QUARTERLY ENVIRONMENTAL MONITORING REPORT (QEMR) JUNE 2022

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

ENVIRONMENT PROTECTION LICENCE (EPL) 5984

Prepared For: **Shellharbour City Council**
Project Number: **ENRS0033**
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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 June 2022 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 is provided in **Appendix A** (EPL No. 5984). ENRS note that EPL No. 12903 does not specify sample points.

The objectives of this AEMR are to:

- Meet the environmental monitoring requirements of Sites EPLs; No. 5984 and 12903;
- Assess and analyse the environmental monitoring data for the Site against NSW EPA endorsed criteria;
- Identify trends of the environmental monitoring data over the reporting period;
- Identify any on-site or off-site impacts associated with operation of the Site;
- Advise SCC if the current environmental monitoring program is providing adequate information to identify potential environmental impacts from existing operations (if any) and provide recommendations on improvement to the monitoring program if required; and
- Document monitoring results in a Quarterly Environmental Monitoring Report.
- The scope of work for this QEMR comprised the collation, assessment and reporting of Site data made available to ENRS from the March 2021 monitoring period in regard to the following tasks:Review previous reports and document the hydrogeological setting;
- Tabulate results of all monitoring data for both water and dust samples, collected and provided by ALS as required by the EPLs for the respective reporting period.
- Analysis and interpretation of all monitoring data (water, dust and landfill surface gas);

- Review all quarterly environmental monitoring reports from the 2020-2021 reporting period and available data from the last three (3) years;Identification of any deficiencies in environmental performance identified by the monitoring data, trends or environmental incidents, and identification of remedial actions taken or proposed to be taken to address these deficiencies; and
- Recommendations on improving the environmental performance of the facility including improvement to the monitoring program.

Based on the findings obtained during the June 2022 monitoring program the following conclusions and recommendations are provided:

- Shallow groundwater flow is expected to mimic topography with low hydraulic gradients flowing towards the south and southeast towards Rocklow creek. The nearest sensitive receptors are likely to include; recreational users of the Minnamurra River estuary environs; down gradient stakeholders; and downgradient alluvial aquifers, swamps, Rocklow Creek, Minnamurra River and Groundwater Dependent Ecosystems near discharge zones;
- Groundwater throughout the monitoring period reported exceedances of the assessment criteria for; ammonia, heavy metals, nitrate, sulphate and salinity (EC) within multiple groundwater bores including; BH-1c, BH-3, BH-4, BH-9, BH-12r, BH-13, BH-14, BH-15, BH-18, BH-19r, BH-21 and BH-22. This was considered to be consistent with historical values;
- With the exception of Nitrate, Rocklow Creek surface water samples (SWC-Up, SWC-2, SWC-down and SWC-down 2) were reported within the adopted Site Assessment Criteria.
- On eight (8) out of twelve (12) occasions, flare operating temperatures were below operating threshold target of 760 degrees during the monitoring period. Operations taken by the operator to address the root causes of the low Flare Stack temperatures are outlined in the monthly LGI reports attached as **Appendix G**;
- Surface gas methane monitoring reported satisfactory results all within the adopted assessment criteria;
- Gas accumulation monitoring reported satisfactory results for all enclosures tested within 250m of emplaced waste or leachate storage facility;
- Dust deposition gauges recorded satisfactory results below the guidelines provided in AS3580.10.1. Monitoring should continue in accordance with EPL 5984 requirements;
- Based on this review of the June 2022 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

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

This (QEMR) summarises the results of field testing and laboratory analysis conducted by ALS for the June 2022 monitoring period, and provides the necessary data assessment and analysis to meet requirements of the Site's Environment Protection Licence/s (EPL's); No.5984 and No.12903.

1.1 PROJECT BACKGROUND

1.1.1 Site History

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

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

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

1.1.2 EPL Requirements

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

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

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

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

1.2 OBJECTIVES

The objectives of this AEMR are to:

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

1.3 SCOPE OF WORK

The scope of work for this QEMR comprised the collation, assessment and reporting of Site data made available to ENRS from the June 2022 monitoring period in regard to the following tasks:

- Review previous reports and document the hydrogeological setting;
- Tabulate results of all monitoring data for both water and dust samples, collected and provided by *ALS* as required by the EPLs for the respective reporting period.
- Analysis and interpretation of all monitoring data (water, dust and landfill surface gas);
- Review all quarterly environmental monitoring reports from the 2021-2022 reporting period and available data from the last three (3) years;
- Identification of any deficiencies in environmental performance identified by the monitoring data, trends or environmental incidents, and identification of remedial actions taken or proposed to be taken to address these deficiencies; and
- Recommendations on improving the environmental performance of the facility including improvement to the monitoring program.

2.0 SITE DESCRIPTION

2.1 LOCATION

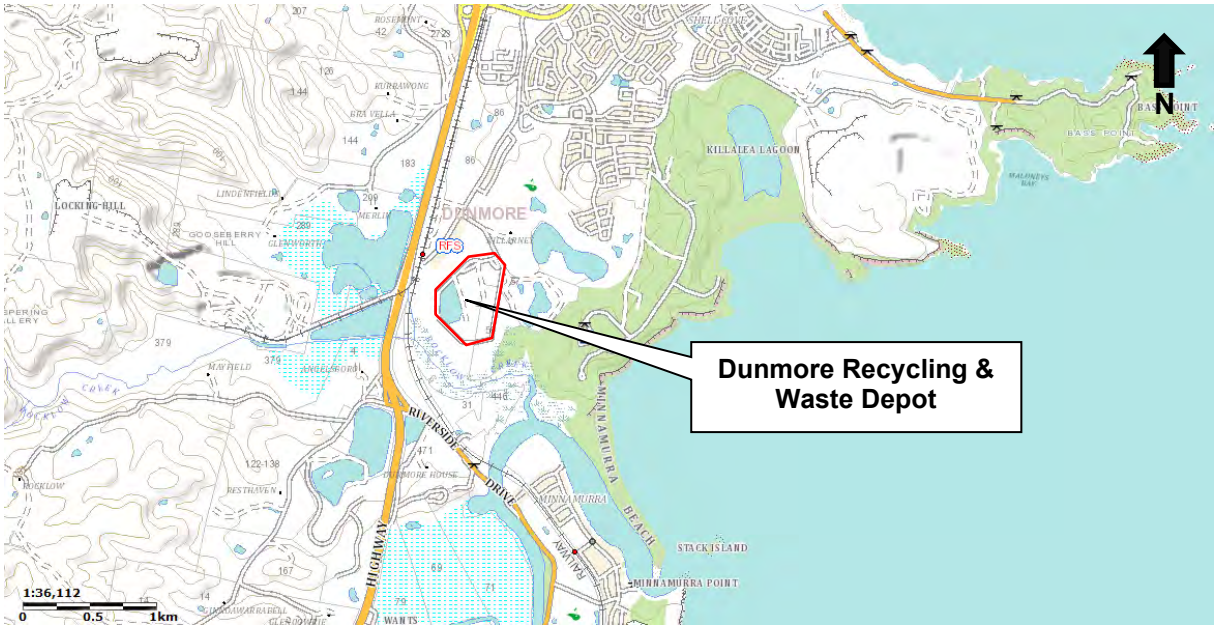
The Site is located at 44 Buckleys Road, Dunmore, NSW, 2529, legally defined as Lot 21 in Deposited Plan 653009 and Lot 1 Deposited Plan 419907. The Site is situated approximately three and a half (3.5) kilometres southwest of the Shellharbour town centre. The area's regional location is defined in **Figure 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
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
North:	Buckleys Road, commercial infrastructure and open grassland. Residential dwellings along the northwest border of the Site. Golf course further to the northeast.

Direction	Land Use
East:	Dunmore Resources and Recycling facility immediately to the east, bushland to the southeast.
South:	Bushland, Rocklow Creek (300m from landfill activities). Further to Kiama Community Recycling Centre and Riverside Drive.
West:	Bushland to the southwest, scattered trees immediately to the west and further to the Princes Highway. Boral Quarries complex beyond the Highway. Residential dwellings to the Northwest.

2.2.1 Sensitive Receptors

The nearest sensitive receptors are likely to include:

- Recreational users of the Minnamurra River estuary environs;
- Down gradient stakeholders; and
- Down gradient alluvial aquifers, swamps, Rocklow Creek, Minnamurra River and Groundwater Dependent Ecosystems (GDE) near discharge zones.

2.3 TOPOGRAPHY & DRAINAGE

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

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

2.4 SOIL LANDSCAPE

The previous annual monitoring report (Environmental Earth Sciences 2018) reported the soil profile at the Site as organic, black, massive sandy loam topsoil overlying loose bleached light grey sand with iron staining in the subsoil.

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

2.5 GEOLOGY

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

borehole logs, the Site infrastructure including the landfill cell is located within the alluvial deposits.

2.6 HYDROGEOLOGY

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

2.6.1 Existing Bores

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

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

2.6.2 Flow Regime

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

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

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

2.7 SURFACE WATER

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

to; stormwater drains; sedimentation ponds; levee banks; collection and diversion drains; and leachate dams.

3.0 ASSESSMENT CRITERIA

3.1 CONTAMINANTS OF POTENTIAL CONCERN

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

3.2 WATER QUALITY GUIDELINES

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

Table 3: Groundwater Assessment Criteria

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

3.2.1 ANZG Guidelines

The relevant criteria for this water quality assessment are the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG;2018). The ANZG (2018) provide Default Guideline Values (DGVs) for four (4) levels of protection categorised by the percentage of species possibly affected, being 80%, 90%, 95% or 99% of species. Values for a level of protection for 95% of species in a marine environment have been adopted and are displayed in **Table 4**. Where 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	0.9 mg/L	0.9 mg/L
Nitrate	10.6 mg/L	10.6 mg/L
pH	6.5-8.5 pH units	6.5-8.5 pH units

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

3.2.2 National Environmental Protection Measure (NEPM)

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

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

NEPM	Description of Land use Categories
HIL A	Residential A with garden/accessible soil also includes children's day care centres, preschools and primary schools.
HIL B	Residential B with minimal opportunities for soil access; includes buildings with fully and permanently paved yard space such as high-rise buildings and apartments.
HIL C	Recreational C includes public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and unpaved footpaths.
HIL D	Commercial/industrial D includes premises such as shops, offices, factories and industrial sites.
GILs	Groundwater Investigation Levels (GILs) should be applied based on the receiving environment and groundwater resources. GILs are provided in NEPM Table 1C for; Fresh Waters; Marine Waters; and Drinking Water;
EILs	Ecological Investigation Levels (EILs) for common contaminants in the top two (2) metres of soil based on three (3) generic land use settings: • Areas of ecological significance; • Urban residential areas and public open space; and • 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^2/month.

3.4 SURFACE METHANE GAS ASSESSMENT CRITERIA

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

3.5 GAS ACCUMULATION MONITORING IN ENCLOSED STRUCTURES

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

4.0 SAMPLING METHODOLOGY

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

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

4.1 WATER SAMPLING

4.1.1 Location of Water Monitoring Points

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

4.1.2 Depth to Water

Prior to sampling, the depth to the groundwater table was measured from the top of casing (TOC) using a water dipper and clear disposable bailer. The bores were inspected for the presence of hydrocarbon and the thickness of any LNAPL was measured visually in clear disposable bailers. ***No LNAPL was identified in monitoring Wells***.

4.1.3 Sample Collection

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

4.1.4 Groundwater Sampling

Groundwater wells were sampled in order of distance from any areas of known contamination to ensure that lower contaminated wells are sampled before likely higher contaminated wells. Groundwater bores were purged prior to sampling by removing at least three (3) well volumes with samples being collected using clear disposal bailers or low flow parameter stabilisation

methods applied with field sheets provided to document pumping volumes and field parameters. Post sampling all samples were sealed in laboratory-prepared sampling containers appropriate for the analysis.

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

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

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

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

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

4.1.5 Field Testing

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

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

4.2 DUST DEPOSITION SAMPLING

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

Dust collection gauges were set up for a one (1) month period between the dates; ***18th November*** and ***7th June 2022***. A total of four (4) dust monitoring locations were considered adequate to assess site conditions.

4.3 SURFACE METHANE GAS MONITORING

The concentration of methane gas (in units of ppm) at the Site was carried out in accordance with EPA Guidelines Solid Waste Landfill 2nd Edition 2016. On the day of sampling the wind

speed was below 10 km/hr. Testing was conducted using a calibrated *LaserOne* portable gas monitor specifically designed for landfill gas monitoring. A calibration Certificate is provided in **Appendix F.**

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

4.4 GAS ACUMMULATION MOITORING IN ENCLOSED STRUCTURES

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

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

4.5 LABORATORY ANALYSIS

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

4.6 FLARE MONITORING

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

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

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

5.0 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

5.1 DATA QUALITY OBJECTIVES

Data Quality Objectives (DQO) are required to define the quality and quantity of data needed to support management decisions. The process for establishing DQO's is documented by Australian Standard: AS 4482.1-2005 and referenced by the National Environment Protection (Assessment of Site Contamination) Measure (NEPC;2013). The DQO's for the investigation were to obtain representative data to allow assessment of:

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

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

Table 5: Data Quality Objectives

DQO	Evaluation Criteria
Documentation completeness	Completion of field records, chain of custody documentation, laboratory test certificates from NATA-accredited laboratories.
Data comparability	Use of appropriate techniques for the sampling, storage and transportation of samples. Use of NATA accredited laboratory using NEPM endorsed procedures.
Data representativeness	Adequate sampling coverage of all areas of environmental concern at the Site, and selection of representative samples.
Precision and accuracy for sampling and analysis	Use properly trained and qualified field personnel and achieve field and laboratory QA/ QC criteria.

5.2 QA/QC PROCEDURES

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

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

Relative Percent Difference (RPD) analysis of all duplicate and triplicate samples(s) results was performed by ENRS and is included in the report as **Table 9** and **Table 10**. Results were generally reported within the acceptance criteria documented in Table 4 of AS4482.1-2005, the RPD for inorganics was set at <30% and for organics set at <50%.

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

5.3 EPL NON-COMPLIANCE

No non-compliances were noted during the June 2022 quarterly monitoring period. 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 9** with comparison against the relevant Site Assessment Criteria (SAC). The laboratory certificates of analysis are provided in Appendix B.

6.1 OVERFLOW RESULTS

Overflow samples were taken from SWP-1 on two (2) occasions during Q3 monitoring period. Summary results are included in **Table 6** and are consistent with EPA guidelines.

