TAT (List due date):		FOR LABORATORY USE ONLY (Circle)	
OFFICE: 41 Burelli St WOLLONGONG NSW 2500		(Standard TAT may be longer for some tests e.g., Ultra Trace Organics) <input type="checkbox"/> Non Standard or urgent TAT (List due date):		Custody Seal Intact? Yes No	
PROJECT: Dunmore Quarterly Leachate		ALS QUOTE NO.: WO/030/19 TENDER		Freeze or frozen ice bricks present upon receipt? Yes No	
ORDER NUMBER:				Random Sample Temperature on Receipt: 10.4 °C	
PROJECT MANAGER: Ryan Stirling				Other comment:	
SAMPLER: Robert Dario		SAMPLER MOBILE:		RELINQUISHED BY: Robert Dario	
COC emailed to ALS? ( YES / NO)		EDD FORMAT (or default):		RECEIVED BY: Robert Dario	
Email Reports to :		DATE/TIME: 1.3.23		DATE/TIME: 1.3.22	
Email Invoice to :				DATE/TIME:	

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: CC reports to:

[illegible]

**Water Container Codes:** P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic

V = VOA Vial HCl Preserved; VS = VOA Vial Sodium Bisulphate Preserved; VS VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial; SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Spills; B = Unpreserved Bag.

## CERTIFICATE OF ANALYSIS

**Work Order** : **EW2300847**  
**Client** : **SHELLHARBOUR CITY COUNCIL**  
**Contact** : Ryan Stirling  
**Address** : LAMERTON HOUSE, LAMERTON CRESCENT  
 SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529  
**Telephone** : ----  
**Project** : Dunmore Quarterly Leachate Tank EPL  
**Order number** : 147649  
**C-O-C number** : ----  
**Sampler** : Robert DaLio  
**Site** : DUNMORE LANDFILL TENDER  
**Quote number** : WO/030/19 TENDER LEACHATE  
**No. of samples received** : 1  
**No. of samples analysed** : 1

**Page** : 1 of 4  
**Laboratory** : Environmental Division NSW South Coast  
**Contact** : Aneta Prosaroski  
**Address** : 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia  
**Telephone** : +61 2 4225 3125  
**Date Samples Received** : 01-Mar-2023 15:41  
**Date Analysis Commenced** : 01-Mar-2023  
**Issue Date** : 13-Mar-2023 11:38



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
Aneta Prosaroski	Environmental Services Representative	Laboratory - Wollongong, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, 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.**
- EK059G, EK057G: NOx and Nitrite on sample no:1 confirmed by re-analysis.
- ED041G: LOR raised for Sulfate 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.
- Temperature performed by ALS Wollongong via in-house method EA116 and EN67 PK.
- Dissolved oxygen (DO) performed by ALS Wollongong via in-house method EA025FD 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/67.10 Wastewaters
- 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.







## Analytical Results

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

Sample ID

				Leachate Storage Tank LP1	----	----	----	----
Sampling date / time				01-Mar-2023 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2300847-001	-----	-----	-----	-----
Result					----	----	----	----
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser - Continued</b>								
Nitrite + Nitrate as N	----	0.01	mg/L	<b>0.20</b>	----	----	----	----
<b>EP005: Total Organic Carbon (TOC)</b>								
Total Organic Carbon	----	1	mg/L	<b>373</b>	----	----	----	----
<b>EP025FD: Field Dissolved Oxygen</b>								
Dissolved Oxygen	----	0.01	mg/L	<b>5.66</b>	----	----	----	----
Dissolved Oxygen - % Saturation	----	0.1	% saturation	<b>70.5</b>	----	----	----	----

## 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) 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) EA015: Total Dissolved Solids dried at 180 ± 5 °C

(WATER) ED045G: Chloride by Discrete Analyser

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) EK040P: Fluoride by PC Titrator

(WATER) ED041G: Sulfate (Turbidimetric) as SO<sub>4</sub> 2- by DA

## **Appendix C**

### **Laboratory Chain of Custody (COC) & Certificates of Analysis (COA) – Dust Samples**



# CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ Sydney: 277 Woodpark Rd, Smithfield NSW 2176  
Ph: 02 8784 8555 E: samples.sydney@alsenviro.com  
☐ Newcastle: 5 Roaogum Rd, Warabrook NSW 2304  
Ph: 02 4968 9433 E: samples.newcastle@alsenviro.com

☐ Brisbane: 32 Shand St, Stafford QLD 4053  
Ph: 07 3243 7222 E: samples.brisbane@alsenviro.com  
☐ Townsville: 14-15 Desima Ct, Bohle QLD 4818  
Ph: 07 4796 0600 E: townsville.environmental@alsenviro.com

☐ Melbourne: 2-4 Westall Rd, Springvale VIC 3171  
Ph: 03 8549 5000 E: samples.melbourne@alsenviro.com  
☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5095  
Ph: 08 8359 0890 E: adelaide@alsenviro.com

☐ Perth: 10 Hod Way, Malaga WA 6090  
Ph: 08 9209 7655 E: samples.perth@alsenviro.com  
☐ Launceston: 27 Wellington St, Launceston TAS 7250  
Ph: 03 6331 2158 E: launceston@alsenviro.com

CLIENT:	Shellharbour City Council	TURNAROUND REQUIREMENTS:	<input type="checkbox"/> Standard TAT (List due date):	<b>FOR LABORATORY USE ONLY (Circle)</b> Custody Seal Intact? Yes No Free ice / frozen ice bricks present upon receipt? Yes No Random Sample Temperature on Receipt: °C Other comment:	
OFFICE:	Dunmore	(Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	<input type="checkbox"/> Non Standard or urgent TAT (List due date):		
PROJECT:	Dunmore Dust	ALS QUOTE NO.:	WO/030/19 TENDER		
ORDER NUMBER:					
PROJECT MANAGER:	Ryan Stirling				
SAMPLER:	Robert Dabio	SAMPLER MOBILE:		RELINQUISHED BY:	RECEIVED BY:
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):		DATE/TIME:	DATE/TIME:
Email Reports to:				1.3.23	2/3/23
Email Invoice to:					

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: CC reports to:

