



# **QUARTERLY ENVIRONMENTAL MONITORING REPORT (QEMR) MARCH 2021**

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

**ENVIRONMENT PROTECTION LICENCE (EPL) 5984**

Prepared For: **Shellharbour City Council**  
Project Number: **ENRS0033**  
Date: **March 2021**

**ENRS**

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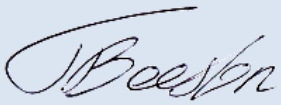

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ACKNOWLEDGEMENTS

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 Monitoring Report for the Dunmore Recycling and Waste Depot (herein referred to as the Site).

This report summarises the results of field testing and laboratory analysis conducted by ALS for the March 2021 quarterly monitoring period. This Quarterly Report 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 Council (SC) 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.

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 are provided in **Appendix A** (EPL No. 5984). ENRS note that EPL No. 12903 does not specify sample points.

The objectives of this Quarterly Environmental Monitoring Report 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 any on-site or off-site impacts associated with operation of the Site;
- Advise SCC if the current environmental monitoring program is providing adequate information to identify potential environmental impacts from existing operations (if any) and provide recommendations on improvement to the monitoring program if required; and
- Document monitoring results in a Quarterly Environmental Monitoring Report.

The scope of work for this Quarterly Environmental Monitoring Report comprised the collation, assessment and reporting of Site data made available to ENRS from the quarterly December 2019 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);

- 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 2021 quarterly 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 reported exceedances of the assessment criteria for; ammonia, nitrate, nitrate and salinity (EC) within multiple groundwater bores including; BH-1c, BH-3, BH-4, BH-9, BH-12r, BH-13, BH-15, BH-19r. This is consistent with previous monitoring events;
- Onsite surface water samples (SWP-1, SW-2, SWP-4 and SWP-5) reported a single minor exceedance for pH above the ANZECC (2000) trigger values for 95% marine/freshwater. The remaining chemical leachate indicators were reported below the assessment criteria;
- Downgradient Rocklow Creek surface water samples (SWC-Up, SWC-2, SWC-down and SWC-down 2) were within the adopted Site Assessment Criteria;
- The existing monitoring locations and sampling regime (specified in EPL 5984) is generally considered to provide a suitable assessment of surface water, leachate and groundwater conditions;
- Surface gas methane monitoring reported satisfactory results all within the adopted assessment criteria;
- Dust deposition gauges recorded satisfactory results below the guidelines provided in AS3580.10.1. Monitoring should continue in accordance with EPL 5984 requirements;
- No non-compliances with the EPL were reported during the March 2021 quarterly monitoring period;
- Based on this review of the quarterly March 2021 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.

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## 1.0 INTRODUCTION

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### 1.1 PROJECT BACKGROUND

#### 1.1.1 Site History

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## 2.0 SITE DESCRIPTION

### 2.1 LOCATION

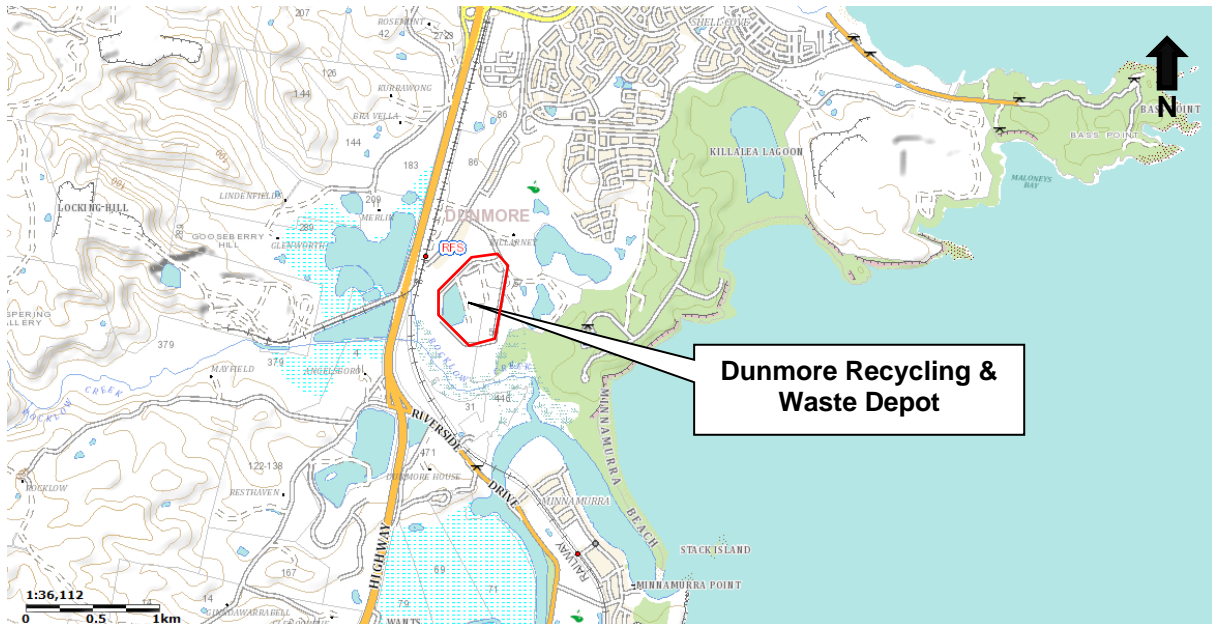
The Site is located at 44 Buckleys Road, Dunmore, NSW, 2529, legally defined as Lot 21 in Deposited Plan 653009 and Lot 1 Deposited Plan 419907. The Site is situated approximately three and a half (3.5) kilometres southwest of the Shellharbour town centre. The area's regional location is defined in **Figure 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
Site	Dunmore Recycling and Waste Depot
Street Address	44 Buckleys Road, Dunmore, NSW 2529
Site Area	72.36 hectares
Title Identifier	Lot 21 DP 653009, Lot 1 DP 419907

Aspect	Description
Zoning	RU1 Primary Production
Local Government Area	Shellharbour City Council

**Figure 1: Site Location Map**



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

## 2.2 SURROUNDING LANDUSE

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.
<b>East:</b>	Dunmore Resources and Recycling facility immediately to the east, bushland to the southeast.
<b>South:</b>	Bushland, Rocklow Creek (300m from landfill activities). Further to Kiama Community Recycling Centre and Riverside Drive.
<b>West:</b>	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. 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.

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 aquifer, the shallow groundwater flow is inferred to mimic topography with low to moderate hydraulic gradients flowing towards the south.

The Site and adjoining land, is 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 Error! Reference source not found..

### 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 ANZECC 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 DVGs 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	0.91 mg/L	1.88 mg/L
Nitrate	0.70 mg/L	0.70 mg/L
pH	6.5-8.5 pH units	6.5-8.5 pH units
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	-

#### 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.
<b>GILs</b>	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;
<b>EILs</b>	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> </ul> Commercial and industrial land uses.

### 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.

## 4.0 SAMPLING METHODOLOGY

Field sampling was conducted by *ALS Environmental* (Wollongong) as commissioned by SCC in June 2020. 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 Error! Reference source not found.. In summary the sampling regime collected samples from; eight (8) surface waters; nine (9) groundwater monitoring wells; and two (2) leachate points. 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 is 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 or low flow parameter stabilisation methods applied with field sheets provided to document pumping volumes and field parameters. Samples were collected using clear disposal bailers. and were sealed in laboratory-prepared sampling containers appropriate for the analysis. All samples were stored on ice immediately after their collection and transported to the laboratory under Chain of Custody (CoC) documentation.

Surface water and leachate samples were collected using as 'grab samples' from the midpoint of the structure and at mid-depth.

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 **12<sup>th</sup> Feb 2021** and **17<sup>th</sup> Mar 2021**. A total of four (4) dust monitoring locations were considered adequate to assess site conditions. ENRS note that the June 2020 quarterly sampling was the third event to four (4) dust gauges.

## 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 E.

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. The concentration of methane gas was also recorded in any buildings located within a distance of 250 m of the deposited waste, and any depressions or surface fissures away from the sampling grid were also investigated.



## 4.4 LABORATORY ANALYSIS

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

## 5.0 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

Data provided for the purpose of this report by SC was prepared by ALS. ALS is NATA accredited for the laboratory testing. The QA/QC indicators as provided to ENRS either all

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 is considered acceptable for use in this assessment.

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

### 5.3 EPL NON-COMPLIANCE

Monitoring requirements are defined by the EPL.

## 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 8** with comparison against the relevant Site Assessment Criteria (SAC). Exceedances of relevant guidelines are also summarised in **Table 6**. The laboratory certificates of analysis are provided in Appendix B.

### 6.1 OVERFLOW RESULTS

ENRS understand no overflow events were recorded during the **March 2021** quarterly monitoring period. Hence, no water samples were collected by ALS and no results are presented for this reporting period.

### 6.2 FIELD TESTING

Field testing is 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

### 6.3 PHYSICAL INDICATORS

#### 6.3.1 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 for of  $0.68 \text{ mg/L} = 0.68 \text{ EC } (\mu\text{S/cm})$ . Table 3.3.3 of the ANZECC (2000) guidelines document default TV for EC in lowland freshwater rivers between  $125 \mu\text{S/cm} - 2,200 \mu\text{S/cm}$  (~1,500 mg/L).

### **Groundwater**

Salinity in groundwater is typically higher than surface water due to mineral dissolution. Groundwater salinity at the Site was generally reported above the freshwater SAC of 2,200  $\mu\text{S/cm}$ . Elevated results were reported in four (4) groundwater bores ranging between; **2,550  $\mu\text{S/cm}$  (BH-12r)** and **7,300  $\mu\text{S/cm}$  (BH-1c)**. Results are consistent with the previous 2020 quarterly monitoring events.

### **Leachate**

Leachate salinity for the **March** Quarterly 2021 monitoring period was reported to be **15,700  $\mu\text{S/cm}$  (LP1)** and **15,900  $\mu\text{S/cm}$  (Sump)** which is above the TV.

### **6.3.2 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 sulfide 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.

Dissolved Oxygen was recorded for Leachate only, at **0.98 mg/L (Sump)** and **1.26 mg/L (LP1)**.

### **6.3.3 pH**

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

### **Surface Water**

Surface water reported pH values of between **pH 7.2 (SWP1)** and **pH 8.5 (SWP-4)**.

### **Groundwater**

Groundwater pH was reported between **pH 6.7 (BH-14)** and **pH 7.3 (BH-3)**. All groundwater results were reported within the ANZECC recommended range of pH 6.5-8.0. The results are largely within the historical range of values.

### 6.3.4 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 were reported between **<5 mg/L** (SWC-down2 and SWC2) and **46 mg/L** (SWC-up).

## 6.4 INORGANIC ANALYTES

### 6.4.1 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.

#### ***Ammonia***

Ammonia was measured within groundwater monitoring bores between **0.36 mg/L** (BH-14) and **340 mg/L** (BH-1c). Eight (8) out of the nine (9) groundwater wells reported exceedances over the adopted trigger value of 0.91 mg/L. This is consistent with historical values.

Ammonia in leachate was reported at **1960 mg/L** (LP1) and **1960 mg/L** (Sump). High ammonia concentrations are expected in untreated leachate.