A full summary of results is provided in **Table 9** with comparison against the relevant Site Assessment Criteria (SAC). Laboratory certificates of analysis are provided in Appendix B.

Table 6: Summary Table of Overflow Events

Sample Date	pH	TSS	Ambient Temperature	Rainfall (mm) Previous 24Hrs
13/05/2022	7.9	23	20.6	28.6
24/05/2022	7.6	7	16.9	22.6

6.2 FIELD TESTING

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

- Electrical Conductivity (Salinity);
- pH (Acidity); and
- Dissolved Oxygen (surface waters only).

6.3 PHYSICAL INDICATORS

6.3.1 Depth

Groundwater

Depth of ground water to top of casing (TOC) ranged between **0.47 mbgl** (BH-15, 08/06/2022) to **4.31 mbgl** (BH-19r, 08/06/2022). Across the Site groundwater levels were consistently higher in comparison to historical data sets.

6.3.2 Temperature

Groundwater

Temperature of groundwater in the June 2022 monitoring period ranged between **16.2 degrees Celsius** (BH-15, 08/06/2022) and **24.9 degrees Celsius** (BH-1C, 08/06/2022).

Results are consistent with historical data.

Surface Waters

Surface water temperature at SWP-1 was **13.0 degrees Celsius** (07/06/2022). Temperatures of **17.6 degrees Celsius** and **15.8 degrees Celsius** were observed for the overflow samples dated 13/05/2022 and 24/05/2022 respectively.

Results are consistent with historical data.

Leachate

Leachate Temperatures at the leachate Tank (LP-1) was **11.8 degrees Celsius** (07/06/2022).

Results are consistent with historical data.

6.3.3 Salinity (EC & TDS)

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

Groundwater

During the June 2022 monitoring period, salinity ranged between; **808 µS/cm** (BH-18, 08/06/2022) and **7,350 µS/cm** (BH-1C, 08/06/2022). Four (4) monitoring points reported

salinity values in excess of freshwater SAC of **2,200 µS/cm**, **7,350 µS/cm** (BH-1c), **4,270 µS/cm** (BH-9), **4490 µS/cm** (BH-15), **2,500 µS/cm** (BH-21).

With the exception of BH1c which were consistent with historical data, EC readings generally continued to trend down across the site.

Surface Waters

Electrical Conductivity results for onsite surface water (SWP-1, 07/06/2022) was **1,750 µS/cm** which corresponds to a calculated Total Dissolved Solids result of **1,375 mg/L**. These results were below the TV.

Electrical conductivity for offsite surface waters ranged between **2,740 µS/cm** (SWC-DOWN, 07/06/2022) to **4,670 µS/cm** (SWC-UP, 07/06/2022).

Total Dissolved Solids results for offsite surface waters located along Rocklow Creek ranged between **1,781 mg/L** (SWC-DOWN, 07/06/2022) to **3,035 mg/L** (SWC-UP, 07/06/2022).

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

Leachate

Salinity in leachate is expected to vary significantly with leachate concentration and stormwater dilution. Leachate salinity for June 2022 monitoring was **8,360 µS/cm** (LP1, 7/06/2022) which was above the TV. Results are significantly lower than historical data at **3,941 µS/cm** than the mean value of **12,301 µS/cm** observed between 1/2/2017 and 07/06/2022.

6.3.4 Dissolved Oxygen

Levels of Dissolved Oxygen (DO) were measured in the field during sampling. DO reflects the equilibrium between oxygen-consuming processes and oxygen-releasing processes. DO can initiate redox reactions resulting in the uptake or release of nutrients. Low DO concentrations can result in adverse effects on many aquatic organisms which depend on oxygen for their efficient metabolism. At reduced DO concentrations many compounds become increasingly toxic, for example Zinc, Lead, Copper, phenols, cyanide, hydrogen sulphide and Ammonia.

The ANZECC (2000) guidelines Table 3.3.2 outlines a range between 85% to 110% saturation for low land rivers. Assuming a water temperature of 18°C this is equivalent to approximately 7-11 mg/L or ppm.

Surface Waters

Dissolved Oxygen at SWP-1 was **3.33 mg/L** (07/03/2022). SWP-1 was not discharging at the time of sampling and are consistent with previous data.

Dissolved Oxygen for the offsite surface waters at Rocklow Creek ranged from **9.24 mg/L** (SWC-DOWN_2, 07/06/2022) to **7.37 mg/L** (SWC-DOWN, 07/06/2022). Results are generally above historical readings but are consistent with a tidal creek passing through a mangrove swamp.

Leachate

Dissolved oxygen at LP1 (Leachate Tank) was **6.54 mg/L** (07/06/2022). Results were consistent with previous data.

6.3.5 pH

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

Groundwater

Groundwater pH was reported between **pH 6.4** (BH-14, 08/06/2022) and **pH 7.2** (BH-19r 08/06/2022). All groundwater results were reported within the ANZECC recommended range of pH 6.5-8.0 and are generally consistent with historical data.

Surface Water

Surface water for the June 2022 monitoring period reported pH values of between **pH 7.3** (SWC_UP, 07/06/2022) and **pH 7.6** (SWP-1, 07/06/2022). All surface water were reported within the ANZECC recommended range of pH 6.5-8.0 and are consistent with historical data.

Leachate

Leachate pH was as reported as **pH 9.0** (LP-1, 07/06/2022). Results were reported above the ANZECC recommended range of pH 6.5-8.5. Leachate pH has been trending upward since September 2021.

6.3.6 Total Suspended Solids (TSS)

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

TSS was reported for surface water only. Concentrations for the June 2022 monitoring period were reported between **10 mg/L** (SWC-DOWN, 10/03/2022 and SWC- 2, 10/03/2022) and **12 mg/L** (SWC-DOWN2, 10/03/2022). All results were below the **50mg/L** TV.

TSS results are generally consistent with historical results.

6.4 INORGANIC ANALYTES

Nutrients

Water samples were analysed for select nutrients including Ammonia, Ammonium, Nitrate and Nitrite. The most bio-available forms of Nitrogen are Ammonium (NH4+) and Nitrate (NO3-).

Ammonia is an oxygen-consuming compound and is toxic to aquatic biota at elevated concentrations. Ammonia toxicity increases under low oxygen levels and higher ph.

6.4.1 Ammonia

Groundwater

For the June 2022 monitoring period, ammonia was measured within groundwater monitoring bores between **0.29 mg/L** (BH3, 08/06/2022) and **302 mg/L** (BH-1c, 08/06/2022). With the exception of BH-3, BH-14 (**0.51 mg/L**) and BH-18 (**0.56 mg/L**) all groundwater wells exceeded of the adopted trigger value of **0.91 mg/L** for the June 2022 monitoring period. However, since the corresponding pH was below 8.00 pH units it was not considered significant. Results are generally consistent with historical values.

Surface Water

Ammonia in surface water samples ranged from **0.30 mg/L** (SWC_DOWN_2, 07/06/2022) to **20.8 mg/L** (SWP-1, 07/06/2022). The result for SWP-1 exceeded the adopted trigger value of **0.91 mg/L** during the monitoring period. However, since the corresponding pH was below 8.00 pH units it was not considered significant.

Leachate

Ammonia in leachate was reported between **670 mg/L** (LP1, 07/06/2022). High ammonia concentrations are expected in untreated leachate.

6.4.2 Nitrate

Groundwater

Results for Nitrate in groundwater were reported between **<0.01 mg/L** in multiple bores and **20.01 mg/L** (BH-14, 08/06/2022). Although results generally continue to trend downward a total of two (2) groundwater wells reported exceedances above the TV of 0.7mg/L in the June 2022 monitoring period, including BH-3 and BH-14.

Surface Water

The nitrate concentration of the onsite surface water SWP-1 in the June 2022 monitoring period was **<0.01 mg/L** (SWP-1; 07/06/2022).

Nitrate concentration for Rocklow Creek surface water samples in the June 2022 monitoring period ranged between **0.97 mg/L** (SWC-DOWN_2; 07/06/2022) and **1.13 mg/L** (SWC-UP; 07/06/2022).

With the exception of SWP-1 the Nitrate concentration of all other surface water samples was above the TV of **0.7mg/L.**

Leachate

Nitrate concentration of leachate (LP-1) was **0.12mg/L** in the June 2022 monitoring period.

6.4.3 Nitrite

Groundwater

Results for Nitrate in groundwater during the June 2022 monitoring period were reported between **<0.01 mg/L** in multiple bores and **0.74 mg/L** (BH-14, 07/06/2022). No exceedances

were reported for nitrite during the June 2022 monitoring period. All results are below the accepted TV and consistent with previous data.

Surface Water

During the June 2022 monitoring period surface water SWP-1 was reported as **0.08 mg/L**. Results are generally consistent with previous data and below the accepted TV.

Leachate

/Leachate LP1 result was reported as to **<0.1 mg/L** (07/12/2021). Results are below the accepted TV and consistent with previous data.

Anions

6.4.4 Chloride

Groundwater

Results for Chloride in groundwater were reported between **7 mg/L** in (BH-18, 10/03/2022) and **831 mg/L** (BH-1c, 08/06/2022). Mean ground water chloride concentration has been trending down since December 2019.

Surface Water

During the June 2022 monitoring period chloride results for surface water SWP-1 was **277 mg/L** (07/06/2022). The results are below the accepted TV and are generally consistent with historical data. Chloride results for overflow samples were **230 mg/L** (13/05/2022) and **262 mg/L** (24/05/2022) respectively.

Leachate

Chloride at the Leachate Tank (LP-1) was **1570 mg/L** (07/06/2022). Chloride results have generally been trending down since February 2019.

6.4.5 Fluoride

Groundwater

Results for Fluoride in groundwater were reported between **<0.1 mg/L** in multiple bores and **0.5 mg/L** (BH-14, 08/06/2022). Results are consistent with historical data.

Surface Water

Surface water results ranged from of **0.2 mg/L** (SWC_2 and SWC_UP, 07/06/2022) and **0.5 mg/L** (SWP-1, 07/06-2022). Results are generally consistent with historical data.

Leachate

The fluoride result at the Leachate tank (LP-1) was **0.2 mg/L** (07/06/2022). Results have been trending down since August 2018 and have stabilised at 0.2 mg/L for the last three quarters.

6.4.6 Sulphate

Groundwater

Results for Sulphate in groundwater were reported between **1 mg/L** (BH-1C, 08/06/2022) and **1270 mg/L** (BH-15, 08/06/2022). Results are generally consistent with previous data.

Surface Water

Sulphate in surface water ranged from **188 mg/L** (SWC_UP, 07/06/2022 and **296 mg/L** (SWP_DOWN_2, 07/06/2022). Historical data indicates a stepwise reduction in sulphate concentration levels for Rocklow Creek surface waters from 16/06/2021. June levels remain consistent with the lower concentration noted over the last four (4) quarters.

Leachate

Sulphate level at the leachate tank (LP-1) in the June 2022 monitoring period was **<10 mg/L** (07/06/20221). The sulphate concentration in leachate has been trending down since 2017 and has been consistent at **<10 mg/L** since December 2020.

6.4.7 Total Alkalinity

Surface Water

Total Alkalinity at SWP-1 ranged was **559 mg/L** (07/06/2022). Historical data indicates an upward trend in Total Alkalinity over the last three (3) quarters.

Leachate

Total Alkalinity in Leachate (LP-1) was **3,550 mg/L** (07/06/2022). Results are consistent with historical data.

6.4.8 Bicarbonate Alkalinity

Groundwater

Bicarbonate in groundwaters ranged from **284 mg/L** (BH-19r, 08/06/2022) to **2,800 mg/L** (BH-1C, 08/06/2022). Historical data indicates that Bicarbonate Alkalinity has been trending down since 2017. Results are generally consistent with historical data.

Metals & Metalloids

6.4.9 Manganese

Groundwater

Manganese was analysed as dissolved manganese in groundwater, total manganese in surface water and total manganese in leachate sampling points. Concentrations of dissolved manganese in groundwater for the June 2022 monitoring period were reported between **0.006 mg/L** (BH-3, 08/06/2022) and **0.552 mg/L** (BH-15, 08/06/2022). Results are generally consistent with historical data.

Surface Water

The total manganese concentration at SWP-1 was from **0.994 mg/L** (07/06/2022). Results are consistent with historical data.

Leachate

Total Manganese concentrations in leachate was reported as **0.107 mg/L** (Leachate Tank LP-1, 07/06/2022). A step change reduction in manganese has been noted for the three (3) monitoring periods with the June 2022 result down by 88% on the mean manganese result since Feb 2019. 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.

6.4.10 Iron (Total Fe)

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

Surface Water

Concentrations of total iron for onsite surface water was reported as **0.31 mg/L** (SWP-1, 07/06/2022). Results are generally consistent with historical data.

Leachate

Concentration of iron at the leachate Tank (LP-1) was reported between **1.14 mg/L** (07/06/2022). Results are generally consistent with historical data.

6.4.11 Iron (Dissolved Fe)

Groundwater

Dissolved iron was measured within selected groundwater and surface water sampling points. Groundwater results were reported between **0.05 mg/L** (BH3, 08/06/2022) and **20.6 mg/L** (BH15, 08/06/2022). Results are generally consistent with historical data.

6.4.12 Calcium

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

Groundwater

Groundwater results were reported between **83 mg/L** (BH-18, 08/06/2022) and **161 mg/L** (BH9, 08/06/2022). Calcium levels have generally been trending down since December 2021, the June 2022 results are generally consistent with the trend.

Surface Water

Calcium in surface water ranged from **50 mg/L** (SWC_UP, 07/06/2022) to **79 mg/L** (SWP-1 07/06/2022).

Calcium levels in Rocklow Creek are consistent with the reduced levels observed since March 2022.

Leachate

Calcium concentration in Leachate (LP-1) for the June 2022 monitoring period was **57 mg/L** (07/06/2020).

Historical observations indicate that low calcium levels have been observed for four (5) of the last seven (7) sampling events since 15/12/2020 at LP-1. Leachate calcium concentration for the June 2022 period is 66.1% lower than the mean calcium concentration since 2017 of **168 mg/L**.

6.4.13 Potassium

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

Groundwater

Groundwater results were reported between **9 mg/L** (BH-18, 08/06/2022) and **203 mg/L** (BH15, 08/06/2022). The potassium levels for groundwaters are generally consistent with historical data.

Surface Water

During the June 2022 monitoring period potassium levels for the offsite groundwaters ex Rocklow Creek ranged from **20 mg/L** (SWC-UP, 07/06/2022) to **36 mg/L** (SWC-DOWN_2, 07/06/2022).