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).							Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	A04 (Ash, CM, TIS)							Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	DDG1	1.3.23 9:15	AIR			✓							
	DDG2	8:55	AIR			✓							
	DDG3	9:25	AIR			✓							
	DDG4	9:15	AIR			✓							
TOTAL						10							

Environmental Division  
Wollongong  
Work Order Reference  
**EW2300845**



Telephone : 02 42263125

**Water Container Codes:** P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic  
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;  
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

## CERTIFICATE OF ANALYSIS

**Work Order** : **EW2300845**  
**Client** : **SHELLHARBOUR CITY COUNCIL**  
**Contact** : Ryan Stirling  
**Address** : LAMERTON HOUSE, LAMERTON CRESCENT  
 SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529  
**Telephone** : ----  
**Project** : Dunmore Landfill Dust  
**Order number** : 147649  
**C-O-C number** : ----  
**Sampler** : Robert DaLio  
**Site** : DUNMORE LANDFILL TENDER  
**Quote number** : WO/030/19 TENDER DUST  
**No. of samples received** : 4  
**No. of samples analysed** : 4

**Page** : 1 of 3  
**Laboratory** : Environmental Division NSW South Coast  
**Contact** : Aneta Prosaroski  
**Address** : 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia  
**Telephone** : +61 2 4225 3125  
**Date Samples Received** : 02-Mar-2023 10:42  
**Date Analysis Commenced** : 06-Mar-2023  
**Issue Date** : 13-Mar-2023 13:29



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
Zoran Grozdanovski	Laboratory Operator	Newcastle - Inorganics, Mayfield West, 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.

- Dust analysis conducted by ALS Newcastle, NATA accreditation no. 825, site no. 1656.
- 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 g/m<sup>2</sup>.mth as sampling data was provided by the client.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/66.1 Sampling and Siting of Dust Depositon Gauges.
- The dust gauges for all samples 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.
- 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 01/02/2023 - 01/03/2023	DDG2 01/02/2023 - 01/03/2023	DDG3 01/02/2023 - 01/03/2023	DDG4 01/02/2023 - 01/03/2023	----
Sampling date / time				01-Mar-2023 09:15	01-Mar-2023 08:55	01-Mar-2023 09:25	01-Mar-2023 09:15	----
Compound	CAS Number	LOR	Unit	EW2300845-001	EW2300845-002	EW2300845-003	EW2300845-004	-----
				Result	Result	Result	Result	----
<b>EA120: Ash Content</b>								
Ash Content	----	0.1	g/m <sup>2</sup> .month	0.9	0.3	0.7	1.9	----
Ash Content (mg)	----	2	mg	15	5	12	31	----
<b>EA125: Combustible Matter</b>								
Combustible Matter	----	0.1	g/m <sup>2</sup> .month	0.6	0.5	0.8	0.5	----
Combustible Matter (mg)	----	2	mg	9	8	12	9	----
<b>EA141: Total Insoluble Matter</b>								
Total Insoluble Matter	----	0.1	g/m <sup>2</sup> .month	1.5	0.8	1.5	2.4	----
Total Insoluble Matter (mg)	----	2	mg	24	13	24	40	----



Page : 3 of 3  
Work Order : EW2300845  
Client : SHELLHARBOUR CITY COUNCIL  
Project : Dunmore Landfill Dust

---



### ***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

# ALS Landfill Emissions Report



Client:		Shellharbour City Council		Date:		17/12/2021	
Site:		Dunmore		Sampler(s)		Robert Da'Lo, Megan Gould	
Transact / Location		Point	GPS North	GPS East	CH4 Conc (ppm)	Comments	
A						No Vehicle Access, Very Overgrown (Snake Haszrd and uneven footing)	
B		1	6168 021	302 330	0.4		
B		2	6168 052	302 334	3.1	Methane Cage	
B		3	6168 077	302 334	0.6		
B		4	6168 102	302 332	0.8		
B 5-8						No Vehicle Access, Very Overgrown (Snake Haszrd and uneven footing)	
C		1	6168 244	302 275	0.8		
C		2	6168 133	302 303	0.8		
C		3	6168 076	302 313	4.0		
C		4	6167 980	302 319	0.8		
C		5	6167 905	302 306	0.5		
C		6	6168 857	302 299	0.6		
C		7	6168 840	302 294	0.4		
D		1	6167 944	302 282	1.8		
D		2	6167 955	302 283	1.9		
D		3	6168 977	302 277	1.2		
D 4-9						No Vehicle Access, Very Overgrown (Snake Haszrd and uneven footing)	
E		1	6168 023	302 230	1.4		
E		2	6168 032	302 227	1.6		
E		3	6168 050	302 223	1.8		
E		4	6167 994	302 244	1.6		
E		5	6167 948	302 266	1.4		
F		1	6167 939	302 248	1.0		
F		2	6167 962	302 237	0.8		
F		3	6167 986	302 227	1.3		
F		4	6168 013	302 214	0.8		
F		5				No Vehicle Access, Very Overgrown (Snake Haszrd and uneven footing)	
F		6				No Vehicle Access, Very Overgrown (Snake Haszrd and uneven footing)	
G		1	6168 218	302 180	1.1		
G		2	6168 233	302 193	1.0		
G		3	6168 241	302 207	1.0		
G		4	6168 268	302 247	1.0		