#### ***Ammonium***

Ammonium was measured at Rocklow Creek surface water monitoring locations between **0.16 mg/L** (SWC-down 2) and **0.24 mg/L** (SWC-2 and SWC-down). All results are below the adopted trigger value of 0.91 mg/L.

#### ***Nitrate***

Results for Nitrate in groundwater were reported between **<.01 mg/L** in multiple bores and **17.4 mg/L** (BH-15). A total of four (4) exceedances in groundwater were reported above the TV of 0.7mg/L including: **17.4 mg/L** (BH-15), **17.2 mg/L** (BH-14), **2.01 mg/L** (BH-13) and **1.49 mg/L** (BH-3).

Nitrate in Rocklow Creek surface water samples were all reported below the TV of 0.7mg/L. The results are considered satisfactory.

Nitrate in leachate was reported at **11.1 mg/L** (Leachate Sump), **<0.10 mg/L** (Leachate Tank LP1).

### 6.4.2 Metals & Metalloids

#### ***Magnesium (Total Mg)***

Magnesium was analysed in selected surface water samples. Concentrations of magnesium in surface water were reported between **18 mg/L** (SWP-1) and **1,100 mg/L** (SWC-down).

### ***Manganese (Total Mn)***

Manganese was analysed in groundwater and leachate sampling points. Concentrations of Manganese in groundwater were reported between **0.102 mg/L** (BH-1c) and **0.685 mg/L** (BH-9). Leachate concentrations were reported as **0.448 mg/L** (Sump) and **0.513 mg/L** (Tank). These values are below the adopted TV (1.9 mg/L 95% of Species - freshwater) and are considered acceptable. Concentrations of Manganese should continue to be reviewed during subsequent monitoring events.

## **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 monitoring period at the following concentrations:

- Groundwater; between **16 mg/L** (BH-4) and **219 mg/L** (BH-1c); and
- Leachate; **3080 mg/L** (Sump) and **3540 mg/L** (LP1).

## 6.6 SUMMARY OF WATER QUALITY EXCEEDANCES

The following table provides a summary of exceedances above the ANZECC (2000) guidelines for the protection of 95% of fresh water and marine species for the collected water samples.

**Table 6: Summary of Quarterly Water Monitoring Exceedances**

Sample ID	EPA Point No.	Exceedances		Comments
		Results	Guideline	
BH-1c	3	Ammonia 340 mg/L EC 7,300 µS/cm	0.91 mg/L 125-2200 µS/cm	Exceedances of Ammonia, Nitrate, pH and Salinity (EC) were encountered in multiple wells at the Site.  Concentrations are elevated and within range of historical data sets. Exceedances of Ammonia and Electrical Conductivity were encountered
BH-3	5	Ammonia 42.5 mg/L Nitrate 1.49 mg/L	0.91 mg/L 0.7 mg/L	
BH-4	6	Ammonia 16.6 mg/L	0.91 mg/L	
BH-9	18	Ammonia 96.4 mg/L EC 4,240 µS/cm	0.91 mg/L 125-2200 µS/cm	
BH-12r	17	Ammonia 8.93 mg/L EC 2,550 µS/cm	0.91 mg/L 125-2200 µS/cm	
BH-13	3	Ammonia 1.43 mg/L Nitrate 0.97 mg/L	0.91 mg/L 0.7 mg/L	
BH-14	11	No exceedances		
BH-15	7	Ammonia 1.65 mg/L EC 6,250 µS/cm	0.91 mg/L 125-2200 µS/cm	
BH-18	25	Ammonia 48.6 mg/L	0.91 mg/L	
BH-19r	16	No exceedances		
BH-21	23	Ammonia 3.40 mg/L EC 2,770 µS/cm	0.91 mg/L 125-2200 µS/cm	
BH-22	24	Ammonia 1.24 mg/L	0.91 mg/L	
SWP-1	1	No exceedances	-	
SWP-2	2	No exceedances	-	-
SWP-4	-	pH 8.5	6.5-8.5 pH units	One exceedance for pH in within sampled onsite surface water monitoring locations above the protection 95% of species (freshwater and marine water).
SWP-5	-	Dry	-	-
SWC-up	20	No exceedances		
SWC-2	19	No exceedances		
SWC-down	21	No exceedances	-	
SWC-down 2	22	No exceedances		
Leachate Sump	-	Ammonia 1960 mg/L DO 12% EC 15,900 µS/cm	0.91 mg/L 85-100% 125-2,200 µS/cm	Elevated levels of Ammonia and EC considered to be characteristic of untreated leachate material.
Leachate Tank LP1	2	Ammonia 1960 mg/L DO 21% EC 15,900 µS/cm	0.91 mg/L 85-100% 125-2,200 µS/cm	

## 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 15<sup>th</sup> May and 17<sup>th</sup> June 2020, in general accordance with AS3580.10.1.

**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	0.9	Satisfactory
DDG2		0.6	Satisfactory
DDG3		2.2	Satisfactory
DDG4		2.5	Satisfactory

Results for depositional dust during the June 2020 quarterly monitoring period reported levels of dust between below the adopted assessment criteria of **4 g/m<sup>2</sup>/month**. The results are therefore considered satisfactory. Dust gauge locations are provided in **Figure 2** attached. It is recommended that monitoring is continued as part of the quarterly regime.

## 8.0 SURFACE METHANE GAS RESULTS

The surface gas monitoring from the June 2020 quarterly monitoring period reported levels of methane between 2.0 ppm and 12.9 ppm which is below the EPA license limits of 500 ppm. The results are considered satisfactory. A table of results is provided in Appendix D.

## 9.0 ENVIRONMENTAL ASSESSMENT

### 9.1 MONITORING POINT SUMMARY

Field measurements and laboratory water quality results from the **March 2021** quarterly monitoring period reported concentrations analytes generally within the range historical values. Groundwater and surface water within the Site boundary reported high levels of analytes in exceedance of the SAC, considered to be characteristic of landfill and leachate.

Offsite sample locations within Rocklow Creek generally reported satisfactory results.

All dust gauges were reported below the site assessment criteria which was considered satisfactory.

Results of surface methane gas monitoring recorded satisfactory results. The landfill surface cap is therefore considered intact and effective.

## 10.0 CONCLUSION AND RECOMMENDATIONS

Based on the findings obtained during the **March 2021** quarterly 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 reported exceedances of the assessment criteria for; ammonia, nitrate and salinity (EC) within multiple groundwater bores including; BH-1c, BH-3, BH-4, BH-9, BH-12r, BH-13, BH-15, BH-18, BH-19r, BH-21 and BH-22. This is consistent with previous monitoring events;
- Onsite surface water samples (SWP-1, SW-2, SWP-4 and SWP-5) reported a single minor exceedance for pH above the ANZECC (2000) trigger values for 95% marine/freshwater. The remaining chemical leachate indicators were reported below the assessment criteria;
- Downgradient Rocklow Creek surface water samples (SWC-Up, SWC-2, SWC-down and SWC-down 2) were reported within the adopted Site Assessment Criteria. Concentrations of key leachate indicators including ammonium and nitrate were below the ANZECC (2000) trigger values for marine waters in all Rocklow Creek sample locations;
- The existing monitoring locations and sampling regime (specified in EPL 5984) is generally considered to provide a suitable assessment of surface water, leachate and groundwater conditions;
- Surface gas methane monitoring reported satisfactory results all within the adopted assessment criteria;
- Dust deposition gauges recorded satisfactory results below the guidelines provided in AS3580.10.1. Monitoring should continue in accordance with EPL 5984 requirements;
- No non-compliances with the EPL were reported during the June 2020 quarterly monitoring period;
- Based on this review of the quarterly March 2021 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.

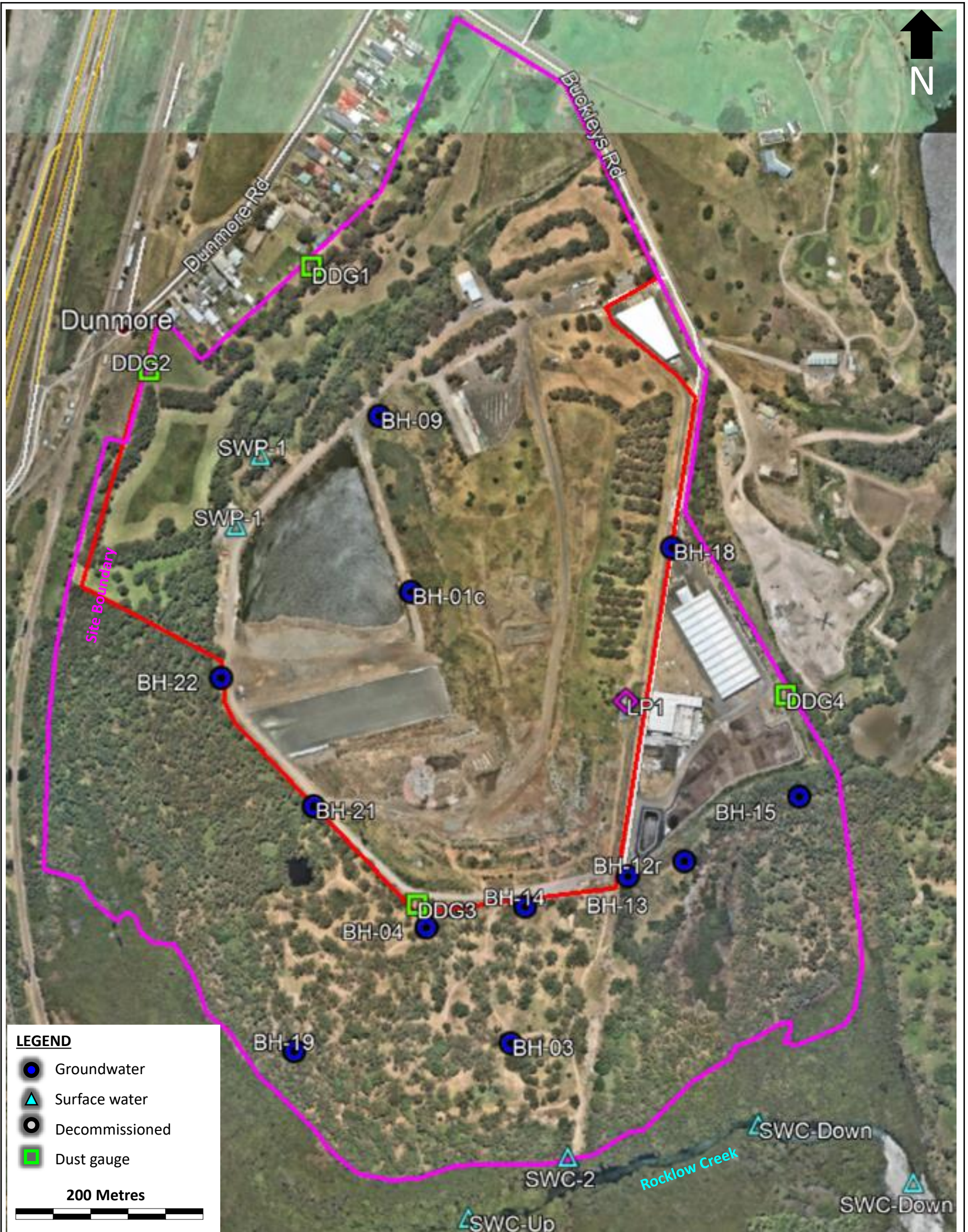
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It is the responsibility of the Client to accept if the Client so chooses any recommendations contained within and implement them in an appropriate, suitable and timely manner.