Historical data indicates that potassium concentrations in surface waters have been trending down since 2018. A step change reduction in June 2021 coupled with an additional step change reduction in March 2020 has produced the lowest potassium results on record for all Rocklow Creek sample locations with reductions of 62.7% (SWC_2, 10/03/2020) to 98.0% (SWC_DOWN, 10/03/2022) when compared to the mean potassium results for each site since November 2017. The results for the June 2022 quarter remain generally consistent with those of March 2022.

6.5 ORGANIC ANALYTES

6.5.1 Total Organic Carbon

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

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

TOC was reported during the June 2022 monitoring period at the following concentrations:

Groundwater

TOC levels ranged between **15 mg/L** (BH-18 and BH-4; 08/06/2022) and **176 mg/L** (BH-1c; 08/06/2022). Results are consistent with historical data.

Surface Water

In the June 2022 monitoring period the TOC levels ranged between **8** mg/L (SWC-UP and SWC-DOWN_2, 07/06/2022) and **31** mg/L (SWP-1, 07/06/2022). The results are generally consistent with historical data.

Leachate

For the June 2022 monitoring period TOC concentration in leachate was **563 mg/L** (LP-1 Leachate Storage Tank 07/06/2022). The results are generally consistent with previous data

7.0 DUST GAUGE RESULTS

The below table provides the results of the dust depositions results. A total of four (4) dust collectors were onsite for one (1) month between **4th May** and **7th June 2022**, in general accordance with AS3580.10.1. A summary of results is provided in **Table 7** below.

Table 7: Summary of Dust Gauge Results

Sample ID	Guideline Criteria (g/m^2/month)	Total Insolvable Matter (g/m^2/month)	Comments
DDG1	4	**0.1**	Satisfactory
DDG2		**0.4**	Satisfactory
DDG3		**0.6**	Satisfactory
DDG4		**0.8**	Satisfactory

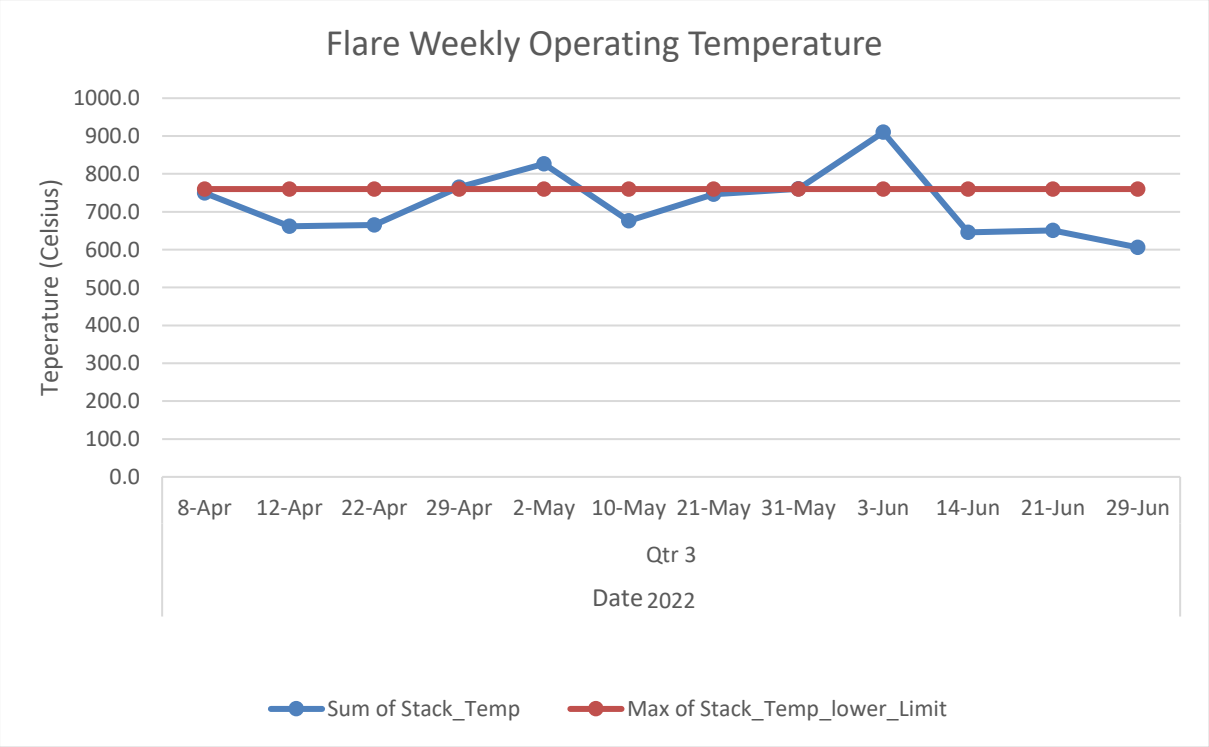
Results for depositional dust during the June 2022 quarterly monitoring period reported levels of dust below the adopted assessment criteria of **4 g/m^2/month**.

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

Table 8: Summary of Flare Operating Temperatures

Year	Monitoring Period	Date	Compliant	Non-Compliant
2022	Qtr 3	8-Apr		750.0
		12-Apr		662.0
		22-Apr		665.0
		29-Apr	765.0	
		2-May	827.0	
		10-May		676.0
		21-May		746.0
		31-May	761.0	
		3-Jun	910.0	
		14-Jun		646.0
		21-Jun		651.0
		29-Jun		606.0
		2022 Total	**3263.0**	**5402.0**

Chart 1: Weekly Flare Operating Temperatures June Quarter 2022



Weekly average operating temperatures supplied by LGI displayed typical variation associated with a continuous process.

Weekly operating temperatures at the Flare fell below the Operational temperature Limit of 760 degrees on 8 out of 12 occasions during the June monitoring period.

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

8.0 METHANE MONITORING

8.1 SURFACE GAS METHANE

The surface gas monitoring for the June 2022 monitoring period *DID NOT* detect any levels of methane above the EPA license limits of 500 ppm. The results were considered satisfactory. A table of results is provided in Appendix D.

8.2 GAS ACCUMULATION MONITORING IN ENCLOSED STRUCTURES

The internal methane testing for enclosed structures within 250m of the landfill during the June 2022 monitoring period *DID NOT* detect any levels of methane above the EPA license limits of 1% V/V. The results were considered satisfactory. A table of results is provided in Appendix D.

9.0 ENVIRONMENTAL ASSESSMENT

9.1 MONITORING POINT SUMMARY

Field measurements and NATA laboratory results for dust and methane results for the June 2022 monitoring period reported satisfactory results. Water results including leachate, groundwater, onsite and offsite surface water reported concentrations of analytes within the range historical values. Water results from the last four (4) years have been tabulated and presented **Charts 1-59** attached.

Groundwater and surface water within the Site boundary generally reported multiple high levels of analytes considered to be characteristic of landfill and leachate. Offsite sample locations within Rocklow Creek generally reported satisfactory results.

All dust gauges reported satisfactory results over the June 2022 monitoring period.

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

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

Results for flare monitoring reported consistent temperature exceedances throughout the June 2022 monitoring period.

9.2 ENVIRONMENTAL MANAGEMENT

9.2.1 Landfill Operations

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

9.3 ENVIRONMENTAL SAFEGUARDS

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

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

Access tracks to sampling points should be inspected prior to each quaterly sampling events.

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

9.4 MONITORING PROGRAM

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

Review of the June 2022 monitoring results indicate no significant change in environmental conditions at the Site during the past 3 months. Future sampling events should continue to monitor the key indicators of leachate within surface and ground waters, especially concentration of ammonia and nitrate.

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

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

10.0 CONCLUSIONS

Based on the findings obtained during the June 2022 monitoring program the following conclusions and recommendations are provided:

- Shallow groundwater flow is expected to mimic topography with low hydraulic gradients flowing towards the south and southeast towards Rocklow creek. The nearest sensitive receptors are likely to include; recreational users of the Minnamurra River estuary environs; down gradient stakeholders; and downgradient alluvial aquifers, swamps, Rocklow Creek, Minnamurra River and Groundwater Dependent Ecosystems near discharge zones;

- Groundwater throughout the monitoring period reported exceedances of the assessment criteria for; ammonia, heavy metals, nitrate, sulphate and salinity (EC) within multiple groundwater bores including; BH-1c, BH-3, BH-4, BH-9, BH-12r, BH-13, BH-14, BH-15, BH-18, BH-19r, BH-21 and BH-22. This was considered to be consistent with historical values;
- With the exception of Nitrate, Rocklow Creek surface water samples (SWC-Up, SWC-2, SWC-down and SWC-down 2) were reported within the adopted Site Assessment Criteria.
- On eight (8) out of twelve (12) occasions, flare operating temperatures were below operating threshold target of 760 degrees during the monitoring period. Operations taken by the operator to address the root causes of the low Flare Stack temperatures are outlined in the monthly LGI reports attached as **Appendix G**;
- Surface gas methane monitoring reported satisfactory results all within the adopted assessment criteria;
- Gas accumulation monitoring reported satisfactory results for all enclosures tested within 250m of emplaced waste or leachate storage facility;
- Dust deposition gauges recorded satisfactory results below the guidelines provided in AS3580.10.1. Monitoring should continue in accordance with EPL 5984 requirements;
- Based on this review of the June 2022 monitoring period, contaminants associated with the landfill cell, leachate dam/s and general site uses are considered to be relatively consistent with the range of historical results;
- Should any change in Site conditions or incident occur which causes a potential environmental impact, a suitable environmental professional should be engaged to further assess the Site and consider requirements for any additional monitoring; and
- This report must be read in conjunction with the attached Statement of Limitations.

11.0 LIMITATIONS

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

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

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

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

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

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

12.0 REFERENCES

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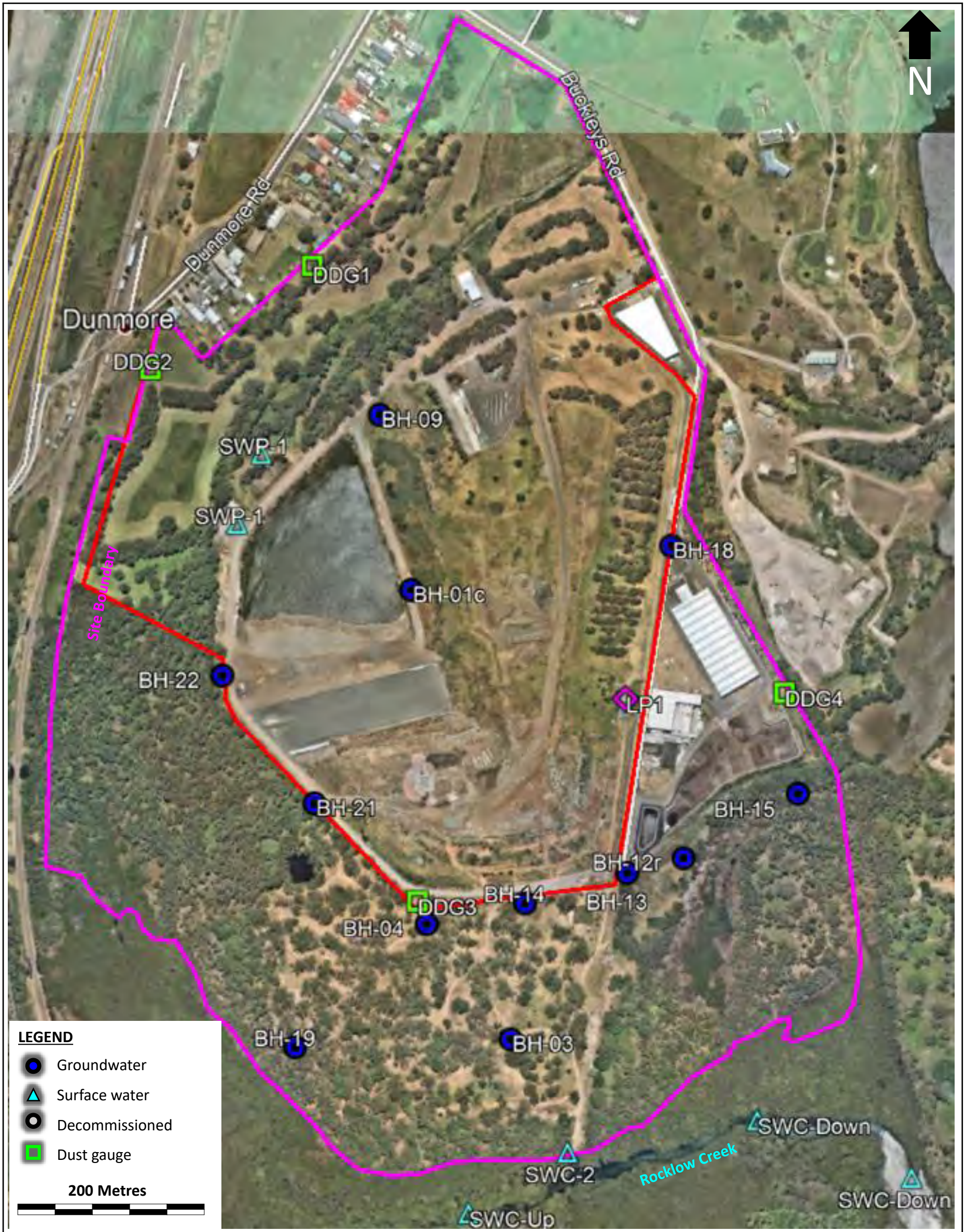
FIGURES