H	1	6168 189	302 450	1.1	
H	2	6168 146	302 443	1.3	
H	3	6168 046	302 447	1.8	
H	4	6168 016	302 468	1.7	
H	5	6167 964	302 494	1.4	
H	6	6167 917	302 513	1.3	
H	7	6168 885	301 508	1.7	
H	8	6167 892	301 475	1.9	
H	9	6167 928	302 450	2.1	
H	10	6167 741	302 386	1.7	
H	11	6168 800	302 391	2.0	
H	12	6167 857	302 398	1.6	
H	13	6167 921	302 407	1.1	
H	14	6167 972	302 413	0.7	
H	15	6167 037	302 419	0.7	
H	16	6167 093	302 425	0.7	
H	17	6167 172	302 434	0.6	
H	18	6167 271	302 370	0.6	
H	19	6167 286	302 221	0.7	
H	20	6167 227	302 144	0.9	
H	21	6167 158	302 072	1.0	
H	22	6167 101	302 017	1.3	
H	23	6167 006	301 971	0.7	
H	24	6167 895	302 968	0.8	
H	25	6167 844	302 996	1.8	
H	26	6168 801	301 42	5.1	
H	27	6168 773	302 067	1.8	
H	28	6168 969	302 145	1.8	
H	29	6168 679	301 204	1.9	
H	30	6167 682	302 261	1.6	
H	31	6167 697	302 328	1.8	
H	32	6167 712	302 378	1.9	
I	1	6167 932	301 154	1.4	
I	2	6167 933	302 104	1.6	
I	3	6167 939	302 049	1.5	
I	4	6167 952	301 995	1.4	
J	1	6168 147	302 100	1.6	
J	2	6168 084	302 124	1.5	
J	3	6168 008	302 153	1.5	
J	4	6167 970	302 164	1.5	
J	5	6167 938	302 166	1.5	
K	1	6168 333	302 287	0.4	
K	2	6168 350	302 337	0.4	
K	3	6168 390	302 343	0.6	
K	4	6168 396	302 301	0.4	
K	5	6168 364	302 276	0.5	
L	1	6168 568	302 232	0.6	
L	2	6168 563	302 203	0.7	
L	3	6168 437	302 175	0.8	
L	4	6168 377	302 125	0.8	
L	5	6168 340	302 068	0.9	
L	6	6168 301	302 034	0.9	
Compressor Shed	1			2.1	
Office	1			2.8	
Community Recycling Centre	1			2.1	
OLD Weighbridge	1			0.5	
OLD Weighbridge Toilet	1			3.4	
Revolve Shop	1			1.8	
Building Truckwash	1			0.6	
New Weighbridge	1			2.1	
Methane Blank (Pre testing )				1.0	Taken at entrance to Dunmore site before main gate
Methane Blank (Post testing )				0.9	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 Event**

# Appendix F

## Calibration Certificates



Page 20 of 20



[illegible]

# Appendix G

## Gas Flare Reports



## PROJECT PROFILE: **DUNMORE, NSW**

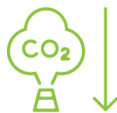
We expedite the transition to renewables with clean energy and carbon abatement solutions.  
Carbon credits enable a commercially viable project to create additional abatement.

### Results Achieved since the Project Commenced\*



#### BIOGAS CAPTURED

24.2 million m3



#### CARBON ABATEMENT

229 thousand tonnes  
(t CO2e - environmental  
benefit)



#### ACCUs CREATED

92 thousand Australian  
Carbon Credit Units



#### SEEDLINGS PLANTED

3.8 million seedlings  
planted for 10 years  
(t CO2e)



#### CARS OFF THE ROAD

6,214 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 1000 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.

P: +61 7 3711 2225 E: [enquiries@lgi.com.au](mailto:enquiries@lgi.com.au) in: [linkedin.com/company/lgi-ltd](https://www.linkedin.com/company/lgi-ltd) | 57 Harvey Street N, Eagle Farm QLD 4009

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

\* ACCUs created to 15 May 2022. Other Results Achieved to 1 February 2023



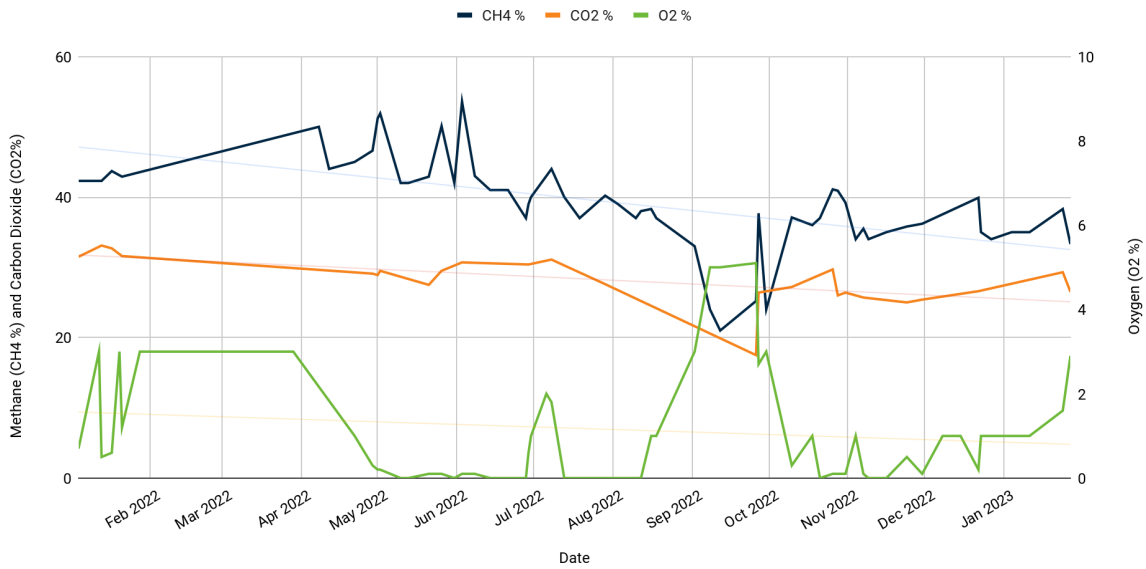
<b>Site:</b>	Dunmore	<b>Report issue date:</b>	17/02/2022
<b>Report month:</b>	January 2023	<b>Prepared by:</b>	Grace Tap
<b>Prepared for:</b>	Shellharbour City Council	<b>Checked by:</b>	Matthew Tap