## 12.0 REFERENCES

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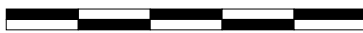
# FIGURES



**LEGEND**

- Groundwater
- ▲ Surface water
- Decommissioned
- Dust gauge

200 Metres



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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		

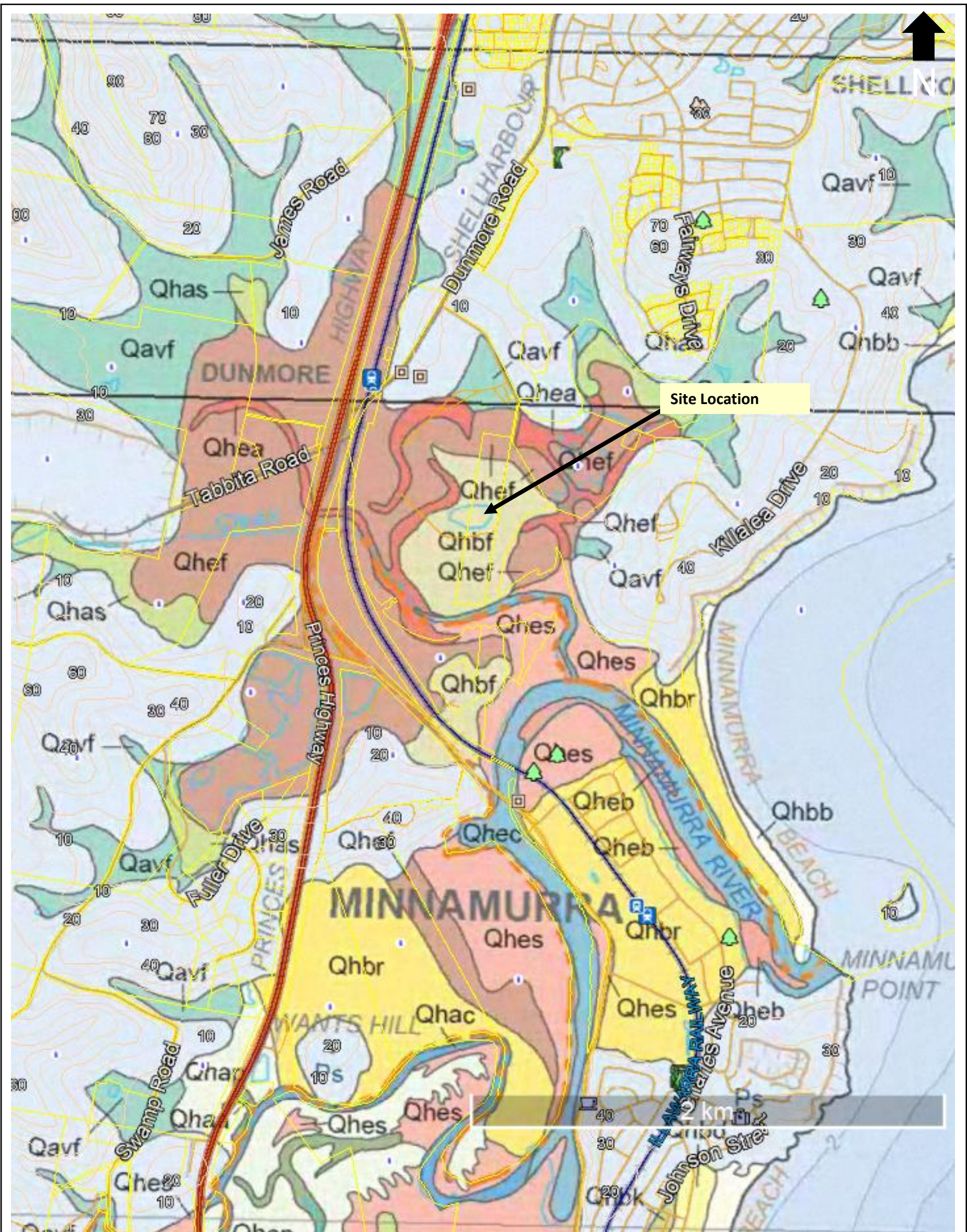


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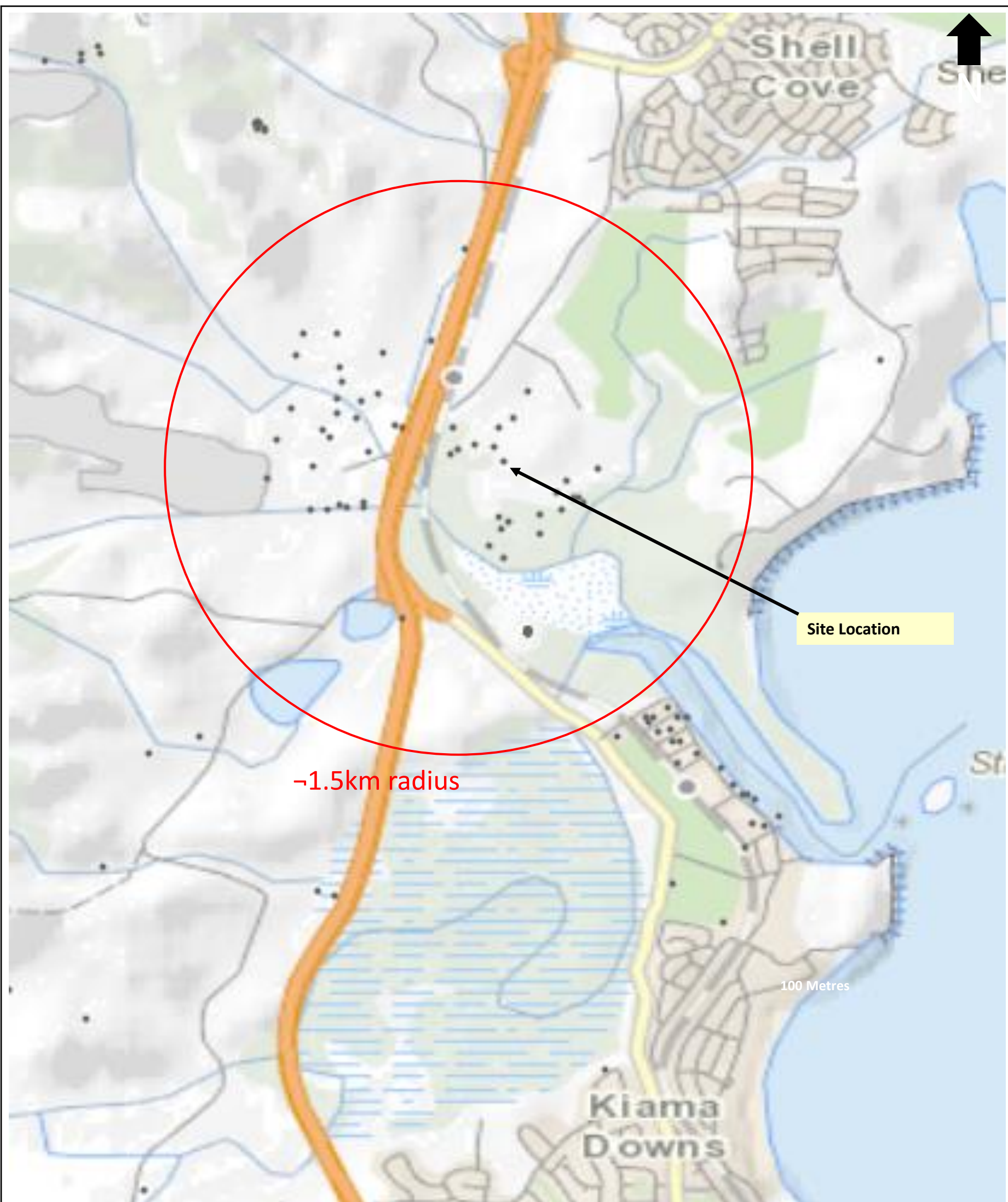
Client:	<b>Shellharbour City Council</b>	Drawn:	<b>PL</b>	Figure:	<b>3</b>
Project:	<b>ENRS0033</b>	Source:	<b>SixMaps</b>	Date:	<b>16/03/2020</b>
Location:	Dunmore Recycling & Waste Depot 44 Buckleys Rd, Dunmore, NSW	Scale:	<b>NA</b>	Title:	<b>Surface Gas Sample transects</b>
		Status:	<b>Rev 1</b>		



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Client:	Shellharbour City Council	Drawn:	PL	Figure:	4
Project:	ENRS0033	Source:	DPI	Date:	16/01/2020
Location:	Dunmore Recycling & Waste Depot 44 Buckley's Rd, Dunmore, NSW	Scale:	NA	Title:	Geology
		Status:	Rev 1		



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

# TABLES



**TABLE 8: Total Concentration Results**  
Quarterly Water Monitoring Results - March 2021: Dunmore Recycling and Waste Depot