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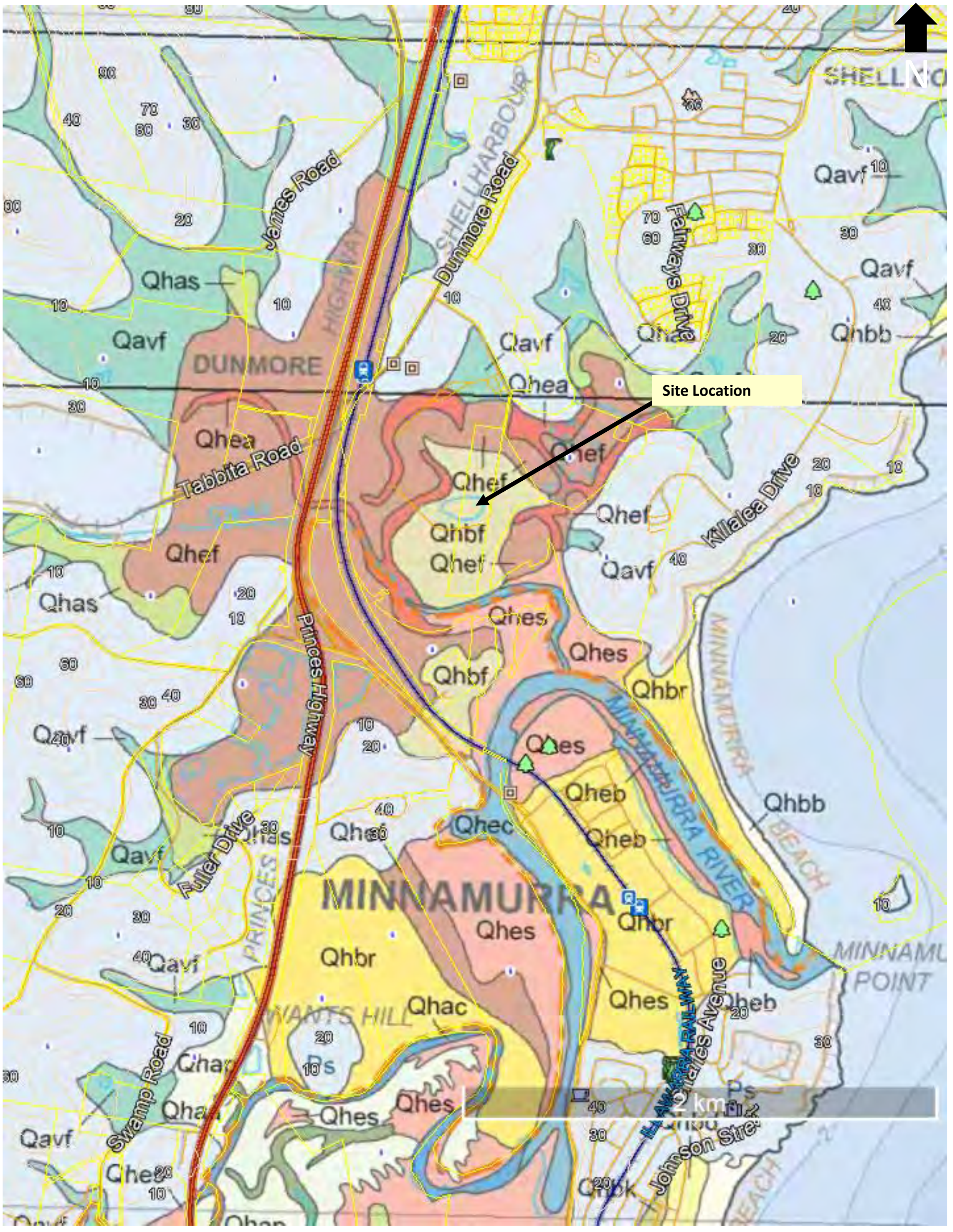
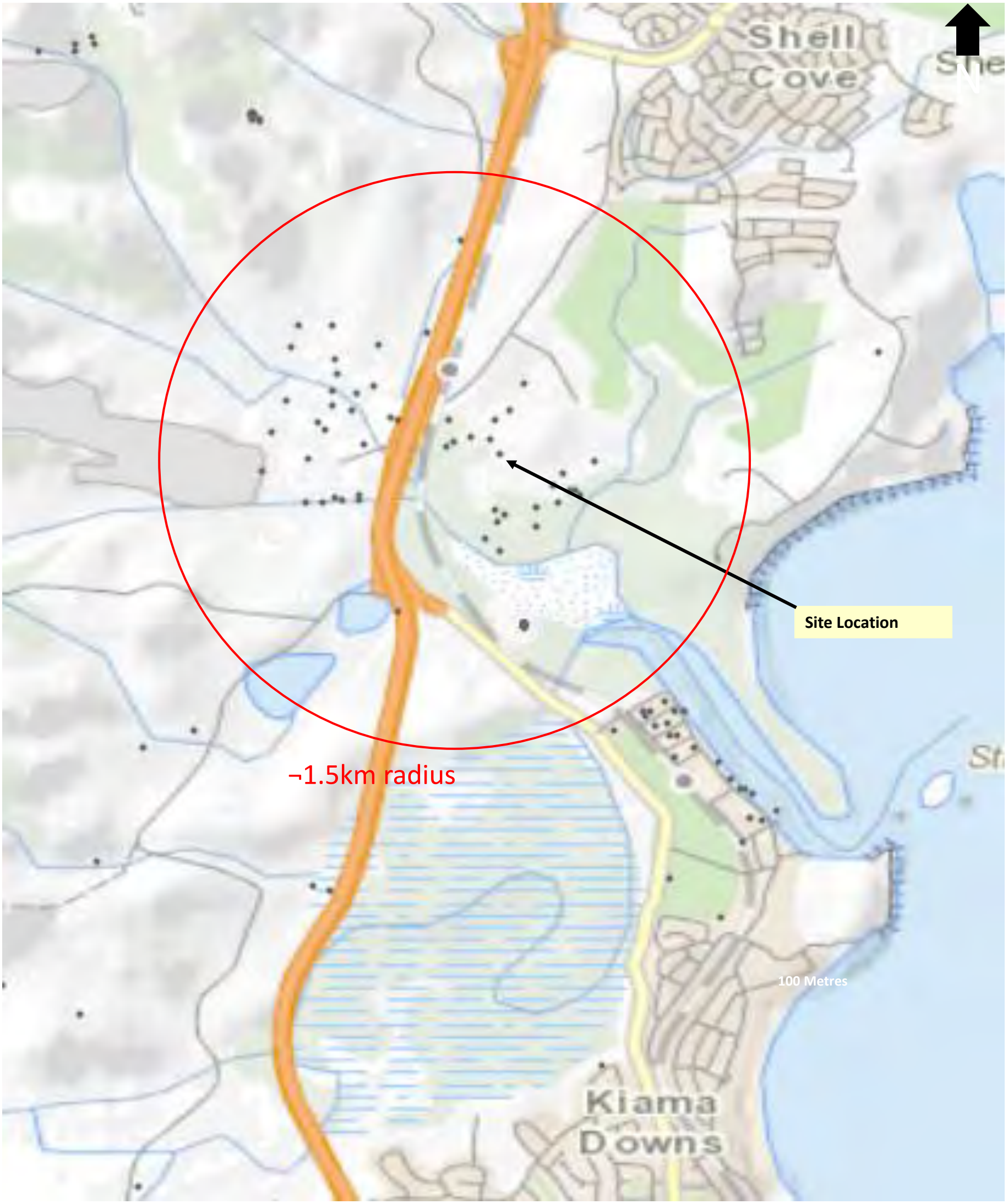
Client:	**Shellharbour City Council**	Drawn:	**PL**	Figure:	**3**
Project:	**ENRS0033**	Source:	**SixMaps**	Date:	**16/03/2020**
Location:	Dunmore Recycling & Waste Depot 44 Buckleys Rd, Dunmore, NSW	Scale:	**NA**	Title:	**Surface Gas Sample transects**
		Status:	**Rev 1**		



ENRS *Environment & Natural Resource Solutions* 108 Jerry Bailey Road, Shoalhaven Heads, NSW, 2535 Tel: 02 4448 5490 Fax: 02 90374708 projects@enrs.com.au www.enrs.com.au	Client:	**Shellharbour City Council**	Drawn:	**PL**	Figure:	**4**
	Project:	**ENRS0033**	Source:	**DPI**	Date:	**16/01/2020**
	Location:	Dunmore Recycling & Waste Depot 44 Buckleys Rd, Dunmore, NSW	Scale:	**NA**	Title:	**Geology**
			Status:	**Rev 1**		



ENRS *Environment & Natural Resource Solutions* 108 Jerry Bailey Road, Shoalhaven Heads, NSW, 2535 Tel: 02 4448 5490 Fax: 02 90374708 projects@enrs.com.au www.enrs.com.au	Client:	**Shellharbour City Council**	Drawn:	**PL**	Figure:	**5**
	Project:	**ENRS0033**	Source:	**SixMaps**	Date:	**16/01/2020**
	Location:	Dunmore Recycling & Waste Depot 44 Buckleys Rd, Dunmore, NSW	Scale:	**NA**	Title:	**Registered Bores**
			Status:	**Rev 1**		

TABLES

TABLE 9: Total Concentration Results

Quarterly Water Monitoring Results - March 2022: Dunmore Recycling and Waste Depot

GILs -Trigger Values for Freshwater (Protection of 95% of Species) [A]					-	-	-	-	-	1.9	-	-	-	0.9 (pH 8)	-	0.7	-	-	-	-	-	-	-	-	6.5 - 8.5	2200	-	-	
GILs -Trigger Values for Marine Water (Protection of 95% of Species) [A]					-	-	-	-	-	-	-	-	-	0.91 (pH 8)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Australian Drinking Water Guidelines (2018)[C]				Health	-	-	-	-	-	0.5	-	-	1.5	-	3	50	-	-	-	-	-	-	-	-	6.5 - 8.5	-	-	-	
				Aesthetic	250	-	-	180	-	0.1	0.3	0.3	-	0.5	-	-	-	-	-	250	-	-	-	5	6.5 - 8.5	-	-	-	
Lab Report	Sample No.	Sample type	EPA No,	Date Sampled	Chloride	Calcium	Magnesium	Sodium	Potassium	Manganese	Total Iron	Dissolved Iron	Fluoride	Ammonia as N	Nitrite as N	Nitrate as N	Total Organic Carbon	Bicarbonate Alkalinity as CaCO3	Total Alkalinity as CaCO3	Sulfate as SO4 - Turbidimetric	Dissolved Oxygen	Dissolved Oxygen - % Saturation	Suspended Solids (SS)	Turbidity	pH	Electrical Conductivity (Non Compensated)	Temperature	Standing Water Level	Comments
				Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	%	mg/L	NTU	pH	µS/cm	°C	mbgl	
				Laboratory PQL	1	1	1	1	1	0.001	0.05	0.05	0.1	0.01	0.01	0.01	1	1	1	1	0.01	0.1	5	0.1	0.01	1	0.1	-	-
	BH1c	Groundwater	3	Jun 2022	831	128			200	0.09		8.53	0.4	302	0.02	< 0.10	176	2,800	2,800	< 1					6.70	7,350	24.9	2.78	
	BH3	Groundwater	5	Jun 2022	65	114			41	0.01		< 0.05	0.1	0.29	0.04	11.00	16	293	293	164					7.00	1,130	17.4	2.74	
	BH4	Groundwater	6	Jun 2022	142	141			18	0.14		3.88	0.1	3.65	< 0.01	0.16	15	390	390	172					7.00	1,480	18.7	3.94	
	BH9	Groundwater	18	Jun 2022	515	161			60	0.36		4.59	0.4	64.8	< 0.01	0.02	57	1,380	1,380	239					6.70	4,270	17.9	2.69	
	BH12r	Groundwater	17	Jun 2022	242	131			36	0.49		4.04	0.2	3.25	0.04	0.69	24	533	533	226					6.60	2,110	20.8	3.98	
	BH13	Groundwater	10	Jun 2022	105	155			10	0.18		1.39	0.2	1.37	< 0.01	0.26	17	547	547	97					6.60	1,510	21.2	3.84	
	BH14	Groundwater	11	Jun 2022	93	93			21	0.09		0.06	0.5	0.51	0.74	20.10	39	309	309	84					6.40	1,210	20.6	4.18	
	BH15	Groundwater	7	Jun 2022	499	155			203	0.55		20.60	0.2	13.20	< 0.10	< 0.10	46	384	384	1,270					6.80	4,490	16.2	0.47	
	BH18	Groundwater	25	Jun 2022	41	83			9	0.12		1.10	0.2	0.56	< 0.01	< 0.01	15	349	349	< 1					6.50	808	19.9	1.80	
	BH19r	Groundwater	16	Jun 2022	80	89			23	0.07		0.88	0.2	2.32	0.02	< 0.01	22	284	284	97					7.20	1,020	18.6	4.31	
	BH21	Groundwater	23	Jun 2022	308	112			16	0.41		0.31	0.4	4.15	< 0.01	< 0.01	27	568	568	297					7.00	2,500	21.4	2.72	
	BH22	Groundwater	24	Jun 2022	224	150			22	0.12		0.34	0.2	6.77	< 0.01	< 0.01	52	688	688	102					6.80	2,130	18.8	2.41	
	SWP1	Surfacewater	1	Jun 2022	277	79	49	264	19	0.99	0.31	0.10	0.5	20.80	0.02	< 0.01	31	559	559	192	2.38		12	4.30	7.60	1,750	13.0		
	SWC_up	Surfacewater	20	Jun 2022	971	50	70	526	20	0.09	1.22	0.06	0.2	0.29	0.02	1.13	8	124	124	188	9.29		7	14.90	7.30	2,740	10.8		
	SWC_2	Surfacewater	19	Jun 2022	1,150	55	82	630	25	0.10	2.09	0.08	0.2	0.51	0.02	1.09	9	134	134	212	9.25		26	23.70	7.40	3,280	10.9		
	SWC_down	Surfacewater	21	Jun 2022	1,550	62	105	822	32	0.07	1.00	0.05	0.3	0.38	0.02	0.98	9	123	123	265	9.37		9	14.00	7.40	4,170	10.6		
	SWC_down_2	Surfacewater	22	Jun 2022	1,810	66	117	936	36	0.07	0.97	0.05	0.3	0.30	0.02	0.97	8	124	124	296	9.24		9	12.70	7.40	4,670	10.3		
	Leachate Storage Tank LP1	Leachate	2	Jun 2022	1,570	57			389	0.11	1.14		0.2	670	< 0.10	0.12	563	2,520	3,550	< 10	6.54	63.1			9.00	8,360	11.8		
	SWP1	Surfacewater	1	13/05/2022	230	64	42	227	17	0.30	< 0.05	< 0.05	0.4	15.80	0.16	0.19	29	435	435	186	4.45		23	19.90	7.90	1,590	17.6		Overflow Sample
	SWP1	Surfacewater	1	24/05/2022	262	77	49	274	22	0.90	0.23	< 0.05	0.6	22.40	0.06	0.03	33	549	549	182	3.62		7	11.90	7.60	2,150	15.8		Overflow Sample

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.
ANZECC 2000 - pH Upper and Lower Limit for NSW Lowland Rivers (Table 3.3.2).
Investigation levels are taken from the health values of the Australian Drinking Water Guidelines (NHMRC 2011).
NEPM (2013 Table 1A(4) Groundwater HSLs for vapour intrusion (Sand 2m-4m)