<b>Comments on changes to existing system:</b>	<ul style="list-style-type: none"> <li>• <b>January 2016</b> - LGI disconnected the 4 lateral wells and 8 vertical wells.</li> <li>• <b>April 2016</b> - LGI reconnected 8 vertical wells in the SE corner and 4 lateral wells.</li> <li>• <b>June 2016</b> - LGI disconnected the extended gas capture system to assist council.</li> <li>• <b>September 2016</b> - LGI disconnected the extended gas capture system to assist council.</li> <li>• <b>November 2016</b> - LGI commissioned the connection to leachate sump 6 as of 23-11-2016.</li> <li>• <b>May 2017</b> - LGI installed an additional 10 vertical wells to the existing LFG system</li> <li>• <b>November 2019</b> - 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.</li> <li>• <b>April 2020</b> - LGI installed a flowline to sump 6 after earlier disconnection.</li> <li>• <b>February 2021</b> - LGI installed 13 new vertical wells, including a new submain</li> <li>• <b>March 2022</b> - LGI replaced the flare gas analyser panel with a Draeger model analyser for greater accuracy and reliability</li> <li>• <b>August 2022</b> - LGI repaired the 225mm mainline and adjacent sub main to allow for intermediate capping to continue across the top of cell 3</li> <li>• <b>December 2022</b> - LGI installed a pneumatic bore pump in a J-trap, allowing for greater reliability of condensate management in the main gas line.</li> </ul>
<b>Comments on operation / maintenance:</b>	Availability - 100.00% Down Time: 0.00hrs  Field Tuned: - 24/01/2023
<b>Recommendations:</b>	After discussion with Council, LGI will re investigate options for leachate pumping out of gas extraction wells

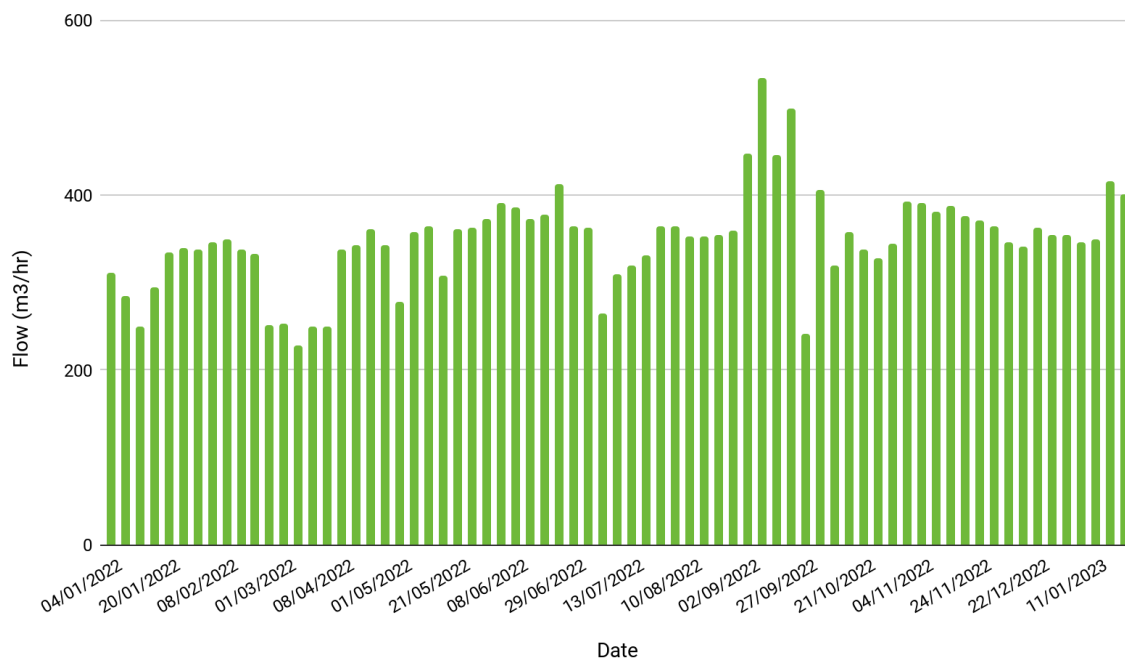
### Flare Operational Data:

Date	CH4 %	CO2 %	O2 %	FLOW m3/h	STACK TEMP C	CUMULATIVE FLOW m3
04/01/2023	35	-	1	346	769	23,924,491
11/01/2023	35	-	1	350	749	23,981,011
24/01/2023	38.3	29.3	1.6	416	870	24,089,024
Average	36.1	29.3	1.2	371	796	-