GILs - Trigger Values for Freshwater (Protection of 95% of Species) <sup>A</sup>		-	-	-	-	-	1.9	-	-	-	0.9 (pH 8)	0.9 (pH 8)	-	0.7	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)	0.91 (pH 8)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Australian Drinking Water Guidelines (2018) <sup>C</sup>		Health		-	-	-	-	-	0.5	-	-	1.5	-	-	3	50	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.5 - 8.5	-	-		
		Aesthetic		250	-	-	180	-	0.1	0.3	0.3	-	0.5	0.5	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	6.5 - 8.5	-	-			
Sample No.		Date Sampled	Chloride	Calcium	Magnesium	Sodium	Potassium	Manganese	Total Iron	Dissolved Iron	Fluoride	Ammonia as N	Ammonium as N	Nitrite as N	Nitrate as N	Nitrite + Nitrate as N	Total Organic Carbon	Biochemical Oxygen Demand	Hydroxide Alkalinity as CaCO3	Carbonate Alkalinity as CaCO3	Bicarbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Sulfate as SO4 - Turbidimetric	Dissolved Oxygen	Dissolved Oxygen - % Saturation	Suspended Solids (SS)	Turbidity	Total Anions	Total Cations	Ionic Balance	pH	Electrical Conductivity	Temperature	Depth to Water (mbgl TOC)	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	mg/L	mg/L	mg/L	%	mg/L	NTU	meq/L	meq/L	meq/L	pH	µS/cm	°C	mbgl				
		EPA No.	Laboratory PQL	1	1	1	1	0.001	0.05	0.05	0.1	0.01	0.01	0.01	0.01	0.01	1	2	1	1	1	1	1	0.01	0.1	5	0.1	0.01	0.01	0.01	0.01	1	0.1	-	-		
Groundwater	BH-1c	3	16/03/2021	834	122	-	-	202	0.102	-	13.30	0.3	340.00	-	<0.01	<0.01	<0.10	219	-	<1	<1	2260	2260	<1	-	-	-	-	-	-	-	-	7.10	7300	19.8	3.31	-
	BH-3	5	16/03/2021	309	126	-	-	27	0.234	-	4.00	0.1	42.50	-	0.02	1.49	1.51	17	-	<1	<1	482	482	97	-	-	-	-	-	-	-	-	7.30	2000	18.8	2.14	-
	BH-4	6	16/03/2021	244	182	-	-	22	0.212	-	6.03	0.1	16.60	-	<0.01	<0.01	<0.01	16	-	<1	<1	725	725	172	-	-	-	-	-	-	-	-	7.00	2170	19.1	4.37	-
	BH-9	18	16/03/2021	465	190	-	-	60	0.685	-	5.85	0.4	96.40	-	<0.01	<0.01	<0.01	51	-	<1	<1	1810	1810	98	-	-	-	-	-	-	-	-	7.20	4240	19.3	3.3	-
	BH-12r	17	16/03/2021	330	206	-	-	53	0.444	-	6.41	0.2	8.93	-	0.02	0.17	0.19	58	-	<1	<1	797	797	185	-	-	-	-	-	-	-	-	6.80	2550	22	4.4	-
	BH-13	10	16/03/2021	112	180	-	-	26	0.172	-	0.67	0.2	1.43	-	<0.01	2.01	2.01	25	-	<1	<1	646	646	215	-	-	-	-	-	-	-	-	6.90	1750	20.7	4.4	-
	BH-14	11	16/03/2021	231	102	-	-	18	0.121	-	<0.05	0.5	0.36	-	0.06	17.2	17.30	37	-	<1	<1	548	548	130	-	-	-	-	-	-	-	-	6.70	1860	21.3	4.83	-
	BH-15	7	16/03/2021	1320	108	-	-	350	0.358	-	11.20	0.2	1.65	-	<0.01	17.4	17.40	106	-	<1	<1	445	445	495	-	-	-	-	-	-	-	-	6.80	6250	19.4	0.86	-
	BH-18	25	16/03/2021	17	36	-	-	7	0.118	-	1.41	0.2	0.79	-	<0.01	<0.01	<0.01	12	-	<1	<1	186	186	4	-	-	-	-	-	-	-	-	6.70	396	21	2.32	-
	BH-19	16	16/03/2021	258	158	-	-	22	0.131	-	1.19	0.1	48.60	-	0.01	0.65	0.66	21	-	<1	<1	525	525	257	-	-	-	-	-	-	-	-	7.00	2020	19.3	4.57	-
	BH-21	23	16/03/2021	389	127	-	-	16	0.276	-	0.77	0.4	3.40	-	<0.01	0.62	0.62	35	-	<1	<1	540	540	429	-	-	-	-	-	-	-	-	7.20	2770	22.3	3.12	-
	BH-22	24	16/03/2021	263	138	-	-	27	0.089	-	0.58	0.4	1.24	-	<0.01	<0.01	<0.01	21	-	<1	<1	476	476	312	-	-	-	-	-	-	-	-	7.50	2110	19.7	2.75	-
Surface Water	SWP-1	1	17/03/2021	137	34	18	94	12	-	0.35	0.15	-	-	-	-	-	-	-	<1	<1	189	189	4	-	-	21	12.5	7.72	7.57	0.98	7.20	-	-	-	-	-	
	SWP-2	1	17/03/2021	359	110	57	341	28	-	-	<0.05	-	-	-	-	-	-	-	<1	<1	527	532	243	-	-	7	3.6	27.20	27.10	0.12	8.20	-	-	-	-	-	
Rocklow Creek	SWC-up	20	17/03/2021	11300	314	896	7320	261	-	0.89	<0.10	-	0.28	0.28	<0.01	0.01	0.01	-	-	<1	<1	167	167	1860	-	-	46	22.6	361.00	414.00	6.92	7.30	-	-	-	-	-
	SWC-2	19	17/03/2021	-	-	-	-	-	-	0.20	<0.50	-	0.24	0.24	<0.01	<0.01	<0.01	-	-	<1	<1	152	152	-	-	-	<5	-	-	-	-	7.60	-	-	-	-	-
	SWC-down	21	17/03/2021	14300	376	1100	9120	326	-	0.16	<0.10	-	0.24	0.24	<0.01	0.02	0.02	-	-	<1	<1	136	136	2210	-	-	6	3.6	452.00	514.00	6.44	7.70	-	-	-	-	-
	SWC-down 2	22	17/03/2021	13100	355	1050	8730	308	-	<0.10	<0.50	-	0.16	0.16	<0.01	0.01	0.01	-	-	<1	<1	139	139	2040	-	-	<5	2.1	415.00	492.00	8.49	7.50	-	-	-	-	-
Leachate	Leachate Tank LP1	2	17/03/2021	1700	128	-	-	492	0.513	2.15	-	0.4	1960	-	<0.10	<0.10	<0.10	3540	-	<1	<1	5990	2990	<10	1.26	20.6	-	-	-	-	-	7.60	15700	26.9	-	-	

<sup>A</sup> Investigation levels apply to typical slightly-moderately disturbed systems. Trigger Levels for 95% of species. See ANZECC & ARMCANZ (2000) for guidance on applying these levels to different ecosystem conditions. Also the same as the NEPM (2013) EILs.  
<sup>B</sup> ANZG 2018 - pH Upper and Lower Limit for NSW Lowland Rivers (Table 3.3.2).  
<sup>C</sup> Investigation levels are taken from the health values of the Australian Drinking Water Guidelines (NHMRC 2018).

# APPENDICES

# Appendix A

## EPL 5984 Sampling Point Summary (NSW EPA, 27/11/2020)

EPA Point	Type	Description
1	Overflow drain	Catch drain collecting overflows from Sediment Dams 1 & 2 and labelled SWP1 on the drawing titled "Shellharbour City Council - "Shellharbour City Council - Dunmore, NSW - Site Layout - Figure no. 1" dated July 2019 (EPA Ref. no. DOC19/1027702).
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 2178  
Ph: 02 8784 8555 E: samples.sydney@alsenviro.com

☐ Brisbane: 32 Shand St. Stafford QLD 4065  
Ph: 07 3249 7222 E: samples.brisbane@alsenviro.com

☐ Melbourne: 2-4 Wastall Rd. Springvale VIC 3171  
Ph: 03 8549 0600 E: samples.melbourne@alsenviro.com

☐ Perth: 10 Hod Way. Melaga WA 6090  
Ph: 08 9209 7655 E: samples.perth@alsenviro.com

☐ Newcastle: 5 Rosegum Rd. Warabrook NSW 2304  
Ph: 02 4963 7433 E: samples.newcastle@alsenviro.com

☐ Townsville: 14-15 Desma Ct. Bihie QLD 4818  
Ph: 07 4798 0690 E: townsville.environmental@alsenviro.com

☐ Adelaide: 2-1 Burma Rd. Pooraka SA 5095  
Ph: 08 9359 0690 E: adelaide@alsenviro.com

☐ Launceston: 27 Wellington St. Launceston TAS 7250  
Ph: 03 8331 2158 E: launceston@alsenviro.com

CLIENT:	Shellharbour City Council	TURNAROUND REQUIREMENTS:	<input type="checkbox"/> Standard TAT (List due date):
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):
PROJECT:	Dunmore Quarterly Ground Waters	ALS QUOTE NO.:	WO/030/19 TENDER
ORDER NUMBER:		COC SEQUENCE NUMBER (Circle)	
PROJECT MANAGER:	Joel Culton	COC:	1 2 3 4 5 6 7
SAMPLER:	SAMPLER MOBILE:	OF:	1 2 3 4 5 6 7
COC emailed to ALS? ( YES / NO)	EDD FORMAT (or default):	RELINQUISHED BY:	RECEIVED BY:
Email Reports to:		DATE/TIME:	DATE/TIME:
Email Invoice to:		16.3.20 15:40	Aneta 16.3.21

**FOR LABORATORY USE ONLY (Circle)**

Chain of Custody:  Yes  No  N/A

Time for analysis:  Field  Lab  Random  Other

**Environmental Division  
Wollongong**  
Work Order Reference  
**EW2101155**

Telephone: 02 42253125

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 Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered)					Field Tests - pH, EC, Temp & SWL
	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)	
	BHA		16.3.20 8:50	W			✓	✓	✓	✓	✓	Field Tests - pH, EC, Temp & SWL
	BH2		14:15	W			✓	✓	✓	✓	✓	Field Tests - pH, EC, Temp & SWL
	BH10		9:45	W			✓	✓	✓	✓	✓	Field Tests - pH, EC, Temp & SWL
	BH16		10:35	W			✓	✓	✓	✓	✓	Field Tests - pH, EC, Temp & SWL
	BH17R		8:20	W			✓	✓	✓	✓	✓	Field Tests - pH, EC, Temp & SWL
	BH18		9:15	W			✓	✓	✓	✓	✓	Field Tests - pH, EC, Temp & SWL
	BH18R		10:10	W			✓	✓	✓	✓	✓	Field Tests - pH, EC, Temp & SWL
	BH20		13:05	W			✓	✓	✓	✓	✓	Field Tests - pH, EC, Temp & SWL
	BH20s		13:10	W			✓	✓	✓	✓	✓	Field Tests - pH, EC, Temp & SWL
	BH21		11:45	W			✓	✓	✓	✓	✓	Field Tests - pH, EC, Temp & SWL
	BH22		11:35	W			✓	✓	✓	✓	✓	Field Tests - pH, EC, Temp & SWL
<b>TOTAL</b>						<b>10</b>						

**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

<b>Work Order</b>	: <b>EW2101155-AA</b>	Page	: 1 of 6
<b>Amendment</b>	: <b>1</b>	<b>Laboratory</b>	: Environmental Division NSW South Coast
<b>Client</b>	: <b>SHELLHARBOUR CITY COUNCIL</b>	<b>Contact</b>	: Aneta Prosaroski
<b>Contact</b>	: Joel Coulton	<b>Address</b>	: 1/19 Ralph Black Dr, North Wollongong 2500
<b>Address</b>	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529		: 4/13 Geary Pl, North Nowra 2541 Australia NSW Australia
<b>Telephone</b>	: ----	<b>Telephone</b>	: +61 2 4225 3125
<b>Project</b>	: Dunmore Quarterly Groundwaters	<b>Date Samples Received</b>	: 16-Mar-2021 16:28
<b>Order number</b>	: 130985	<b>Date Analysis Commenced</b>	: 16-Mar-2021
<b>C-O-C number</b>	: ----	<b>Issue Date</b>	: 03-Jun-2021 14:57
<b>Sampler</b>	: Robert DaLio		
<b>Site</b>	: DUNMORE LANDFILL TENDER		
<b>Quote number</b>	: WO/030/19 TENDER GROUNDWATERS		
<b>No. of samples received</b>	: 8		
<b>No. of samples analysed</b>	: 8		



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>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Robert DaLio	Sampler	Laboratory - Wollongong, NSW