TABLE 10: Duplicate Groundwater Sample Results and QC Data

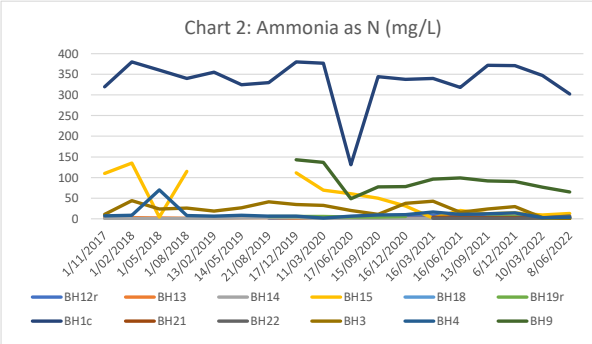
Lab Report.						RPD
Sample No.				BH18	GWDuplicate	
Sample type				Groundwater	GWQC	
EPA No,				25	QC1	
Date Sampled				8/06/2022	8/06/2022	
Analyte	Units	PQL	5 x PQL	Result	Result	
Chloride	mg/L	1	5	41	41	0.00
Calcium	mg/L	1	5	83	84	1.80
Potassium	mg/L	1	5	9	9	0.00
Manganese	mg/L	0.001	0.005	0.119	0.120	1.26
Dissolved Iron	mg/L	0.05	0.25	1.10	1.10	0.00
Fluoride	mg/L	0.1	0.5	0.2	0.2	0.00
Ammonia as N	mg/L	0.01	0.05	0.56	0.59	7.83
Nitrite as N	mg/L	0.01	0.05	< 0.01	< 0.01	0.00
Nitrate as N	mg/L	0.01	0.05	< 0.01	< 0.01	0.00
Nitrite + Nitrate as N	mg/L	0.01	0.05	< 0.01	< 0.01	0.00
Total Organic Carbon	mg/L	1	5	15	15	0.00
Bicarbonate Alkalinity as CaCO3	mg/L	1	5	349	348	0.43
Total Alkalinity as CaCO3	mg/L	1	5	349	348	0.43
Sulfate as SO4 - Turbidimetric	mg/L	1	5	< 1	< 1	0.00
pH	pH	0.01	0.05	6.50	6.50	0.00
Electrical Conductivity (Non Compensated)	µS/cm	1	5	808	808	0.00
Temperature	°C	0.1	0.5	19.9	19.9	0.00
Standing Water Level	mbgl	-		1.8	1.8	0.00

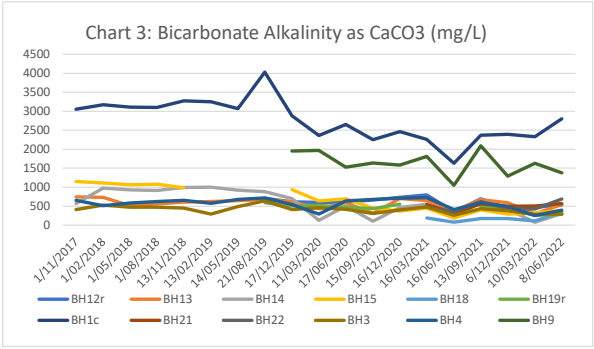
TABLE 11: Duplicate Surface Water Results and QC Data

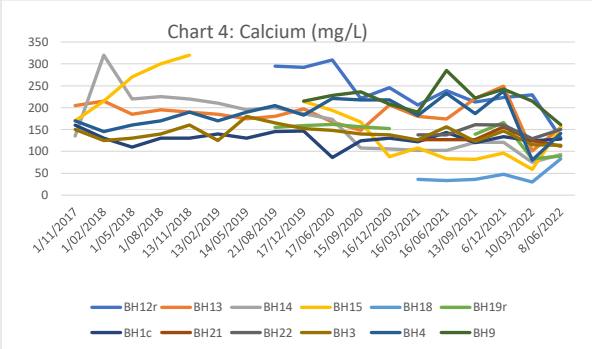
Lab Report.						RPD
Sample No.				SWC_UP	SWDuplicate	
Sample type				Surfacewater	OffSiteSWQC	
EPA No,				20	QC2	
Date Sampled				8/06/2022	8/06/2022	
Analyte	Units	PQL	5 x PQL	Result	Result	
Chloride	mg/L	1	5	971	1,150	✓ 25.32
Calcium	mg/L	1	5	50	56	✓ 16.98
Potassium	mg/L	1	5	20	25	✗ 33.33
Manganese	mg/L	0.001	0.005	0.090	0.088	✓ 3.37
Total Iron	mg/L	0.05	0.25	1.22	1.13	✓ 11.49
Dissolved Iron	mg/L	0.05	0.25	0.06	0.06	✓ 0.00
Fluoride	mg/L	0.1	0.5	0.2	0.2	✓ 0.00
Ammonia as N	mg/L	0.01	0.05	0.29	0.44	✗ 61.64
Nitrite as N	mg/L	0.01	0.05	0.02	0.02	✓ 0.00
Nitrate as N	mg/L	0.01	0.05	1.13	1.10	✓ 4.04
Nitrite + Nitrate as N	mg/L	0.01	0.05	1.15	1.12	✓ 3.96
Total Organic Carbon	mg/L	1	5	8	7	✓ 20.00
Bicarbonate Alkalinity as CaCO3	mg/L	1	5	124	134	✓ 11.63
Total Alkalinity as CaCO3	mg/L	1	5	124	134	✓ 11.63
Sulfate as SO4 - Turbidimetric	mg/L	1	5	188	207	✓ 14.43
Dissolved Oxygen	mg/L	0.01	0.05	9.29	9.14	✓ 2.44
pH	pH	0.01	0.05	7.30	7.40	✓ 2.04
Electrical Conductivity (Non Compensated)	µS/cm	1	5	2,740	3,230	✓ 24.62
Temperature	°C	0.1	0.5	10.8	10.9	✓ 1.38

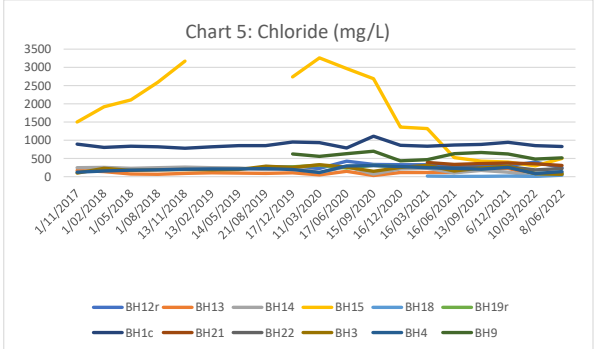
CHARTS

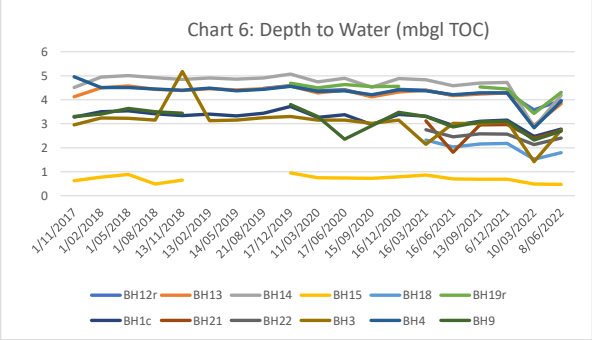
Charts 2-17: Groundwater Charts

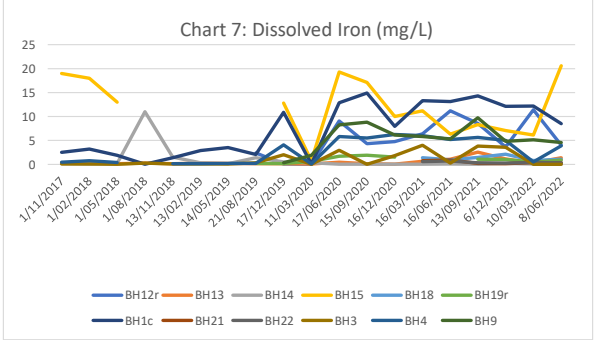


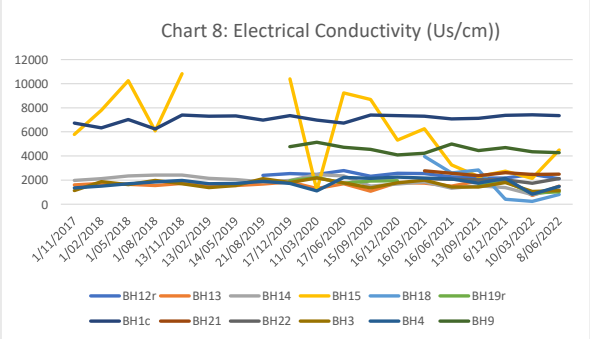


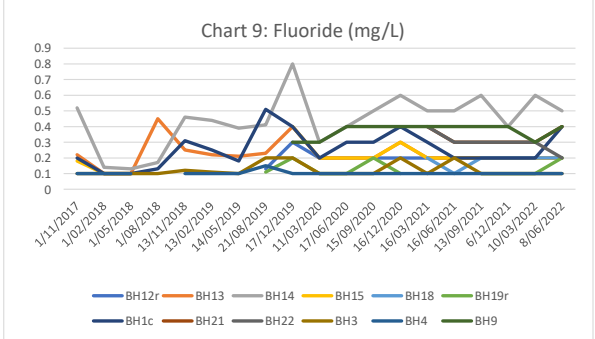












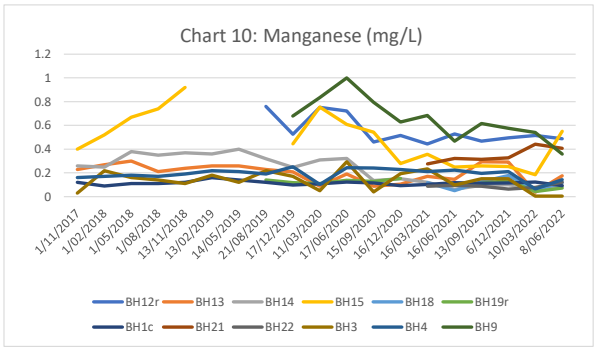


Chart 10: Manganese (mg/L)
1.2
1
0.8
0.6
0.4
0.2
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
16/12/2020
16/03/2021
16/06/2021
13/09/2021
6/12/2021
10/03/2022
8/06/2022
BH12r
BH13
BH14
BH15
BH18
BH19r
BH1c
BH21
BH22
BH3
BH4
BH9

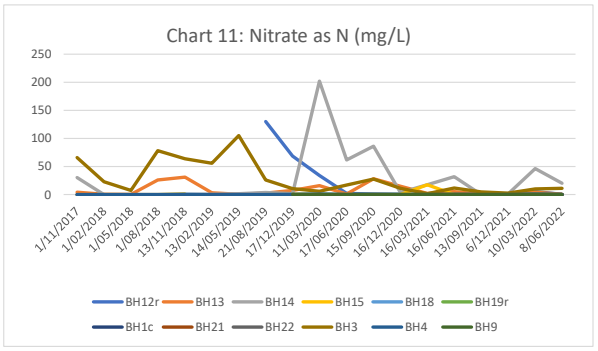


Chart 11: Nitrate as N (mg/L)
250
200
150
100
50
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
16/12/2020
16/03/2021
16/06/2021
13/09/2021
6/12/2021
10/03/2022
8/06/2022
BH12r
BH13
BH14
BH15
BH18
BH19r
BH1c
BH21
BH22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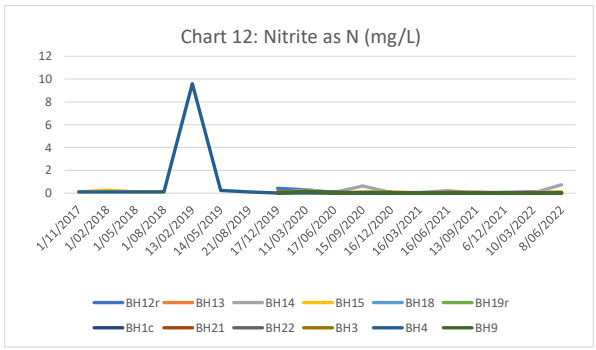
Chart 12: Nitrite as N (mg/L)
12
10
8
6
4
2
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
16/12/2020
16/03/2021
16/06/2021
13/09/2021
6/12/2021
10/03/2022
8/06/2022
BH12r
BH13
BH14
BH15
BH18
BH19r
BH1c
BH21
BH22
BH3
BH4
BH9

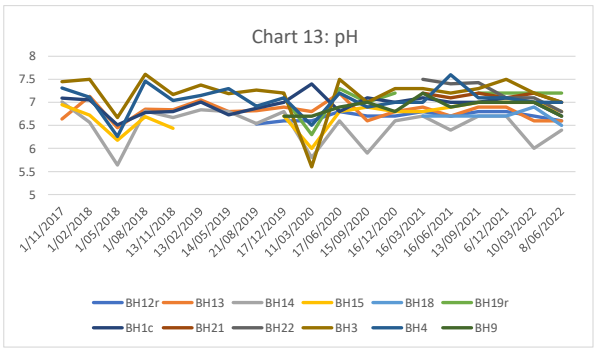
Chart 13: pH
8
7.5
7
6.5
6
5.5
5
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
16/12/2020
16/03/2021
16/06/2021
13/09/2021
6/12/2021
10/03/2022
8/06/2022
BH12r
BH13
BH14
BH15
BH18
BH19r
BH1c
BH21
BH22
BH3
BH4
BH9

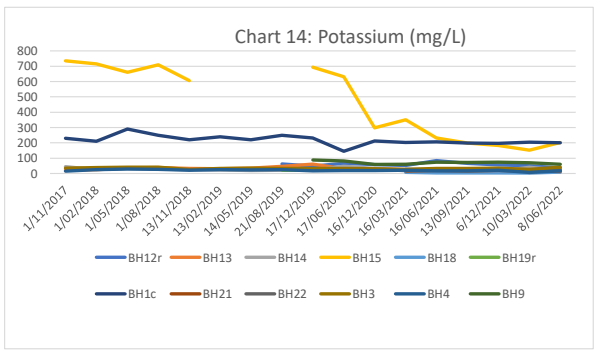
Chart 14: Potassium (mg/L)
800
700
600
500
400
300
200
100
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
17/06/2020
16/12/2020
16/03/2021
16/06/2021
13/09/2021
6/12/2021
10/03/2022
8/06/2022
BH12r
BH13
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BH15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