## Dunmore- Methane, Carbon Dioxide & Oxygen

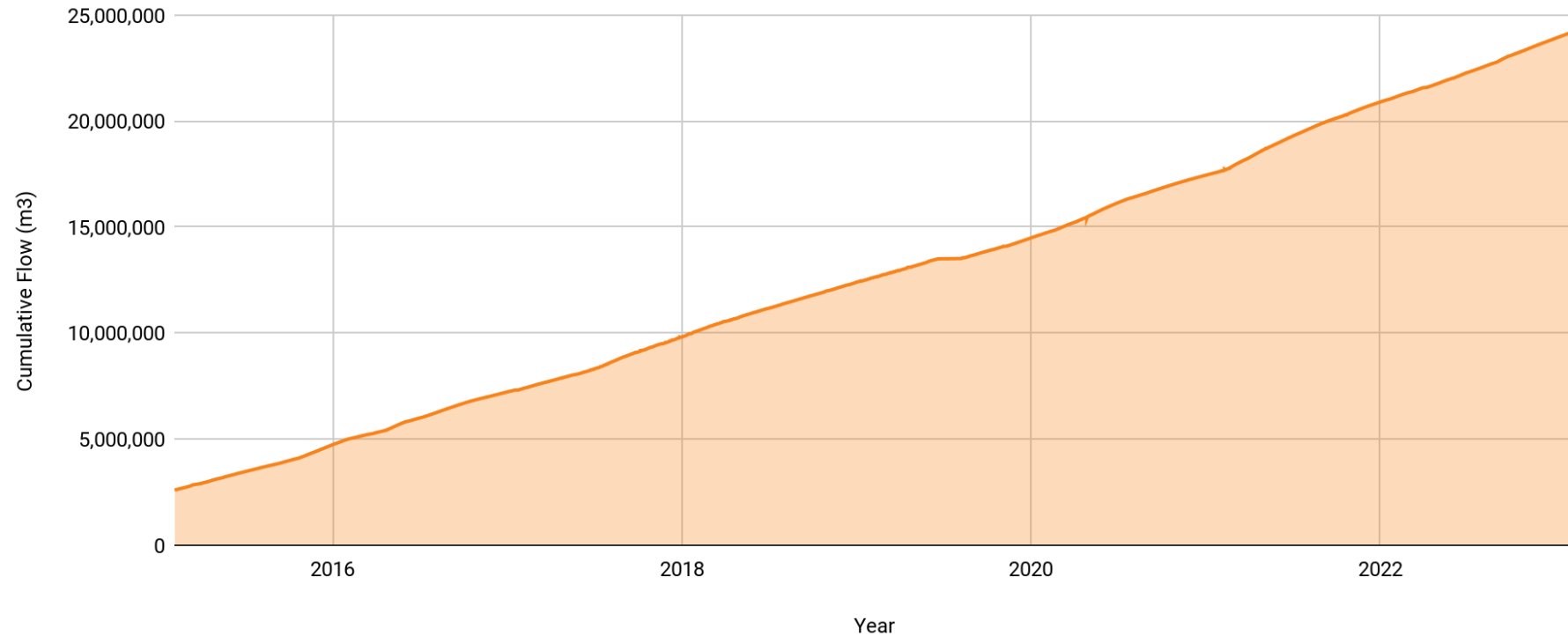


## Dunmore - Flow Rate





## Dunmore - Cumulative Flow



- 24,156,649 of combusted landfill gas up to 1 February 2023, which represents;
  - 229,430 tonnes of CO2 equivalent (total methane abated by gas capture system to date).
  - 3,823,836 seedlings planted for 10 years
  - 6,214 (cars off the road for the last 12 months)
  - 92,714 Australian Carbon Credit Units
- Biogas captured is the cumulative flow reading at the last day of the month.



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## PROJECT PROFILE: **DUNMORE, NSW**

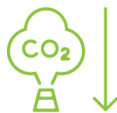
We expedite the transition to renewables with clean energy and carbon abatement solutions. Carbon credits enable a commercially viable project to create additional abatement.

### Results Achieved since the Project Commenced\*



#### BIOGAS CAPTURED

24.4 million m3



#### CARBON ABATEMENT

232 thousand tonnes  
(t CO2e - environmental benefit)



#### ACCUs CREATED

92 thousand Australian  
Carbon Credit Units



#### SEEDLINGS PLANTED

3.9 million seedlings  
planted for 10 years  
(t CO2e)



#### CARS OFF THE ROAD

6,229 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 1000 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.

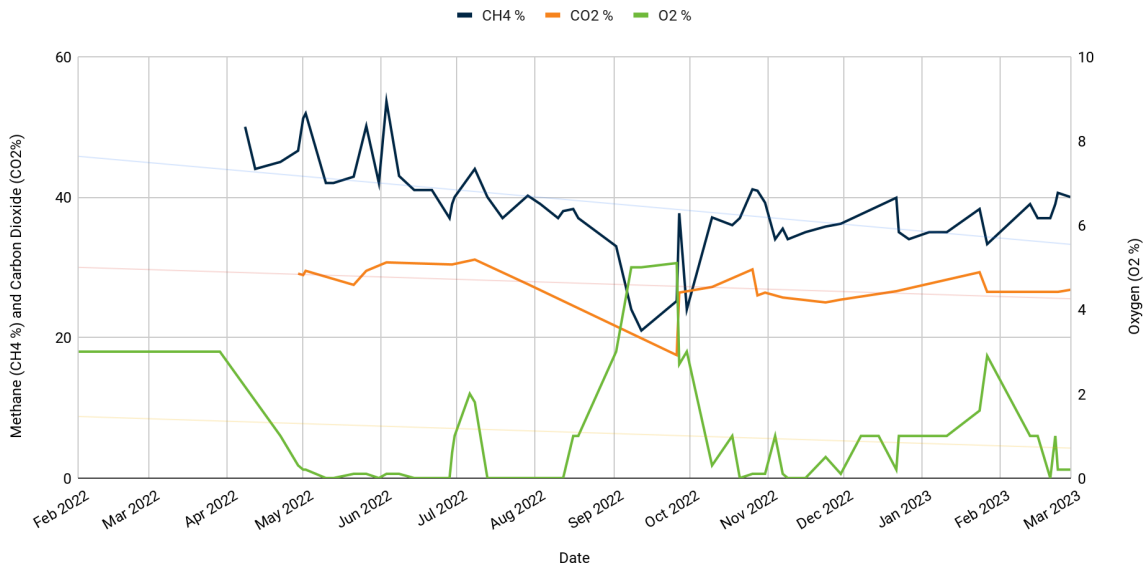
<b>Site:</b>	Dunmore	<b>Report issue date:</b>	17/03/2023
<b>Report month:</b>	February 2023	<b>Prepared by:</b>	Grace Tap
<b>Prepared for:</b>	Shellharbour City Council	<b>Checked by:</b>	Thomas Schnatz

<b>Comments on changes to existing system:</b>	<ul style="list-style-type: none"> <li>• <b>January 2016</b> - LGI disconnected the 4 lateral wells and 8 vertical wells.</li> <li>• <b>April 2016</b> - LGI reconnected 8 vertical wells in the SE corner and 4 lateral wells.</li> <li>• <b>June 2016</b> - LGI disconnected the extended gas capture system to assist council.</li> <li>• <b>September 2016</b> - LGI disconnected the extended gas capture system to assist council.</li> <li>• <b>November 2016</b> - LGI commissioned the connection to leachate sump 6 as of 23-11-2016.</li> <li>• <b>May 2017</b> - LGI installed an additional 10 vertical wells to the existing LFG system</li> <li>• <b>November 2019</b> - 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.</li> <li>• <b>April 2020</b> - LGI installed a flowline to sump 6 after earlier disconnection.</li> <li>• <b>February 2021</b> - LGI installed 13 new vertical wells, including a new submain</li> <li>• <b>March 2022</b> - LGI replaced the flare gas analyser panel with a Draeger model analyser for greater accuracy and reliability</li> <li>• <b>August 2022</b> - LGI repaired the 225mm mainline and adjacent submain to allow for intermediate capping to continue across the top of cell 3</li> <li>• <b>December 2022</b> - LGI installed a pneumatic bore pump in a jtrap, allowing for greater reliability of condensate management in the main gas line.</li> </ul>
<b>Comments on operation / maintenance:</b>	Availability - 95.92% Down Time: 27.42hrs 23.75hrs - Forced Outage Internal - internal equipment fault 3.58 hrs - Planned outage - equipment repairs  Field Tuned: - 24/02/2023
<b>Recommendations:</b>	After discussion with Council, LGI will re investigate options for leachate pumping out of gas extraction wells