## General Comments

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

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

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

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

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

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact 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.**
- Amendment (03/06/2021): This report has been amended to allow the distribution of an Electronic Data Deliverable (EDD) not previously provided. All analysis results are as per the previous report.
- 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.
- Temperature performed by ALS Wollongong via in-house method EA016 and EN67 PK.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.
- 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	BHA	BH2	BH10	BH16	BH17R
Sampling date / time				16-Mar-2021 08:50	16-Mar-2021 14:15	16-Mar-2021 09:45	16-Mar-2021 10:35	16-Mar-2021 08:20	
Compound	CAS Number	LOR	Unit	EW2101155-001	EW2101155-002	EW2101155-003	EW2101155-004	EW2101155-005	
				Result	Result	Result	Result	Result	
<b>EA005FD: Field pH</b>									
pH	----	0.1	pH Unit	6.6	7.2	7.5	6.9	7.0	
<b>EA010FD: Field Conductivity</b>									
Electrical Conductivity (Non Compensated)	----	1	µS/cm	1260	2890	2220	781	2900	
<b>EA116: Temperature</b>									
Temperature	----	0.1	°C	20.8	21.9	20.2	19.0	20.2	
<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	266	790	391	231	409	
Total Alkalinity as CaCO3	----	1	mg/L	266	790	391	231	409	
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	239	194	85	26	197	
<b>ED045G: Chloride by Discrete Analyser</b>									
Chloride	16887-00-6	1	mg/L	132	366	445	84	581	
<b>ED093F: Dissolved Major Cations</b>									
Calcium	7440-70-2	1	mg/L	100	132	24	51	164	
Potassium	7440-09-7	1	mg/L	15	36	3	15	70	
<b>EG020F: Dissolved Metals by ICP-MS</b>									
Manganese	7439-96-5	0.001	mg/L	0.066	0.663	0.180	0.148	0.234	
Iron	7439-89-6	0.05	mg/L	10.7	4.00	0.33	0.07	18.6	
<b>EK040P: Fluoride by PC Titrator</b>									
Fluoride	16984-48-8	0.1	mg/L	<0.1	0.2	0.5	0.3	0.1	
<b>EK055G: Ammonia as N by Discrete Analyser</b>									
Ammonia as N	7664-41-7	0.01	mg/L	0.62	37.9	1.22	0.95	9.98	
<b>EK057G: Nitrite as N by Discrete Analyser</b>									
Nitrite as N	14797-65-0	0.01	mg/L	0.03	<0.01	0.03	<0.01	<0.01	
<b>EK058G: Nitrate as N by Discrete Analyser</b>									
Nitrate as N	14797-55-8	0.01	mg/L	1.13	0.33	0.17	0.01	0.04	
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>									
Nitrite + Nitrate as N	----	0.01	mg/L	1.16	0.33	0.20	0.01	0.04	
<b>EP005: Total Organic Carbon (TOC)</b>									
Total Organic Carbon	----	1	mg/L	21	58	6	12	29	





**Analytical Results**

Sub-Matrix: <b>WATER</b> (Matrix: <b>WATER</b> )				Sample ID	BHA	BH2	BH10	BH16	BH17R
Sampling date / time				16-Mar-2021 08:50	16-Mar-2021 14:15	16-Mar-2021 09:45	16-Mar-2021 10:35	16-Mar-2021 08:20	
Compound	CAS Number	LOR	Unit	EW2101155-001	EW2101155-002	EW2101155-003	EW2101155-004	EW2101155-005	
				Result	Result	Result	Result	Result	
<b>QWI-EN 67.11 Sampling of Groundwaters</b>									
Standing Water Level	----	0.01	m AHD	<b>3.05</b>	<b>3.94</b>	<b>1.22</b>	<b>0.82</b>	<b>3.50</b>	



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)		Sample ID		BH18R	BH20	BH20s	----	----
		Sampling date / time		16-Mar-2021 10:10	16-Mar-2021 13:05	16-Mar-2021 13:10	----	----
Compound	CAS Number	LOR	Unit	EW2101155-007	EW2101155-008	EW2101155-009	-----	-----
				Result	Result	Result	----	----
<b>EA005FD: Field pH</b>								
pH	----	0.1	pH Unit	7.8	7.2	7.5	----	----
<b>EA010FD: Field Conductivity</b>								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	3650	1990	1150	----	----
<b>EA116: Temperature</b>								
Temperature	----	0.1	°C	18.7	18.9	20.1	----	----
<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	846	403	355	----	----
Total Alkalinity as CaCO3	----	1	mg/L	846	403	355	----	----
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	137	196	----	----
<b>ED045G: Chloride by Discrete Analyser</b>								
Chloride	16887-00-6	1	mg/L	738	322	51	----	----
<b>ED093F: Dissolved Major Cations</b>								
Calcium	7440-70-2	1	mg/L	99	157	99	----	----
Potassium	7440-09-7	1	mg/L	33	29	57	----	----
<b>EG020F: Dissolved Metals by ICP-MS</b>								
Manganese	7439-96-5	0.001	mg/L	0.207	0.079	0.060	----	----
Iron	7439-89-6	0.05	mg/L	0.23	2.02	<0.05	----	----
<b>EK040P: Fluoride by PC Titrator</b>								
Fluoride	16984-48-8	0.1	mg/L	0.7	0.1	0.1	----	----
<b>EK055G: Ammonia as N by Discrete Analyser</b>								
Ammonia as N	7664-41-7	0.01	mg/L	5.56	51.1	1.10	----	----
<b>EK057G: Nitrite as N by Discrete Analyser</b>								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.04	----	----
<b>EK058G: Nitrate as N by Discrete Analyser</b>								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	<0.01	4.19	----	----
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	4.23	----	----
<b>EP005: Total Organic Carbon (TOC)</b>								
Total Organic Carbon	----	1	mg/L	39	18	15	----	----



### Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH18R	BH20	BH20s	----	----
Sampling date / time				16-Mar-2021 10:10	16-Mar-2021 13:05	16-Mar-2021 13:10	----	----	
Compound	CAS Number	LOR	Unit	EW2101155-007	EW2101155-008	EW2101155-009	-----	-----	
				Result	Result	Result	----	----	
<b>QWI-EN 67.11 Sampling of Groundwaters</b>									
<b>Standing Water Level</b>		----	0.01	m AHD	<b>2.70</b>	<b>2.30</b>	<b>2.30</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) 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

## CERTIFICATE OF ANALYSIS

<b>Work Order</b>	: <b>EW2101155-AB</b>	Page	: 1 of 4
<b>Amendment</b>	: <b>1</b>	<b>Laboratory</b>	: Environmental Division NSW South Coast
<b>Client</b>	: <b>SHELLHARBOUR CITY COUNCIL</b>	<b>Contact</b>	: Aneta Prosaroski
<b>Contact</b>	: Joel Coulton	<b>Address</b>	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia NSW Australia
<b>Address</b>	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	<b>Telephone</b>	: +61 2 4225 3125
<b>Telephone</b>	: ----	<b>Date Samples Received</b>	: 16-Mar-2021 16:28
<b>Project</b>	: Dunmore Quarterly Groundwaters	<b>Date Analysis Commenced</b>	: 16-Mar-2021
<b>Order number</b>	: 130985	<b>Issue Date</b>	: 03-Jun-2021 14:57
<b>C-O-C number</b>	: ----		
<b>Sampler</b>	: Robert DaLio		
<b>Site</b>	: DUNMORE LANDFILL TENDER		
<b>Quote number</b>	: WO/030/19 TENDER GROUNDWATERS		
<b>No. of samples received</b>	: 3		
<b>No. of samples analysed</b>	: 3		



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>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Robert DaLio	Sampler	Laboratory - Wollongong, NSW



## General Comments

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

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

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

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

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

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact 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.**
- Amendment (03/06/2021): This report has been amended to allow the distribution of an Electronic Data Deliverable (EDD) not previously provided. All analysis results are as per the previous report.
- 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.
- Temperature performed by ALS Wollongong via in-house method EA016 and EN67 PK.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.
- 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		BH18	BH21	BH22	----	----
		Sampling date / time		16-Mar-2021 09:15	16-Mar-2021 11:45	16-Mar-2021 11:35	----	----
Compound	CAS Number	LOR	Unit	EW2101155-006	EW2101155-010	EW2101155-011	-----	-----
				Result	Result	Result	----	----
<b>EA005FD: Field pH</b>								
pH	----	0.1	pH Unit	6.7	7.2	7.5	----	----
<b>EA010FD: Field Conductivity</b>								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	396	2770	2110	----	----
<b>EA116: Temperature</b>								
Temperature	----	0.1	°C	21.0	22.3	19.7	----	----
<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	186	540	476	----	----
Total Alkalinity as CaCO3	----	1	mg/L	186	540	476	----	----
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	4	429	312	----	----
<b>ED045G: Chloride by Discrete Analyser</b>								
Chloride	16887-00-6	1	mg/L	17	389	263	----	----
<b>ED093F: Dissolved Major Cations</b>								
Calcium	7440-70-2	1	mg/L	36	127	138	----	----
Potassium	7440-09-7	1	mg/L	7	16	27	----	----
<b>EG020F: Dissolved Metals by ICP-MS</b>								
Manganese	7439-96-5	0.001	mg/L	0.118	0.276	0.089	----	----
Iron	7439-89-6	0.05	mg/L	1.41	0.77	0.58	----	----
<b>EK040P: Fluoride by PC Titrator</b>								
Fluoride	16984-48-8	0.1	mg/L	0.2	0.4	0.4	----	----
<b>EK055G: Ammonia as N by Discrete Analyser</b>								
Ammonia as N	7664-41-7	0.01	mg/L	0.79	3.40	1.24	----	----
<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	----	----
<b>EK058G: Nitrate as N by Discrete Analyser</b>								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	0.62	<0.01	----	----
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.62	<0.01	----	----
<b>EP005: Total Organic Carbon (TOC)</b>								
Total Organic Carbon	----	1	mg/L	12	35	21	----	----



## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	BH18	BH21	BH22	----	----
Sampling date / time				16-Mar-2021 09:15	16-Mar-2021 11:45	16-Mar-2021 11:35	----	----	
Compound	CAS Number	LOR	Unit	EW2101155-006	EW2101155-010	EW2101155-011	-----	-----	
				Result	Result	Result	----	----	
<b>QWI-EN 67.11 Sampling of Groundwaters</b>									
<b>Standing Water Level</b>		----	0.01	m AHD	<b>2.32</b>	<b>3.12</b>	<b>2.75</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) 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 8784 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 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 9000 E: samples.melbourne@alsenviro.com  
 Adelaide: 2-1 Burma Rd, Pooraka SA 5095  
 Ph: 08 8339 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