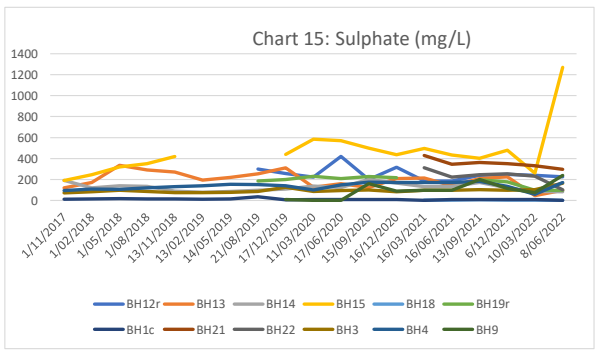
Chart 15: Sulphate (mg/L)
1400
1200
1000
800
600
400
200
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
16/12/2020
16/03/2021
16/06/2021
13/09/2021
6/12/2021
10/03/2022
8/06/2022
BH12r
BH13
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BH15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

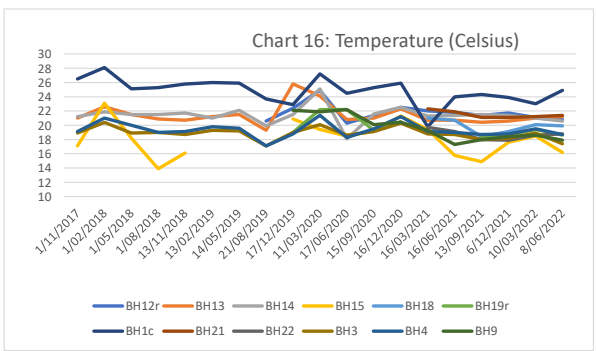


Chart 16: Temperature (Celsius)
30
28
26
24
22
20
18
16
14
12
10
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
16/12/2020
16/03/2021
16/06/2021
13/09/2021
6/12/2021
10/03/2022
8/06/2022
BH12r
BH13
BH14
BH15
BH18
BH19r
BH1c
BH21
BH22
BH3
BH4
BH9

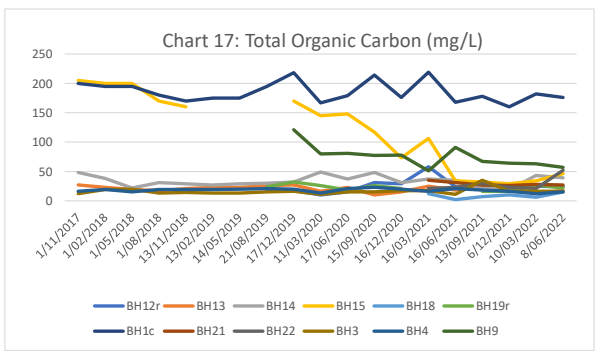
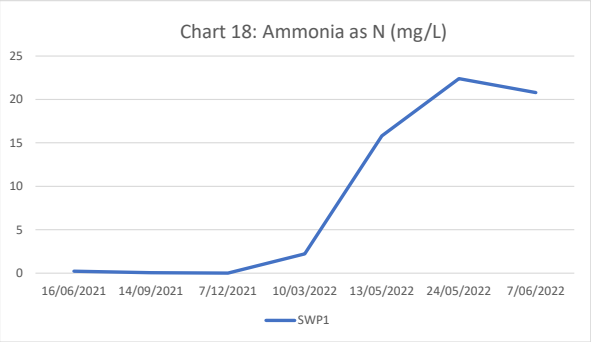
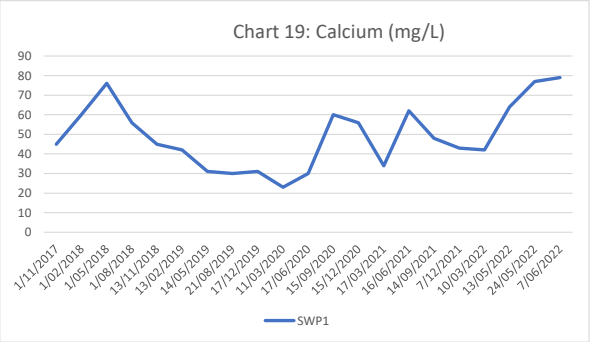
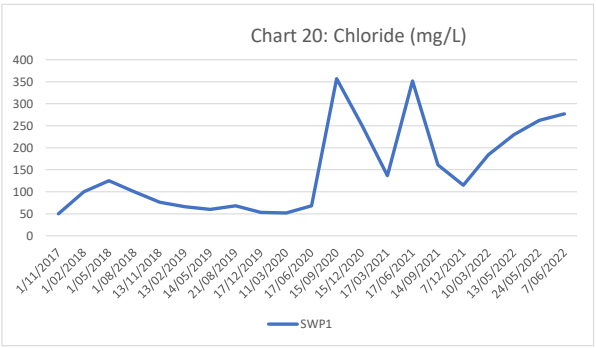


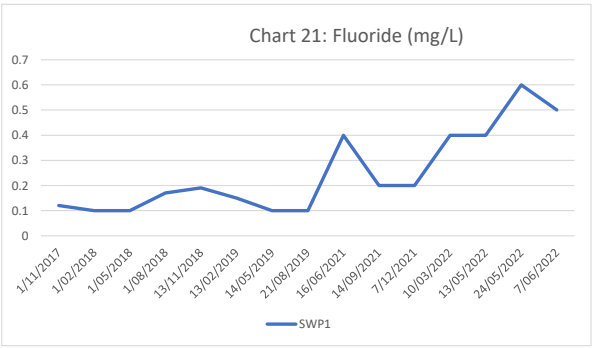
Chart 17: Total Organic Carbon (mg/L)
250
200
150
100
50
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
16/12/2020
16/03/2021
16/06/2021
13/09/2021
6/12/2021
10/03/2022
8/06/2022
BH12r
BH13
BH14
BH15
BH18
BH19r
BH1c
BH21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

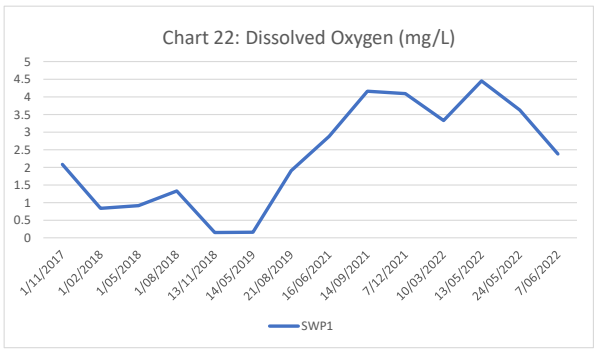
Charts 18-33: Onsite Surface Water Charts

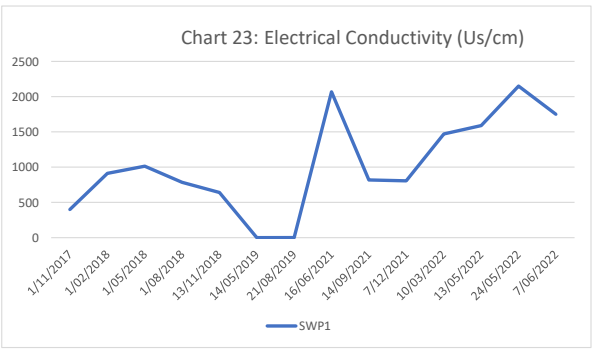


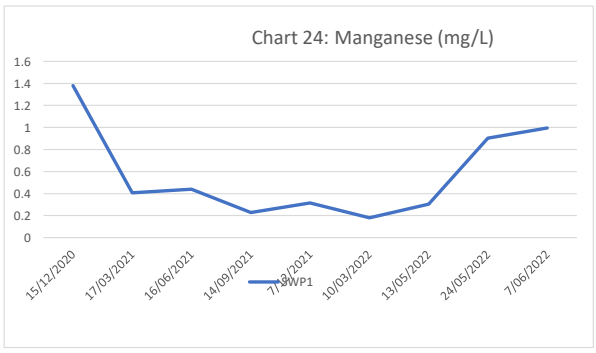


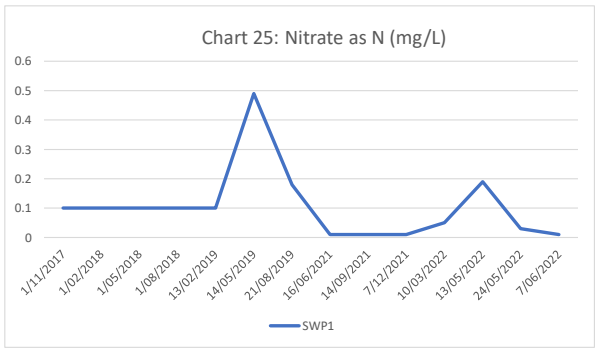












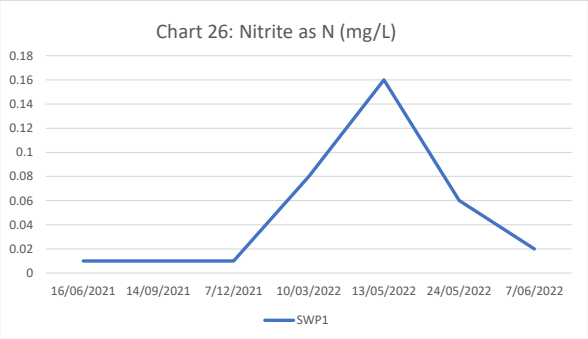


Chart 26: Nitrite as N (mg/L)
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
16/06/2021 14/09/2021 7/12/2021 10/03/2022 13/05/2022 24/05/2022 7/06/2022
SWP1

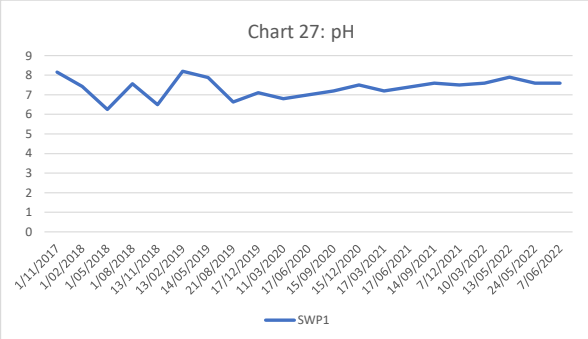


Chart 27: pH
9
8
7
6
5
4
3
2
1
0
1/11/2017 1/02/2018 1/05/2018 1/08/2018 13/11/2018 13/02/2019 14/05/2019 21/08/2019 17/12/2019 11/03/2020 17/06/2020 15/09/2020 15/12/2020 17/03/2021 17/06/2021 14/09/2021 7/12/2021 10/03/2022 13/05/2022 24/05/2022 7/06/2022
SWP1

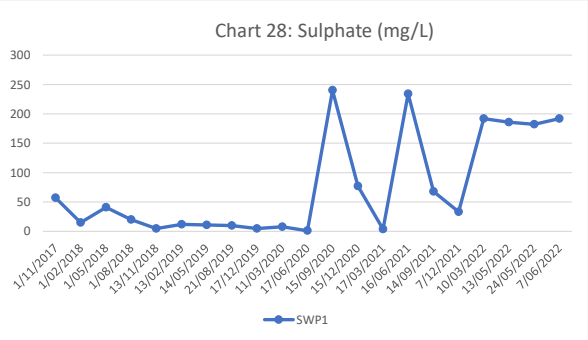


Chart 28: Sulphate (mg/L)
300
250
200
150
100
50
0
1/11/2017 1/02/2018 1/05/2018 1/08/2018 13/11/2018 13/02/2019 14/05/2019 21/08/2019 17/12/2019 11/03/2020 17/06/2020 15/09/2020 15/12/2020 17/03/2021 16/06/2021 14/09/2021 7/12/2021 10/03/2022 13/05/2022 24/05/2022 7/06/2022
SWP1

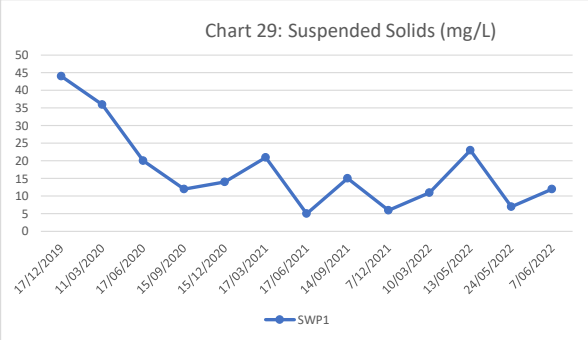


Chart 29: Suspended Solids (mg/L)
50
45
40
35
30
25
20
15
10
5
0
17/12/2019 11/03/2020 17/06/2020 15/09/2020 15/12/2020 17/03/2021 17/06/2021 14/09/2021 7/12/2021 10/03/2022 13/05/2022 24/05/2022 7/06/2022
SWP1

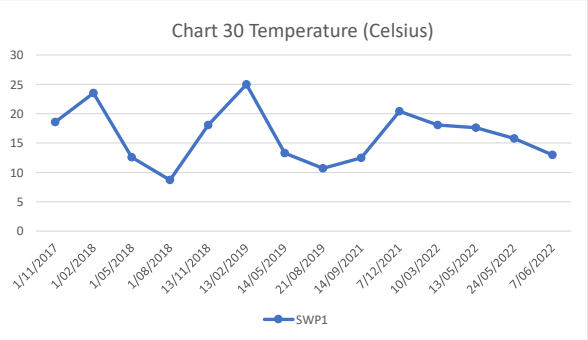


Chart 30 Temperature (Celsius)
30
25
20
15
10
5
0
1/11/2017 1/02/2018 1/05/2018 1/08/2018 13/11/2018 13/02/2019 14/05/2019 21/08/2019 14/09/2021 7/12/2021 10/03/2022 13/05/2022 24/05/2022 7/06/2022
SWP1

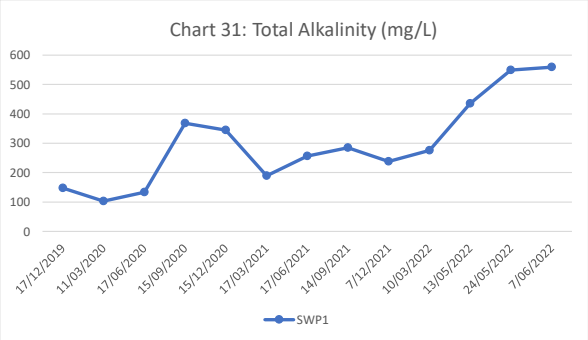


Chart 31: Total Alkalinity (mg/L)
600
500
400
300
200
100
0
17/12/2019 11/03/2020 17/06/2020 15/09/2020 15/12/2020 17/03/2021 17/06/2021 14/09/2021 7/12/2021 10/03/2022 13/05/2022 24/05/2022 7/06/2022
SWP1