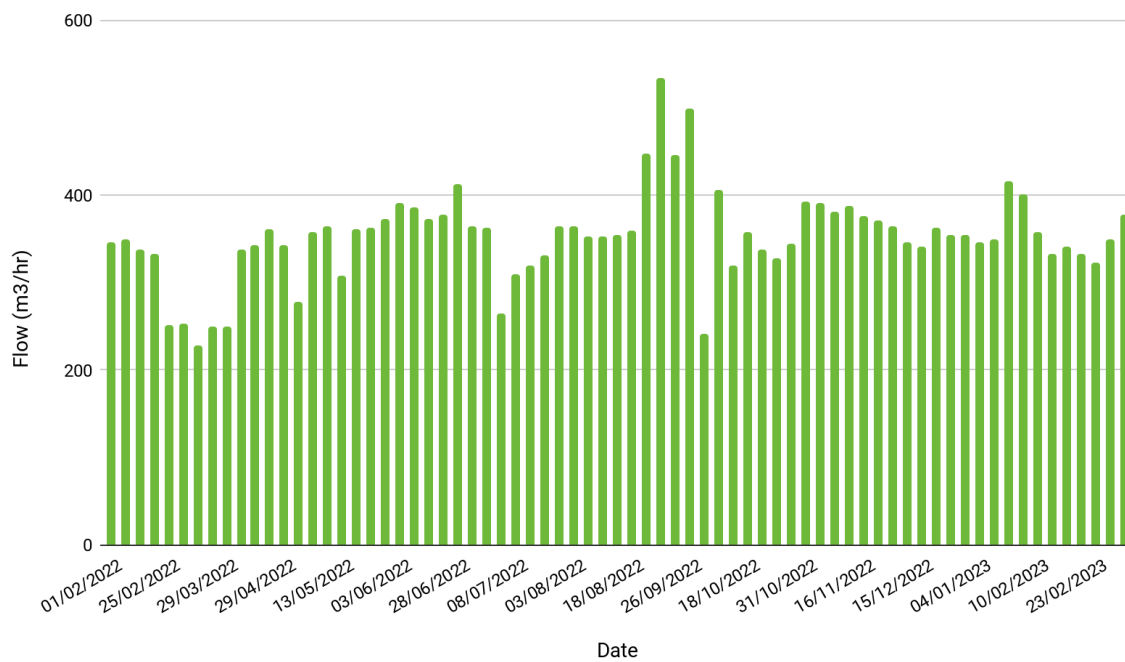
### Flare Operational Data:

Date	CH4 %	CO2 %	O2 %	FLOW m3/h	STACK TEMP C	CUMULATIVE FLOW m3
24/02/2023	40.6	26.5	0.2	350	790	24,335,619
Average	40.6	26.5	0.2	350	790	-

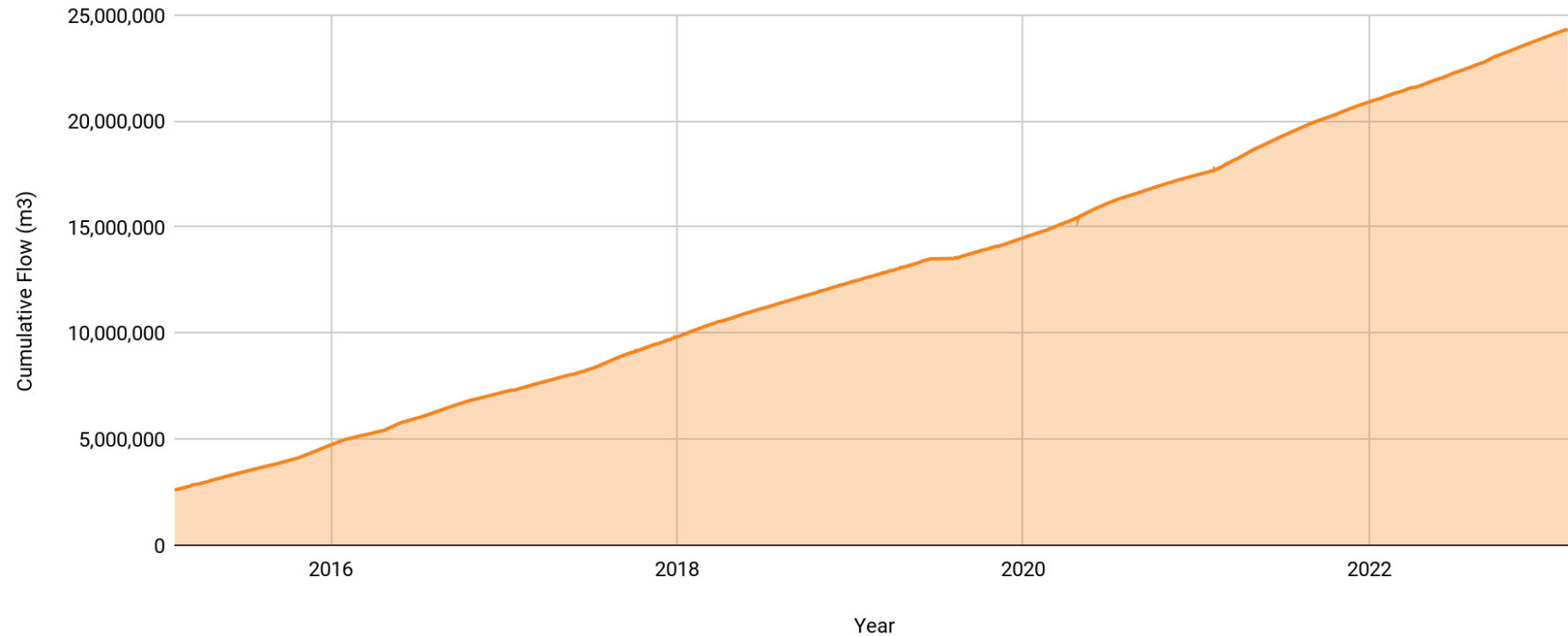
## Dunmore- Methane, Carbon Dioxide & Oxygen



## Dunmore - Flow Rate



## Dunmore - Cumulative Flow



- 24,378,789 of combusted landfill gas up to 1 March 2023, which represents;
  - 231,540 tonnes of CO2 equivalent (total methane abated by gas capture system to date).
  - 3,859,000 seedlings planted for 10 years
  - 6,229 (cars off the road for the last 12 months)
  - 92,714 Australian Carbon Credit Units
- Biogas captured is the cumulative flow reading at the last day of the month.