<b>CLIENT:</b> Shellharbour City Council	<b>TURNAROUND REQUIREMENTS:</b> <input type="checkbox"/> Standard TAT (List due date):	<b>FOR LABORATORY USE ONLY (Circle)</b>																							
<b>OFFICE:</b> 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):																								
<b>PROJECT:</b> Dunmore Quarterly Surface Waters EPL	<b>ALS QUOTE NO.:</b> WO/030/19 TENDER	<table border="1"> <tr> <td colspan="7"><b>COC SEQUENCE NUMBER (Circle)</b></td> </tr> <tr> <td>coc:</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> </tr> <tr> <td>OF:</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> </tr> </table>	<b>COC SEQUENCE NUMBER (Circle)</b>							coc:	1	2	3	4	5	6	7	OF:	1	2	3	4	5	6	7
<b>COC SEQUENCE NUMBER (Circle)</b>																									
coc:	1	2	3	4	5	6	7																		
OF:	1	2	3	4	5	6	7																		
<b>ORDER NUMBER:</b>		<input type="checkbox"/> Custody Seal Intact? Yes No N/A <input type="checkbox"/> Free Ice / frozen ice bricks present upon receipt? Yes No N/A <input type="checkbox"/> Random Sample Temperature on Receipt: °C Other comment:																							
<b>PROJECT MANAGER:</b> Joel Culton																									
<b>SAMPLER:</b>	<b>SAMPLER MOBILE:</b>	<b>RELINQUISHED BY:</b>																							
<b>COC emailed to ALS? (YES / NO)</b>	<b>EDD FORMAT (or default):</b>	<i>Robert</i>																							
<b>Email Reports to:</b>		<b>RECEIVED BY:</b>																							
<b>Email Invoice to:</b>		<i>Anety</i>																							
		<b>DATE/TIME:</b>																							
		<i>17.3.21 14:40</i>																							
		<b>DATE/TIME:</b>																							
		<i>17/3/21</i>																							
<b>COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:</b>	<b>CC reports to:</b>	<b>RECEIVED BY:</b>																							
		<b>DATE/TIME:</b>																							

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-2 (Ionic Balance)	TOC & BOD	Dissolved and Total Fe	Turbidity	NH4 & NO3		Alkalinity
	SWP1		17.3.21 13:20	W			✓	✓		✓				Field Tests - pH
	SWC_2		12:20	W			✓			✓		✓	✓	Field Tests - pH & Temp
	SWC_UP		12:35	W			✓	✓		✓	✓	✓		Field Tests - pH & Temp
	SWC_DOWN		12:45	W			✓	✓		✓	✓	✓		Field Tests - pH & Temp
	SWC_DOWN_2		12:50	W			✓	✓		✓	✓	✓		Field Tests - pH & Temp
						<b>TOTAL</b>	<b>10</b>							

Environmental Division  
 Wollongong  
 Work Order Reference  
**EW2101189**



Telephone : 02 42253126

**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 Unpr  
 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  
 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

<b>Work Order</b>	: <b>EW2101189</b>	Page	: 1 of 4
<b>Amendment</b>	: <b>1</b>	<b>Laboratory</b>	: Environmental Division NSW South Coast
<b>Client</b>	: <b>SHELLHARBOUR CITY COUNCIL</b>	<b>Contact</b>	: Aneta Prosaroski
<b>Contact</b>	: Joel Coulton	<b>Address</b>	: 1/19 Ralph Black Dr, North Wollongong 2500 4/13 Geary Pl, North Nowra 2541 Australia NSW Australia
<b>Address</b>	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	<b>Telephone</b>	: +61 2 4225 3125
<b>Telephone</b>	: ----	<b>Date Samples Received</b>	: 17-Mar-2021 15:14
<b>Project</b>	: Dunmore Quarterly Surface Water EPL	<b>Date Analysis Commenced</b>	: 17-Mar-2021
<b>Order number</b>	: 130985	<b>Issue Date</b>	: 03-Jun-2021 15:25
<b>C-O-C number</b>	: ----		
<b>Sampler</b>	: Robert DaLio		
<b>Site</b>	: DUNMORE LANDFILL TENDER		
<b>Quote number</b>	: WO/030/19 TENDER SURFACE WATER		
<b>No. of samples received</b>	: 5		
<b>No. of samples analysed</b>	: 5		



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>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW
Robert DaLio	Sampler	Laboratory - Wollongong, NSW



## General Comments

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

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

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

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

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

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact 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.**
- EG020: Some samples were diluted and rerun due to matrix interference and LOR's have been raised accordingly. (High Total Dissolved Solids)
- Amendment (03/06/2021): This report has been amended to allow the distribution of an Electronic Data Deliverable (EDD) not previously provided. All analysis results are as per the previous report.
- pH performed by ALS Wollongong via in-house method EA005FD 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.



## 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				17-Mar-2021 13:20	17-Mar-2021 12:20	17-Mar-2021 12:35	17-Mar-2021 12:45	17-Mar-2021 12:50	
Compound	CAS Number	LOR	Unit	EW2101189-001	EW2101189-002	EW2101189-003	EW2101189-004	EW2101189-005	
				Result	Result	Result	Result	Result	
<b>EA005FD: Field pH</b>									
pH	----	0.1	pH Unit	7.2	7.6	7.3	7.7	7.5	
<b>EA025: Total Suspended Solids dried at 104 ± 2°C</b>									
Suspended Solids (SS)	----	5	mg/L	21	<5	46	6	<5	
<b>EA045: Turbidity</b>									
Turbidity	----	0.1	NTU	12.5	----	22.6	3.6	2.1	
<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	189	152	167	136	139	
Total Alkalinity as CaCO3	----	1	mg/L	189	152	167	136	139	
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	4	----	1860	2210	2040	
<b>ED045G: Chloride by Discrete Analyser</b>									
Chloride	16887-00-6	1	mg/L	137	----	11300	14300	13100	
<b>ED093F: Dissolved Major Cations</b>									
Calcium	7440-70-2	1	mg/L	34	----	314	376	355	
Magnesium	7439-95-4	1	mg/L	18	----	896	1100	1050	
Sodium	7440-23-5	1	mg/L	94	----	7320	9120	8730	
Potassium	7440-09-7	1	mg/L	12	----	261	326	308	
<b>EG020F: Dissolved Metals by ICP-MS</b>									
Iron	7439-89-6	0.05	mg/L	0.15	<0.50	<0.10	<0.10	<0.10	
<b>EG020T: Total Metals by ICP-MS</b>									
Manganese	7439-96-5	0.001	mg/L	0.406	----	----	----	----	
Iron	7439-89-6	0.05	mg/L	0.35	0.20	0.89	0.16	<0.10	
<b>EK055G: Ammonia as N by Discrete Analyser</b>									
Ammonia as N	7664-41-7	0.01	mg/L	----	0.24	0.28	0.24	0.16	
<b>EK055G-NH4: Ammonium as N by DA</b>									
Ammonium as N	14798-03-9_N	0.01	mg/L	----	0.24	0.28	0.24	0.16	
<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	
<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	
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser</b>									



## 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					17-Mar-2021 13:20	17-Mar-2021 12:20	17-Mar-2021 12:35	17-Mar-2021 12:45	17-Mar-2021 12:50
Compound	CAS Number	LOR	Unit		EW2101189-001	EW2101189-002	EW2101189-003	EW2101189-004	EW2101189-005
					Result	Result	Result	Result	Result
<b>EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser - Continued</b>									
Nitrite + Nitrate as N	----	0.01	mg/L	----	<0.01	0.01	0.02	0.01	
<b>EN055: Ionic Balance</b>									
∅ Total Anions	----	0.01	meq/L	7.72	----	361	452	415	
∅ Total Cations	----	0.01	meq/L	7.57	----	414	514	492	
∅ Ionic Balance	----	0.01	%	0.98	----	6.92	6.44	8.49	

## Inter-Laboratory Testing

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

(WATER) EA045: Turbidity

(WATER) EG020F: Dissolved Metals by ICP-MS

(WATER) EG020T: Total Metals by ICP-MS

(WATER) ED045G: Chloride by Discrete Analyser

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

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) ED093F: Dissolved Major Cations

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

(WATER) EN055: Ionic Balance

(WATER) EK058G: Nitrate as N by Discrete Analyser

(WATER) EK057G: Nitrite as N by Discrete Analyser

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

(WATER) EK055G-NH4: Ammonium as N by DA

(WATER) EK055G: Ammonia as N by Discrete Analyser



# CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ Sydney: 277 Woodpark Rd. Sutherland NSW 2176  
Ph: 02 8784 8558 E: samples.sydney@alsenviro.com

☐ Brisbane: 32 Strand St, Stafford QLD 4053  
Ph: 07 3243 7222 E: samples.br@alsenviro.com

☐ Melbourne: 2-4 Westall Rd. Springvale VIC 3171  
Ph: 03 8549 9600 E: samples.melbourne@alsenviro.com

☐ Perth: 10 Hod Way, Malaga WA 6050  
Ph: 08 9255 7855 E: samples.perth@alsenviro.com

☐ Launceston: 27 Wellington St, Launceston TAS 7250  
Ph: 03 6331 2158 E: launceston@alsenviro.com

<b>CLIENT:</b> Shellharbour City Council	<b>TURNAROUND REQUIREMENTS :</b> <input type="checkbox"/> Standard TAT (List due date):	<b>FOR LABORATORY USE ONLY (Circle)</b> Custody Seal Intact? Yes No N/A Free ice / frozen ice bricks present upon receipt? Yes No N/A Reason Sample Temperature on Receipt: °C Other comment:							
<b>OFFICE:</b> 41 Burrelli St WOLLONGONG NSW 2500	<input type="checkbox"/> Non Standard or urgent TAT (List due date):								
<b>PROJECT:</b> Dunmore Quarterly Leachate	<b>ALS QUOTE NO.:</b> WO/030/19 TENDER								
<b>ORDER NUMBER:</b>	<b>COC SEQUENCE NUMBER (Circle)</b>								
<b>PROJECT MANAGER:</b> Joel Culton	<b>COC:</b> <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr></table>	1	2	3	4	5	6	7	
1	2	3	4	5	6	7			
<b>SAMPLER:</b>	<b>SAMPLER MOBILE:</b>	<b>RELINQUISHED BY:</b> Robert							
<b>COC emailed to ALS? ( YES / NO)</b>	<b>EDD FORMAT (or default):</b>	<b>RECEIVED BY:</b> Aneta							
<b>Email Reports to :</b>		<b>DATE/TIME:</b> 17-3-21 14:45							
<b>Email Invoice to :</b>		<b>DATE/TIME:</b> 17/3/21							

**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	Ammonia	NT-2A (Alka, So4, Cl, F)	Filtered Ca, K	TOC	Total Fe & Mn	NT-4 (NO2, NO3)	Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	Leachate Storage Tank - LP1	17-3-21 - 11:20 W				✓	✓	✓	✓	✓	✓	Field Tests - pH, EC, Temp & DO
					<b>TOTAL</b>	10						

Environmental Division  
Wollongong  
Work Order Reference  
**EW2101192**



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 Solis; B = Unpreserved Bag.