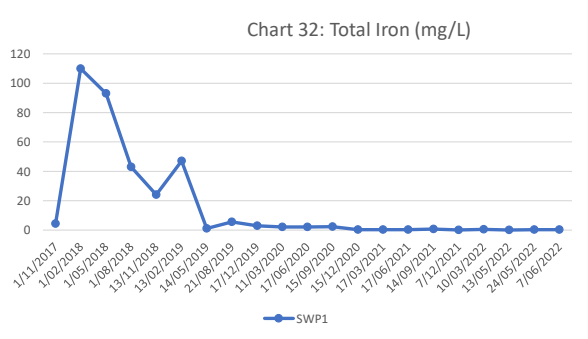


Chart 32: Total Iron (mg/L)
120
100
80
60
40
20
0
1/11/2017 1/02/2018 1/05/2018 1/08/2018 13/11/2018 13/02/2019 14/05/2019 21/08/2019 17/12/2019 11/03/2020 17/06/2020 15/09/2020 15/12/2020 17/03/2021 17/06/2021 14/09/2021 7/12/2021 10/03/2022 13/05/2022 24/05/2022 7/06/2022
SWP1

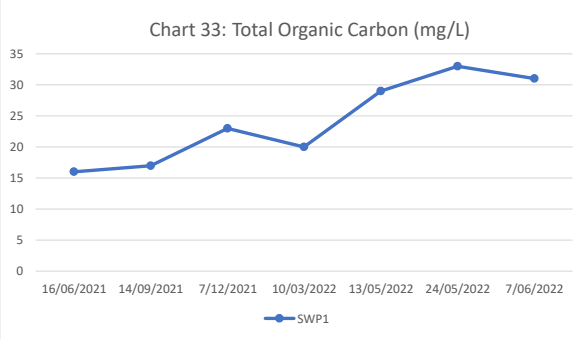
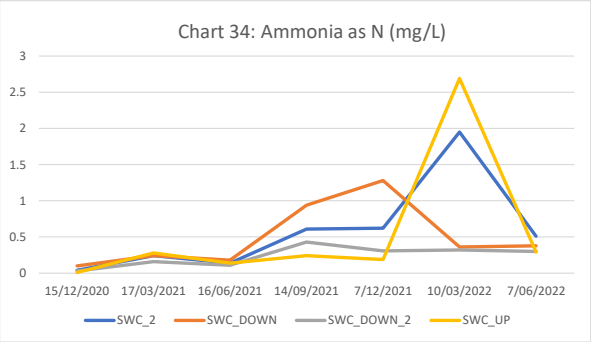
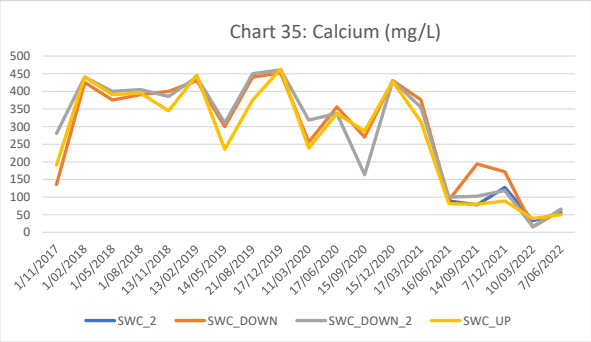
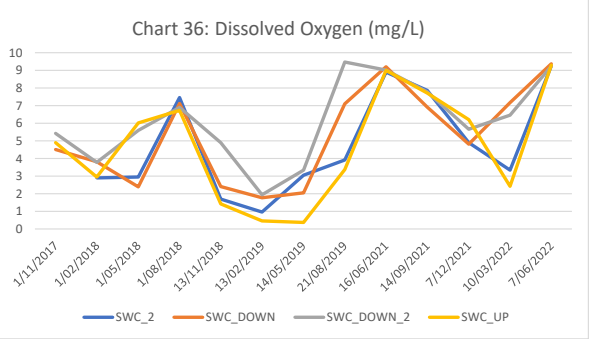


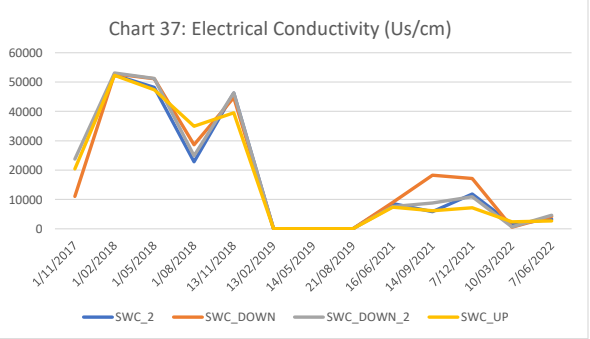
Chart 33: Total Organic Carbon (mg/L)
35
30
25
20
15
10
5
0
16/06/2021 14/09/2021 7/12/2021 10/03/2022 13/05/2022 24/05/2022 7/06/2022
SWP1

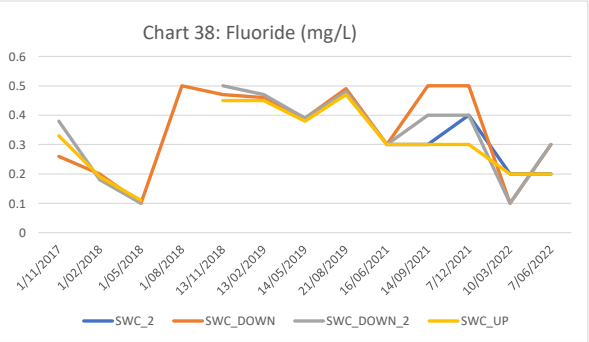
Charts 34-45: Rocklow Creek Surface Water Charts

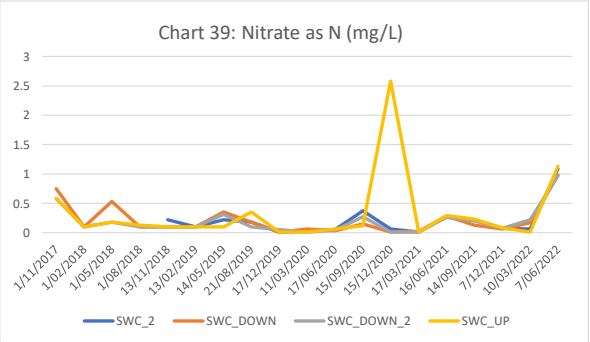


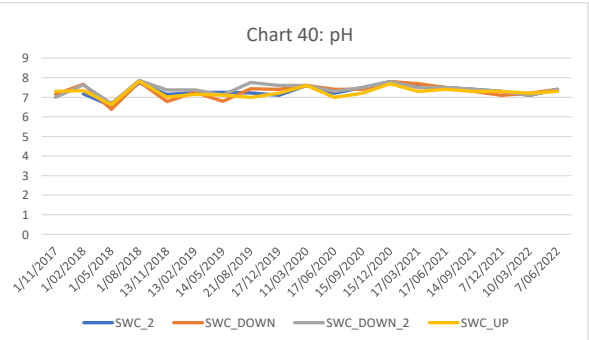


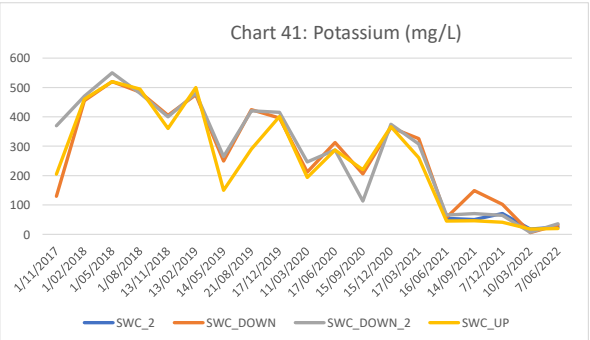












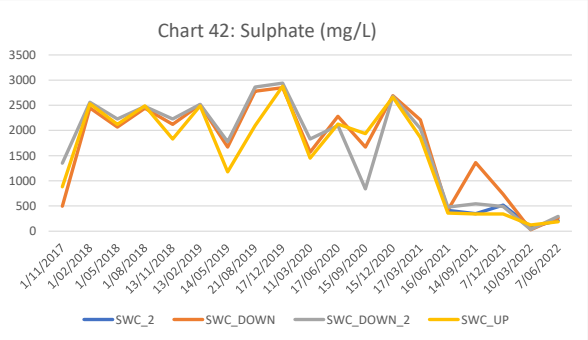


Chart 42: Sulphate (mg/L)
3500
3000
2500
2000
1500
1000
500
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
16/06/2021
14/09/2021
7/12/2021
10/03/2022
7/06/2022
SWC_2
SWC_DOWN
SWC_DOWN_2
SWC_UP

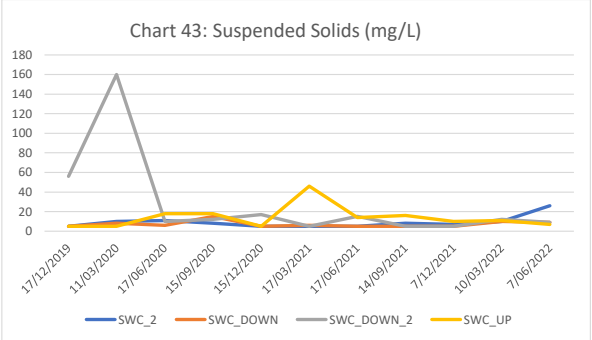


Chart 43: Suspended Solids (mg/L)
180
160
140
120
100
80
60
40
20
0
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
17/06/2021
14/09/2021
7/12/2021
10/03/2022
7/06/2022
SWC_2
SWC_DOWN
SWC_DOWN_2
SWC_UP

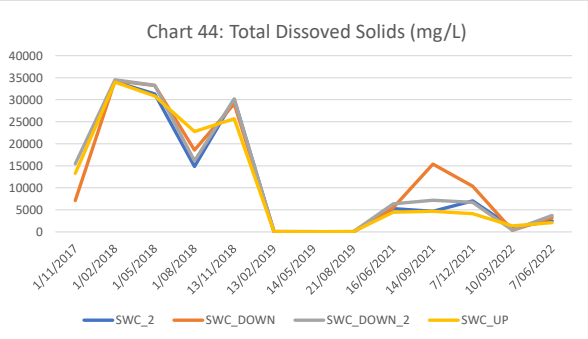


Chart 44: Total Dissoved Solids (mg/L)
40000
35000
30000
25000
20000
15000
10000
5000
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
16/06/2021
14/09/2021
7/12/2021
10/03/2022
7/06/2022
SWC_2
SWC_DOWN
SWC_DOWN_2
SWC_UP

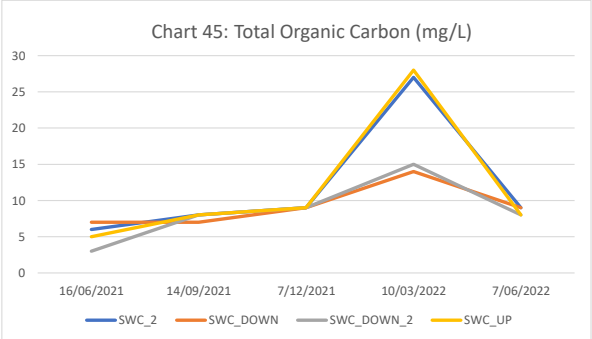
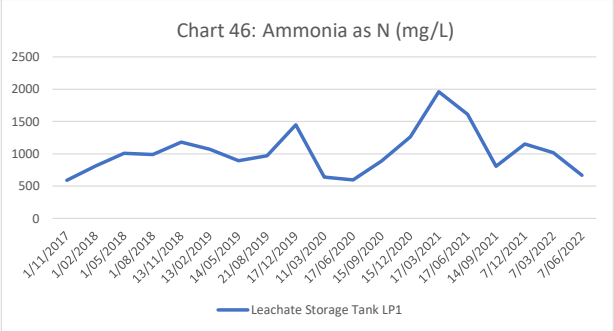
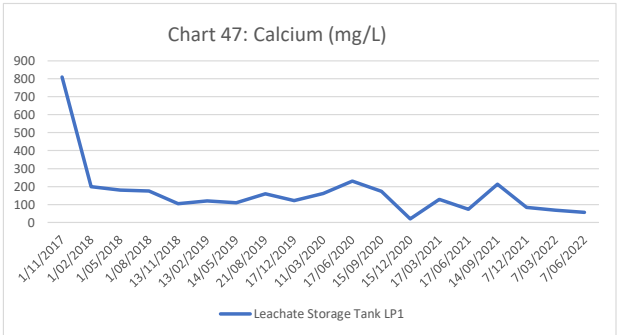
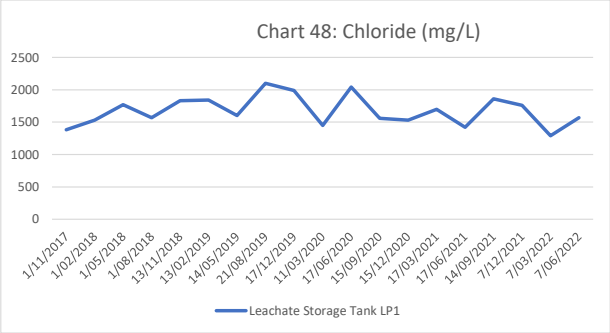


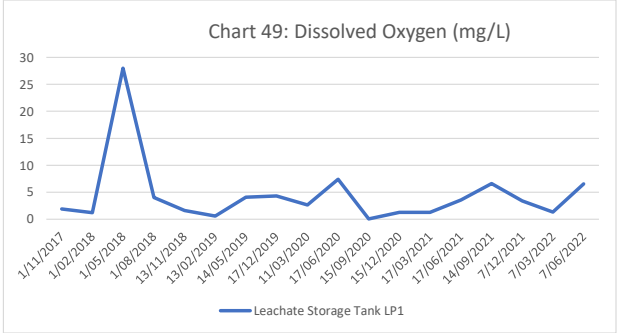
Chart 45: Total Organic Carbon (mg/L)
30
25
20
15
10
5
0
16/06/2021
14/09/2021
7/12/2021
10/03/2022
7/06/2022
SWC_2
SWC_DOWN
SWC_DOWN_2
SWC_UP