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## PROJECT PROFILE: **DUNMORE, NSW**

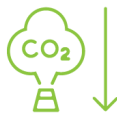
We expedite the transition to renewables with clean energy and carbon abatement solutions. Carbon credits enable a commercially viable project to create additional abatement.

### Results Achieved since the Project Commenced\*



#### BIOGAS CAPTURED

24.6 million m3



#### CARBON ABATEMENT

234 thousand tonnes  
(t CO2e - environmental benefit)



#### ACCUs CREATED

92 thousand Australian  
Carbon Credit Units



#### SEEDLINGS PLANTED

3.9 million seedlings  
planted for 10 years  
(t CO2e)



#### CARS OFF THE ROAD

6,304 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).
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*Saving the planet one landfill, one megawatt, one solar panel, one battery at a time*

Results Achieved to 1 April 2023

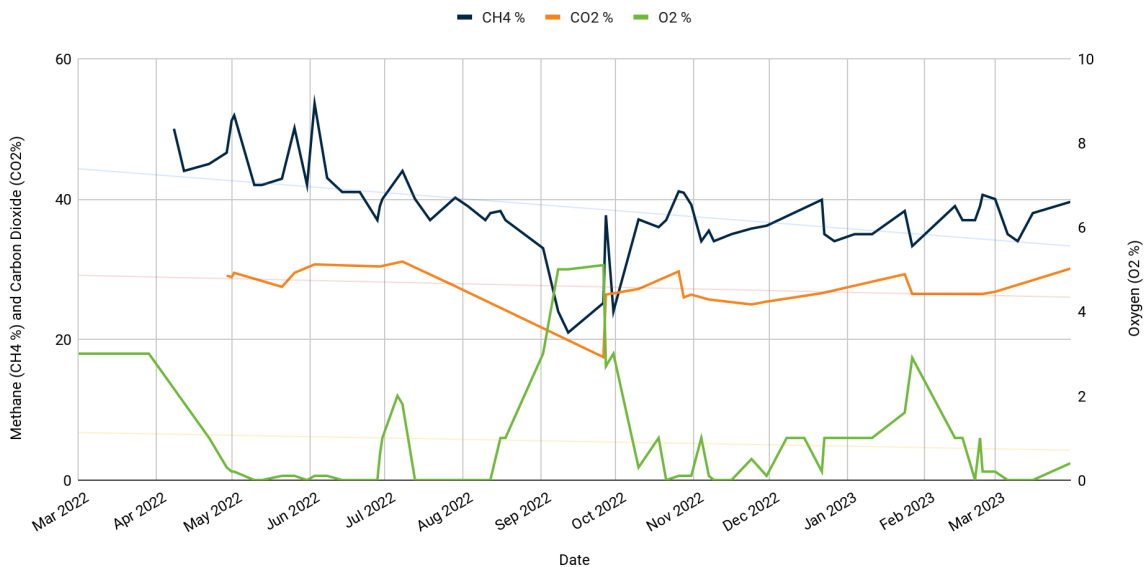
<b>Site:</b>	Dunmore	<b>Report issue date:</b>	18/04/2023
<b>Report month:</b>	March 2023	<b>Prepared by:</b>	Grace Tap
<b>Prepared for:</b>	Shellharbour City Council	<b>Checked by:</b>	Jarryd Doran

<b>Comments on changes to existing system:</b>	<ul style="list-style-type: none"> <li>• <b>January 2016</b> - LGI disconnected the 4 lateral wells and 8 vertical wells.</li> <li>• <b>April 2016</b> - LGI reconnected 8 vertical wells in the SE corner and 4 lateral wells.</li> <li>• <b>June 2016</b> - LGI disconnected the extended gas capture system to assist council.</li> <li>• <b>September 2016</b> - LGI disconnected the extended gas capture system to assist council.</li> <li>• <b>November 2016</b> - LGI commissioned the connection to leachate sump 6 as of 23-11-2016.</li> <li>• <b>May 2017</b> - LGI installed an additional 10 vertical wells to the existing LFG system</li> <li>• <b>November 2019</b> - 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.</li> <li>• <b>April 2020</b> - LGI installed a flowline to sump 6 after earlier disconnection.</li> <li>• <b>February 2021</b> - LGI installed 13 new vertical wells, including a new submain</li> <li>• <b>March 2022</b> - LGI replaced the flare gas analyser panel with a Draeger model analyser for greater accuracy and reliability</li> <li>• <b>August 2022</b> - LGI repaired the 225mm mainline and adjacent sub main to allow for intermediate capping to continue across the top of cell 3</li> <li>• <b>December 2022</b> - LGI installed a pneumatic bore pump in a jtrap, allowing for greater reliability of condensate management in the main gas line.</li> </ul>
<b>Comments on operation / maintenance:</b>	Availability - 100.00% Down Time: 0.00hrs  Field Tuned: - 01/03/2023 - 31/03/2023
<b>Recommendations:</b>	After discussion with Council, LGI will re-investigate options for leachate pumping out of gas extraction wells. We anticipate being on site to upgrade leachate infrastructure in May 2023.