## CERTIFICATE OF ANALYSIS

**Work Order** : **EW2101192**  
**Client** : **SHELLHARBOUR CITY COUNCIL**  
**Contact** : Joel Coulton  
**Address** : LAMERTON HOUSE, LAMERTON CRESCENT  
 SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529

**Telephone** : ----  
**Project** : Dunmore Quarterly Leachate Tank EPL  
**Order number** : 130985  
**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  
 4/13 Geary Pl, North Nowra 2541  
 Australia NSW Australia  
**Telephone** : +61 2 4225 3125  
**Date Samples Received** : 17-Mar-2021 15:11  
**Date Analysis Commenced** : 17-Mar-2021  
**Issue Date** : 24-Mar-2021 17:21



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>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Celine Conceicao	Senior Spectroscopist	Sydney Inorganics, Smithfield, NSW
Robert DaLio	Sampler	Laboratory - Wollongong, NSW



## General Comments

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

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

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

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

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

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact 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.**
- EK055G:LOR raised due to sample matrix.
- LOR Raised 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 EA016 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	17-Mar-2021 11:20	----	----	----
Compound	CAS Number	LOR	Unit	EW2101192-001	-----	-----	-----	-----
				Result	----	----	----	----
<b>EA005FD: Field pH</b>								
pH	----	0.1	pH Unit	7.6	----	----	----	----
<b>EA010FD: Field Conductivity</b>								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	15700	----	----	----	----
<b>EA116: Temperature</b>								
Temperature	----	0.1	°C	26.9	----	----	----	----
<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	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	5990	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	5990	----	----	----	----
<b>ED041G: Sulfate (Turbidimetric) as SO4 2- by DA</b>								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<10	----	----	----	----
<b>ED045G: Chloride by Discrete Analyser</b>								
Chloride	16887-00-6	1	mg/L	1700	----	----	----	----
<b>ED093F: Dissolved Major Cations</b>								
Calcium	7440-70-2	1	mg/L	128	----	----	----	----
Potassium	7440-09-7	1	mg/L	492	----	----	----	----
<b>EG020T: Total Metals by ICP-MS</b>								
Manganese	7439-96-5	0.001	mg/L	0.513	----	----	----	----
Iron	7439-89-6	0.05	mg/L	2.15	----	----	----	----
<b>EK040P: Fluoride by PC Titrator</b>								
Fluoride	16984-48-8	0.1	mg/L	0.4	----	----	----	----
<b>EK055G: Ammonia as N by Discrete Analyser</b>								
Ammonia as N	7664-41-7	0.01	mg/L	1960	----	----	----	----
<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	----	----	----	----
<b>EP005: Total Organic Carbon (TOC)</b>								





## Analytical Results

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

				Sample ID	Leachate Storage Tank LP1	----	----	----	----
				Sampling date / time	17-Mar-2021 11:20	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2101192-001	-----	-----	-----	-----	-----
				Result	----	----	----	----	----
<b>EP005: Total Organic Carbon (TOC) - Continued</b>									
<b>Total Organic Carbon</b>	----	1	mg/L	<b>3540</b>	----	----	----	----	----
<b>EP025FD: Field Dissolved Oxygen</b>									
<b>Dissolved Oxygen</b>	----	0.01	mg/L	<b>1.69</b>	----	----	----	----	----
<b>Dissolved Oxygen - % Saturation</b>	----	0.1	% saturation	<b>20.6</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) 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 8794 8595 E:samples.sydney@alsenviro.com

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

☐ Melbourne: 2-4 Westall Rd, Springvale VIC 3171  
Ph: 03 8549 9000 E:samples.melbourne@alsenviro.com

☐ Perth: 10 Hod Way, Malaga WA 6090  
Ph: 08 9209 7655 E:samples.perth@alsenviro.com

☐ Newcastle: 5 Rosegum Rd, Warabrook NSW 2304  
Ph: 02 4968 9433 E:samples.newcastle@alsenviro.com

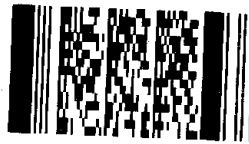
☐ Townsville: 14-15 Casma Ct, Bohle QLD 4818  
Ph: 07 4796 0600 E:townsville.environmental@alsenviro.com

☐ Adelaide: 2-1 Burma Rd, Pooraka SA 5095  
Ph: 08 8368 0890 E:adelaide@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)	FOR LABORATORY USE ONLY (Circle)								
OFFICE:	<input type="checkbox"/> Non Standard or urgent TAT (List due date):	Customary Seal Intact? Yes No	Freezer / frozen ice bricks present upon receipt? Yes No							
PROJECT: Dunmore Landfill Overflows	ALS QUOTE NO.: WO/030/19 TENDER	Random Sample Temperature on Receipt: 21.3 °C								
ORDER NUMBER:	COC SEQUENCE NUMBER (Circle)	Other comment:								
PROJECT MANAGER: Joel Culton	COC: <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr></table>	1	2	3	4	5	6	7		
1	2	3	4	5	6	7				
	OF: <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr></table>	1	2	3	4	5	6	7		
1	2	3	4	5	6	7				
SAMPLER:	SAMPLER MOBILE:	RELINQUISHED BY: Robert	RECEIVED BY: M Green							
COC emailed to ALS? ( YES / NO)	EDD FORMAT (or default):	DATE/TIME: 22.3.21 15:00	DATE/TIME: 22.3.21 16:30							
Email Reports to :										
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	PH		Comments on likely contaminant levels, dilutions, or samples requiring specific QC
1	SWP1	22.3.21 8:05	W			✓	✓		Environmental Division Wollongong Work Order Reference <b>EW2101281</b>  Telephone 02 42253125
2	SWP2	22.3.21 7:55	W			✓	✓		
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 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** : **EW2101281**  
**Client** : **SHELLHARBOUR CITY COUNCIL**  
**Contact** : Joel Coulton  
**Address** : LAMERTON HOUSE, LAMERTON CRESCENT  
 SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529  
  
**Telephone** : ----  
**Project** : Dunmore Landfill Overflows  
**Order number** : 130985  
**C-O-C number** : ----  
**Sampler** : Robert DaLio  
**Site** : ----  
**Quote number** : WO/030/19 TENDER OVERFLOW DISCHARGE  
**No. of samples received** : 2  
**No. of samples analysed** : 2

**Page** : 1 of 2  
**Laboratory** : Environmental Division NSW South Coast  
**Contact** : Aneta Prosaroski  
**Address** : 1/19 Ralph Black Dr, North Wollongong 2500  
 4/13 Geary Pl, North Nowra 2541  
 Australia NSW Australia  
**Telephone** : +61 2 4225 3125  
**Date Samples Received** : 22-Mar-2021 15:35  
**Date Analysis Commenced** : 22-Mar-2021  
**Issue Date** : 29-Mar-2021 14:04



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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

### Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Aneta Prosaroski	Client Liaison Officer	Administration - Wollongong, NSW
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Robert DaLio	Sampler	Laboratory - Wollongong, NSW



## General Comments

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

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

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

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

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

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact 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.
- pH performed by ALS Wollongong via in-house method EA005FD 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

## Analytical Results

Sub-Matrix: WATER  
 (Matrix: WATER)

Sample ID

				SWP1 Point 1	SWP2 Point 1	----	----	----
Sampling date / time				22-Mar-2021 08:05	22-Mar-2021 07:55	----	----	----
Compound	CAS Number	LOR	Unit	EW2101281-001	EW2101281-002	-----	-----	-----
				Result	Result	----	----	----
<b>EA005FD: Field pH</b>								
pH	----	0.1	pH Unit	7.0	7.8	----	----	----
<b>EA025: Total Suspended Solids dried at 104 ± 2°C</b>								
Suspended Solids (SS)	----	5	mg/L	18	20	----	----	----
<b>Sampling Method</b>								
Dummy Analyte	----	1	-	0	0	----	----	----

## Inter-Laboratory Testing

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

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

# 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 8655 E: samples.sydney@alsenviro.com

Newcastle: 5 Rosagum 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 Deema Ct. Bohle QLD 4818  
Ph: 07 4756 0600 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 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):	FOR LABORATORY USE ONLY (Circle) Custody Seal Intact? Yes No N/A Free ice / frozen ice packs present upon receipt? Yes No N/A 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: Joel Culton		
SAMPLER:	SAMPLER MOBILE:	
COC emailed to ALS? ( YES / NO)	EDD FORMAT (or default):	
Email Reports to :		
Email Invoice to :		
RECEIVED BY: <i>Aneta</i>	RECEIVED BY:	
DATE/TIME: 17/3/21 14:40	DATE/TIME: 17/3/21	

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) <small>Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).</small>							Additional Information	
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE <small>(refer to codes below)</small>	TOTAL BOTTLES	A04 (Ash, CM, TIS)								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	DDG1	17.3.21 11:35	AIR			✓								
	DDG2	11:40	AIR			✓								
	DDG3	13:05	AIR			✓								
	DDG4	11:15	AIR			✓								
					TOTAL	10								

Environmental Division  
Wollongong  
Work Order Reference  
**EW2101187**



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** : **EW2101187**  
**Client** : **SHELLHARBOUR CITY COUNCIL**  
**Contact** : Joel Coulton  
**Address** : LAMERTON HOUSE, LAMERTON CRESCENT  
 SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529  
  
**Telephone** : ----  
**Project** : Dunmore Landfill Dust  
**Order number** : 130985  
**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 2  
**Laboratory** : Environmental Division NSW South Coast  
**Contact** : Aneta Prosaroski  
**Address** : 1/19 Ralph Black Dr, North Wollongong 2500  
 4/13 Geary Pl, North Nowra 2541  
 Australia NSW Australia  
**Telephone** : +61 2 4225 3125  
**Date Samples Received** : 17-Mar-2021 15:13  
**Date Analysis Commenced** : 19-Mar-2021  
**Issue Date** : 26-Mar-2021 16:52



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>
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 Contact 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 Newcastle.
- Analysis as per AS3580.10.1-2016. Samples passed through a 1mm sieve prior to analysis. NATA accreditation is not held for results reported in g/m<sup>2</sup>.mth.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/66.1 Sampling and Siting of Dust Deposition Gauges.
- Sample exposure period is 33 days which is outside the typical exposure period of 30 +/- 2 days as per AS3580.10.1.

## Analytical Results

Sub-Matrix: **DEPOSITIONAL DUST**  
 (Matrix: AIR)

Sample ID

				DDG1 12/02/2021 - 17/03/2021	DDG2 12/02/2021 - 17/03/2021	DDG3 12/02/2021 - 17/03/2021	DDG4 12/02/2021 - 17/03/2021	----
Sampling date / time				17-Mar-2021 11:35	17-Mar-2021 11:40	17-Mar-2021 13:05	17-Mar-2021 11:15	----
Compound	CAS Number	LOR	Unit	EW2101187-001	EW2101187-002	EW2101187-003	EW2101187-004	-----
				Result	Result	Result	Result	----
<b>EA120: Ash Content</b>								
Ash Content	----	0.1	g/m <sup>2</sup> .month	0.7	0.2	1.4	1.5	----
Ash Content (mg)	----	1	mg	13	3	28	29	----
<b>EA125: Combustible Matter</b>								
Combustible Matter	----	0.1	g/m <sup>2</sup> .month	0.2	0.4	0.8	1.0	----
Combustible Matter (mg)	----	1	mg	5	8	14	19	----
<b>EA141: Total Insoluble Matter</b>								
Total Insoluble Matter	----	0.1	g/m <sup>2</sup> .month	0.9	0.6	2.2	2.5	----
Total Insoluble Matter (mg)	----	1	mg	18	11	42	48	----

## Inter-Laboratory Testing

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

(AIR) EA125: Combustible Matter

(AIR) EA120: Ash Content

(AIR) EA141: Total Insoluble Matter



# Appendix D

## Surface Gas (Methane) Field Sheets



# CHAIN OF CUSTODY

ALS Laboratory: please tick →

Sydney: 277 Woodpark Rd, Smithfield NSW 2178  
 Ph: 02 8784 8586 E: samples.sydney@alsenviro.com  
 Newcastle: 5 Rosegum Rd, Warabrook NSW 2304  
 Ph: 02 4568 9433 E: samples.newcastle@alsenviro.com

Brisbane: 32 Stand St, Stafford QLD 4053  
 Ph: 07 3243 7222 E: samples.brisbane@alsenviro.com  
 Townsville: 14-15 Deans Ct, Bohle QLD 4816  
 Ph: 07 4706 0400 E: townsville.environmental@alsenviro.com

Melbourne: 2-4 Wastall Rd, Springvale VIC 3171  
 Ph: 03 8549 9800 E: samples.melbourne@alsenviro.com  
 Adelaide: 2-1 Burma Rd, Portra SA 5096  
 Ph: 08 8309 0800 E: adelaide@alsenviro.com

Perth: 10 Hod Way, Melega WA 6290  
 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):		FOR LABORATORY USE ONLY (Circle)								
OFFICE: 41 Burelli St WOLLONGONG NSW 2500		<input type="checkbox"/> Non Standard or urgent TAT (List due date): <small>(Standard TAT may be longer for some tests e.g., Ultra Trace Organics)</small>										
PROJECT: Dunmore Quarterly Methane Testing		ALS QUOTE NO.: WO/030/19 TENDER	COC SEQUENCE NUMBER (Circle)			Custody Seal intact? Yes No N/A Freeze / frozen ice bricks present upon receipt? Yes No N/A Random Sample Temperature on Receipt: C Other comment:						
ORDER NUMBER:		COC: <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr></table>			1	2	3	4	5	6	7	
1	2	3	4	5	6	7						
PROJECT MANAGER: Joel Culton		OF: <table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr></table>			1	2	3	4	5	6	7	
1	2	3	4	5	6	7						
SAMPLER:		SAMPLER MOBILE:	RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:						
COC emailed to ALS? ( YES / NO)		EDD FORMAT (or default):	Robert	Aneta								
Email Reports to :			DATE/TIME: 24/3/21	DATE/TIME: 24/3/21								
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) <small>Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).</small>							Additional Information	
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE <small>(refer to codes below)</small>	TOTAL BOTTLES	Surface Methane Testing								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	Methane	15/3/21	W			✓	✓							MK 24.3.21 
					TOTAL	10								

Environmental Division  
 Wollongong  
 Work Order Reference  
**EW2101320**



Telephone : 02 42253126

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ALS Landfill Emissions Report



Client: Shellharbour City Council Date: 15/03/2021  
 Site: Dunmore Sampler(s) Robert DaLio, Megan Gould

Transact / Location	Point	GPS North	GPS East	CH4 Conc (ppm)	Comments
A	1				Overgrown
B	1	6167 018	302 329	2.4	
B	2	6167 998	302 327	2.8	
B	3	6168 979	302 325	2.5	
B	4	6168 055	302 334	2.5	
B	5	6167 094	302 331	2.3	
C	1	6168 195	302 288	2.7	
C	2	6168 141	302 303	2.7	
C	3	6168 079	302 316	2.8	
C	4	6168 025	302 319	2.7	
C	5	6167 961	302 316	2.9	
C	6	6167 920	302 309	2.7	
C	7	6167 872	302 304	2.8	
D	1	6167 961	302 285	2.9	
D	2	6167 975	302 280	2.9	
D	3	6167 993	302 276	2.7	
D	4	6168 010	302 278	2.8	
D					NO ACCESS/OVERGROWN
E	1	6168 050	302 223	2.8	
E	2	6168 044	302 230	2.9	
E	3	6168 031	302 238	2.9	
E	4	6168 045	302 245	2.8	
E	5	6167 909	302 255	3.1	
E	6	6167 979	302 269	2.0	
F	1	6167 960	302 241	2.3	
F	2	6167 980	302 226	2.6	
F	3	6167 998	302 221	2.5	
F	4	6168 019	302 214	2.6	
F	5	6168 046	302 210	2.7	
G	1	6168 235	302 165	2.5	
G	2	6168 234	302 189	2.6	
G	3	6168 253	302 224	2.6	
G	4	6168 271	302 254	2.6	

H	1	6168 299	302 413	2.5
H	2	6168 278	302 459	2.5
H	3	6168 234	302 391	2.5
H	4	6167 195	302 393	2.5
H	5	6167 162	301 395	2.6
H	6	6167 100	301 401	3.3
H	7	6167 049	301 406	3.3
H	8	6167 000	302 411	3.6
H	9	6167 966	302 429	3.9
H	10	6167 919	302 438	12.9
H	11	6167 892	302 413	3.7
H	12	6167 919	302 459	3.2
H	13	6167 945	302 391	3.4
H	14	6167 983	302 393	4.6
H	15	6167 890	302 395	11.3
H	16	6167 740	302 401	2.4
H	17	6167 791	302 406	4.8
H	18	6168 849	302 411	3.8
H	19	6168 898	302 429	4.0
H	20	6168 934	302 430	5.5
H	21	6168 001	302 368	3.7
H	22	6168 064	302 354	2.9
H	23	6168 161	302 293	2.6
H	24	6168 214	302 202	2.5
H	25	6168 296	302 152	2.2
H	26	6168 300	302 104	2.2
H	27	6168 310	302 061	2.3
H	28	6168 292	302 027	2.4
H	29	6168 257	301 997	2.4
H	30	6168 201	301 973	2.3
H	31	6167 154	301 970	2.4
H	32	6167 103	301 970	2.3
H	33	6167 058	301 972	2.4
H	34	6167 990	302 018	2.4
H	35	6167 895	302 056	2.4
H	36	6167 842	302 160	2.4
H	37	6167 804	302 243	2.4
H	38	6167 755	302 350	2.4
H	39	6167 689	302 162	2.4
H	40	6167 685	302 244	2.6
H	41	6167 702	302 327	11.8

I	1	6167 934	302 986	2.4	
I	2	6167 938	302 024	2.9	
I	3	6167 939	302 069	2.9	
I	4	6167 937	301 134	3.8	
J	1	6168 956	302 165	2.8	
J	2	6168 000	302 152	3.0	
J	3	6168 041	302 137	2.7	
J	4	6168 090	302 119	2.7	
J	5	6167 143	302 100	2.6	
K	1	6168 314	302 267	2.2	
K	2	6168 333	302 323	2.2	
K	3	6168 365	302 356	2.2	
K	4	6168 400	302 333	2.3	
K	5	6168 403	302 308	2.2	
K	6	6168 384	302 270	2.3	
K	7	6168 367	302 274	2.2	
K	8	6168 377	302 304	2.3	
L	1	6168 160	302 231	2.2	
L	2	6168 535	302 215	2.3	
L	3	6168 456	302 151	2.3	
L	4	6168 404	302 113	2.3	
L	5	6168 367	302 84	2.2	
L	6	6168 286	302 014	2.2	
L	7	6168 280	302 994	2.2	
L	8	6168 224	302 942	2.1	
Compressor Shed	1			2.4	
Office	1			2.5	
Community Recycling Centre	1			4.8	
OLD Weighbridge	1			2.3	
OLD Weighbridge Toilet	1			2.5	
Revolve Shop	1			2.2	
Building Truckwash	1			2.3	
New Weighbridge	1			2.6	
Methane Blank (Pre testing)				2.4	Taken at entrance to Dunmore site before main gate
Methane Blank (Post testing)				2.4	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

## Calibration Certificates

# CERTIFICATION OF CALIBRATION



Issued by: QED Environmental Systems Ltd.

Calibration certificate number 16709 H-035773

Instrument Laser One Serial number 16709

**Description of the calibration procedure:**

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

Gas verification from 0-1000ppm CH4

Full scale (ppm)	Gas concentration (ppm)	Response 1 (ppm)	Response 2 (ppm)	Response 3 (ppm)	Average response (ppm)	Maximum error (ppm)	Maximum error (% F.s.)	Maximum error %
1000	0	0	0	0	0.00	0.00	0.00	0.00
1000	3.2	3.2	3.2	3.2	3.20	0.00	0.00	0.00
1000	10.3	10.6	10.7	10.7	10.67	0.40	0.04	0.04
1000	107	104	103	103	103.33	4.00	0.40	0.40
1000	1000	1045	1045	1045	1045.00	45.00	4.50	4.50
Uncertainty						4.50		%
Max % error						4.50		% FS

Gas verification from 0-100% vol CH4

Full scale (%vol)	Gas concentration (%vol)	Response 1 (%vol)	Response 2 (%vol)	Response 3 (%vol)	Average response (%vol)	Maximum error (%vol)	Maximum error (% F.s.)	Maximum error %
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	2.20	2.10	2.10	2.10	2.10	0.10	1.00	1.00
10.00	5.00	5.00	5.00	5.00	5.00	0.00	0.00	0.00
100.00	15.00	15.20	15.20	15.20	15.20	0.20	0.20	0.20
100.00	50.00	50.10	50.20	50.30	50.20	0.30	0.30	0.30
100.00	100.00	99.10	99.10	99.10	99.10	0.90	0.90	0.90
Uncertainty						1.00		%
Max % error						1.00		% FS

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

Full scale (%vol)	Gas concentration (LEL%)	Response 1 (LEL%)	Response 2 (LEL%)	Response 3 (LEL%)	Average response (%vol)	Maximum error (LEL%)	Maximum error (% F.s.)	Maximum error %
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	2.00	2.09	2.09	2.09	2.09	0.09	0.90	0.90
100.00	50.00	47.73	47.73	47.73	47.73	2.27	2.27	2.27
Uncertainty						2.27		%
Max % error						2.27		% FS

www.qedenv.com +44 (0) 333 800 0088 sales@qedenv.co.uk

QED Environmental Systems Ltd. Cyan Park - Unit 3, Jimmy Hill Way, Coventry, CV2 4QP, UNITED KINGDOM

Registered in England and Wales 1898734

# CERTIFICATION OF CALIBRATION



Issued by: QED Environmental Systems Ltd.

### Environmental conditions during calibration

Temperature	22	C
Pressure	1000	mBar

### Gas bottles used for calibration

Gas	Cylinder number	Expiry date	Gas
Synthetic Air	S1624403EE	19/05/2023	Synthetic Air
3 ppm	143123SG	11/04/2024	CH4
10 ppm	114031SG	11/04/2024	CH4
100 ppm	S1145642R	20/10/2024	CH4
1000 ppm	S1361249W	02/12/2024	CH4
1.0 vol	S1198415S	10/04/2024	CH4
2.2% vol	SP1230777S	29/10/2024	CH4
5% vol	220622	15/01/2022	CH4
15% vol	220594	15/01/2022	CH4
50% vol	232920	08/11/2021	CH4
100% vol	S1361235W	05/07/2023	CH4

Calibration results **Pass**

Next scheduled calibration 25/09/2021

Calibration date 22/09/2020

Calibration done by Laura McBride

[www.qedenv.com](http://www.qedenv.com) +44 (0) 333 800 0088 [sales@qedenv.co.uk](mailto:sales@qedenv.co.uk)

QED Environmental Systems Ltd. Cyan Park - Unit 3, Jimmy Hill Way, Coventry, CV2 4QP, UNITED KINGDOM

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