### Flare Operational Data:

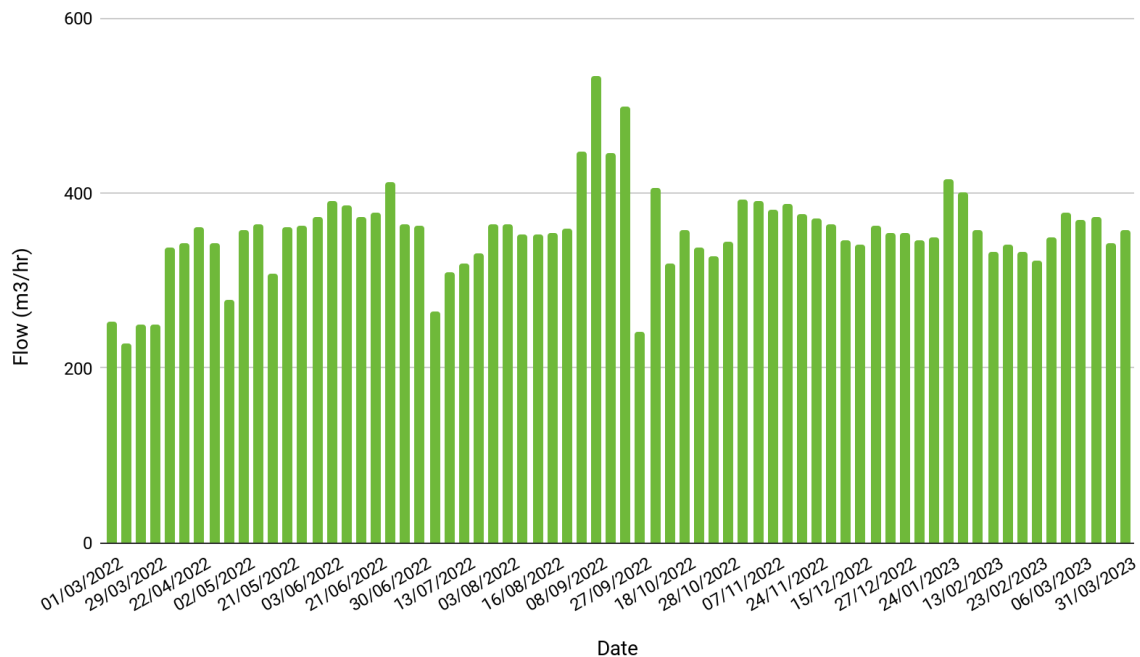
Date	CH4 %	CO2 %	O2 %	FLOW m3/h	STACK TEMP C	CUMULATIVE FLOW m3
01/03/2023	40.0	26.8	0.2	377	682	24,383,436
10/03/2023	34.0	-	0	373	615	24,462,664
16/03/2023	38.0	-	0	342	696	24,514,505
31/03/2023	39.6	30.1	0.4	358	700	24,642,826
Average	37.9	28.45	0.15	363	673	-

## Dunmore- Methane, Carbon Dioxide & Oxygen

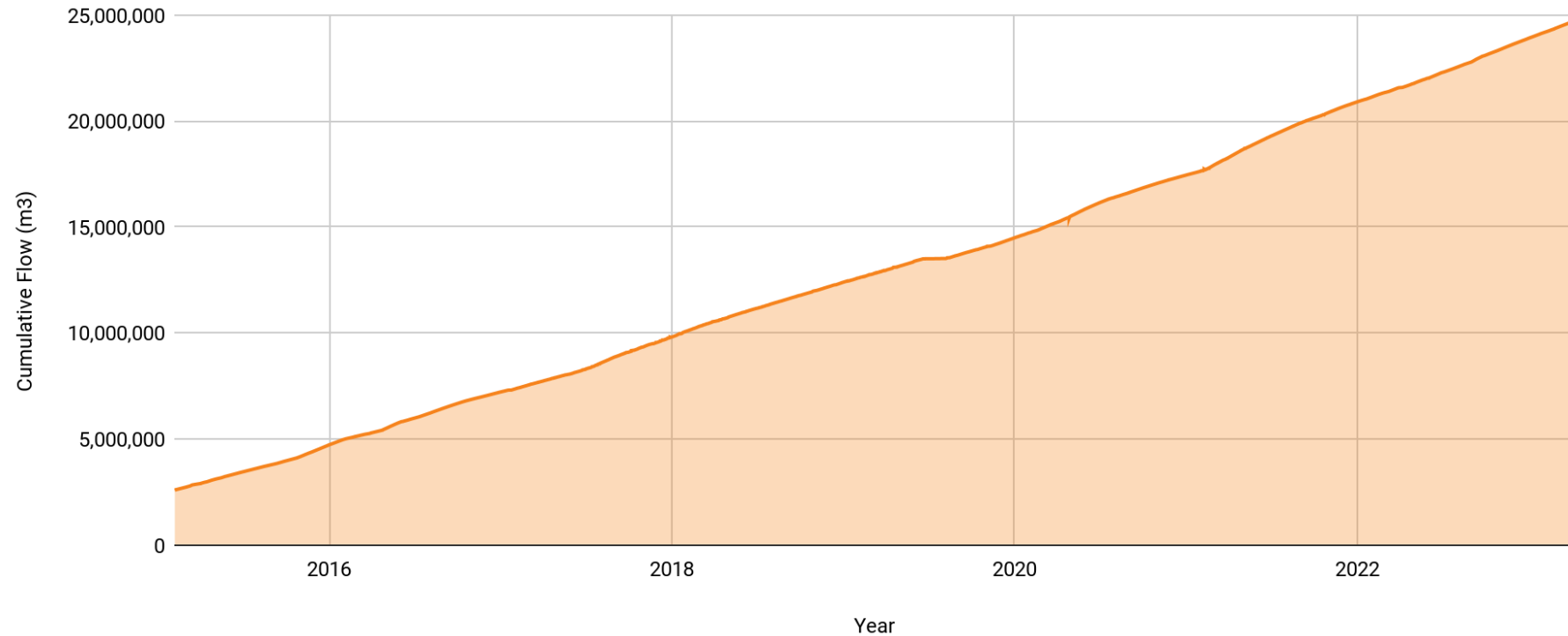


*Damaged infrastructure on 02/09/2022 has allowed an influx of oxygen into the field causing readings of high O2 and low CH4.*

## Dunmore - Flow Rate



## Dunmore - Cumulative Flow



- 24,647,231 of combusted landfill gas up to 1 April 2023, which represents;
  - 234,090 tonnes of CO<sub>2</sub> equivalent (total methane abated by gas capture system to date).
  - 3,901,492 seedlings planted for 10 years
  - 6,304 (cars off the road for the last 12 months)
  - 92,714 Australian Carbon Credit Units
- Biogas captured is the cumulative flow reading at the last day of the month.



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