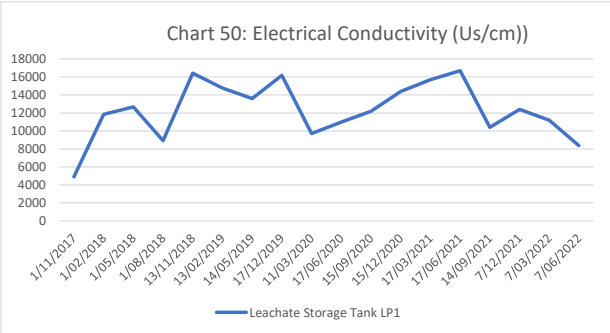
Charts 46-60 Leachate Water Quality Charts

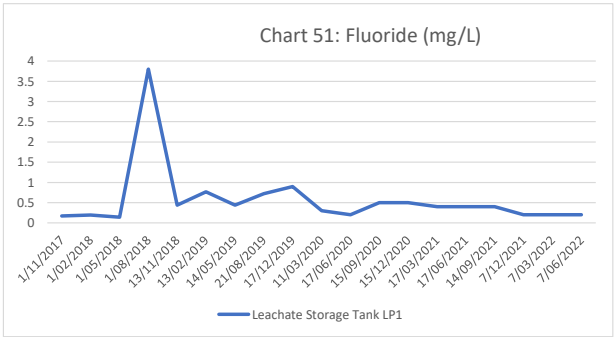


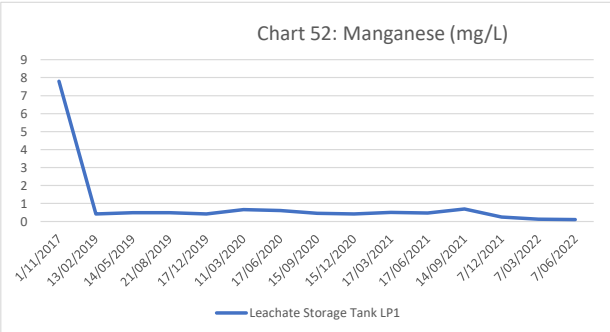


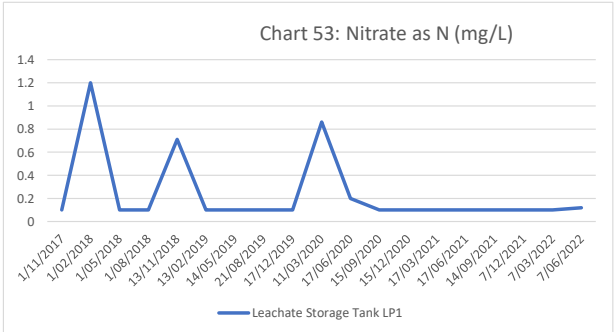












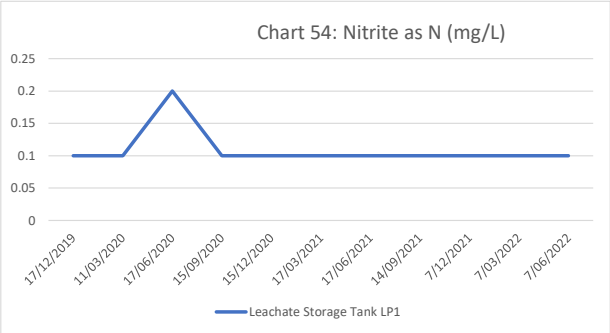


Chart 54: Nitrite as N (mg/L)
0.25
0.2
0.15
0.1
0.05
0
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
17/06/2021
14/09/2021
7/12/2021
7/03/2022
7/06/2022
Leachate Storage Tank LP1

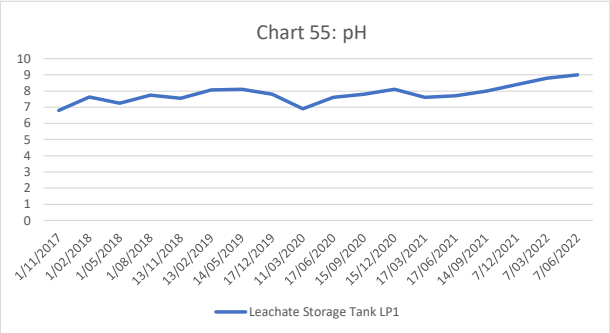


Chart 55: pH
10
9
8
7
6
5
4
3
2
1
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
17/06/2021
14/09/2021
7/12/2021
7/03/2022
7/06/2022
Leachate Storage Tank LP1

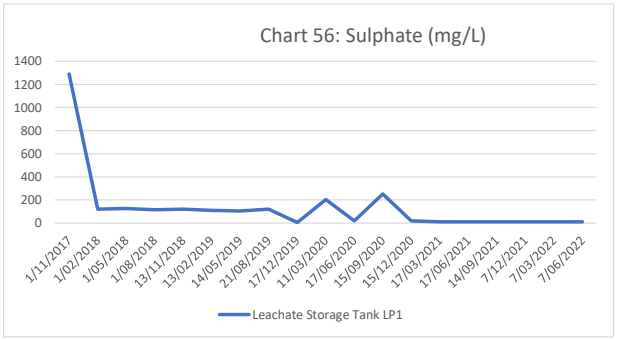


Chart 56: Sulphate (mg/L)
1400
1200
1000
800
600
400
200
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
17/06/2021
14/09/2021
7/12/2021
7/03/2022
7/06/2022
Leachate Storage Tank LP1

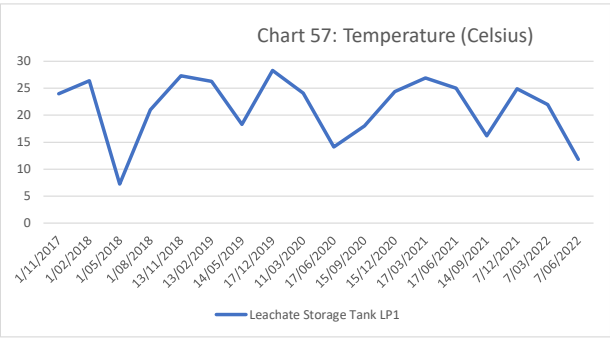


Chart 57: Temperature (Celsius)
30
25
20
15
10
5
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
17/06/2021
14/09/2021
7/12/2021
7/03/2022
7/06/2022
Leachate Storage Tank LP1

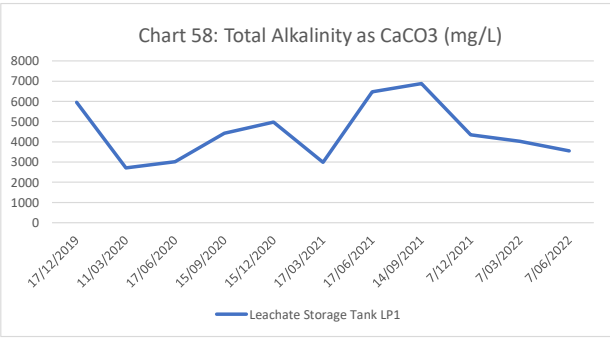


Chart 58: Total Alkalinity as CaCO3 (mg/L)
8000
7000
6000
5000
4000
3000
2000
1000
0
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
17/06/2021
14/09/2021
7/12/2021
7/03/2022
7/06/2022
Leachate Storage Tank LP1

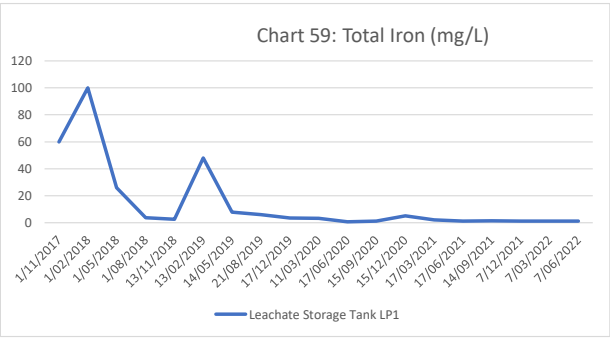


Chart 59: Total Iron (mg/L)
120
100
80
60
40
20
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
17/06/2021
14/09/2021
7/12/2021
7/03/2022
7/06/2022
Leachate Storage Tank LP1

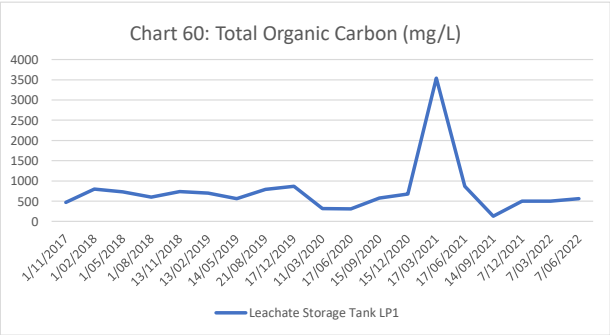


Chart 60: Total Organic Carbon (mg/L)
4000
3500
3000
2500
2000
1500
1000
500
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
17/06/2021
14/09/2021
7/12/2021
7/03/2022
7/06/2022
Leachate Storage Tank LP1

APPENDICES

Appendix A

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

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

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

Appendix B

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

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ Sydney: 277 Woodpark Rd, Smithfield NSW 2164 Ph: 02 8784 8555 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 9600 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 Desma Ct, Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsenviro.com
☐ Adelaide: 2-4 Burma Rd, Pooraka SA 5095 Ph: 08 8359 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 : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	41 Burelli St WOLLONGONG NSW 2500		
PROJECT:	Dunmore Quarterly Ground Waters EPL	ALS QUOTE NO.:	WO/030/19 TENDER
ORDER NUMBER:			
PROJECT MANAGER:	Joel Culton		
SAMPLER:	Robert Dalbo	SAMPLER MOBILE:	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	
Email Reports to :			
Email Invoice to :			

COC SEQUENCE NUMBER (Circle)

COC:	1	2	3	4	5	6	7
OF:	1	2	3	4	5	6	7

FOR LABORATORY USE ONLY (Circle)

Custody Seal intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt:	7.4 °C		
Other comment:			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Robert Dalbo	Anele		
DATE/TIME: 8/6/22. 8.6.22	DATE/TIME: 8/6/22.	DATE/TIME:	DATE/TIME:

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, Fl) Filtered Ca, K	TOC	Dissolved Fe & Mn	NT-4 (NO2, NO3)	Send to Eurofins			Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	BH1C	8.6.22 8:43	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
2	BH3	13:55	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
3	BH4	13:05	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
4	BH9	9:10	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
5	BH12R	11:35	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
6	BH13	12:00	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
7	BH14	12:25	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
8	BH15	11:05	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
9	BH19R	13:30	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
10	BH18	9:55	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
11	BH21	10:35	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
12	BH22	8:15	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
13	Duplicate	9:55	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
14	Triplicate	9:55	W								✓			Send to Eurofins.

Environmental Division Wollongong
Work Order Reference
EW2202630

Telephone : 02 42253125

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = 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; AB = Airfreight Unpreserved Bag; AS = Amber Glass Sulfuric Preserved; 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.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2202630**	Page	: 1 of 8
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Quarterly Groundwaters EPL	Date Samples Received	: 08-Jun-2022 15:12
Order number	: 138956	Date Analysis Commenced	: 08-Jun-2022
C-O-C number	: ----	Issue Date	: 27-Jun-2022 16:43
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER GROUNDWATERS		
No. of samples received	: 14		
No. of samples analysed	: 13		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Aneta Prosaroski	Client Liaison Officer	Laboratory - Wollongong, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- EK057G: LOR raised for Nitrite due to sample matrix
- EK059G: LOR raised for NOx due to sample matrix.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- Sampling and groundwater depth measurements completed by ALS Wollongong via inhouse sampling method EN/67.11 Groundwater Sampling Via Bailer and High Flow Methods.
- Temperature performed by ALS Wollongong via in-house method EA116 and EN67 PK.
- Sample collection of Ground Waters by in-house EN67 where the “surface layer of the aquifer was sampled”.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	BH1C	BH3	BH4	BH9	BH12R
			Sampling date / time	08-Jun-2022 08:43	08-Jun-2022 13:55	08-Jun-2022 13:05	08-Jun-2022 09:10	08-Jun-2022 11:35
Compound	CAS Number	LOR	Unit	EW2202630-001	EW2202630-002	EW2202630-003	EW2202630-004	EW2202630-005
				Result	Result	Result	Result	Result
EA005FD: Field pH								
pH	----	0.1	pH Unit	6.7	7.0	7.0	6.7	6.6
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	7350	1130	1480	4270	2110
EA116: Temperature								
Temperature	----	0.5	°C	24.9	17.4	18.7	17.9	20.8
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	2800	293	390	1380	533
Total Alkalinity as CaCO3	----	1	mg/L	2800	293	390	1380	533
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	164	172	239	226
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	831	65	142	515	242
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	128	114	141	161	131
Potassium	7440-09-7	1	mg/L	200	41	18	60	36
EG020F: Dissolved Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	0.094	0.006	0.144	0.359	0.488
Iron	7439-89-6	0.05	mg/L	8.53	<0.05	3.88	4.59	4.04
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.4	0.1	0.1	0.4	0.2
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	302	0.29	3.65	64.8	3.25
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	0.02	0.04	<0.01	<0.01	0.04
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.10	11.0	0.16	0.02	0.69
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.10	11.0	0.16	0.02	0.73
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	176	16	15	57	24

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	BH1C	BH3	BH4	BH9	BH12R
			Sampling date / time	08-Jun-2022 08:43	08-Jun-2022 13:55	08-Jun-2022 13:05	08-Jun-2022 09:10	08-Jun-2022 11:35
Compound	*CAS Number*	*LOR*	*Unit*	**EW2202630-001**	**EW2202630-002**	**EW2202630-003**	**EW2202630-004**	**EW2202630-005**
				Result	Result	Result	Result	Result
QWI-EN 67.11 Sampling of Groundwaters								
Standing Water Level	----	0.01	m AHD	**2.78**	**2.74**	**3.94**	**2.69**	**3.98**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	BH13	BH14	BH15	BH19R	BH18
				Sampling date / time	08-Jun-2022 12:00	08-Jun-2022 12:25	08-Jun-2022 11:05	08-Jun-2022 13:30	08-Jun-2022 09:55
					EW2202630-006	EW2202630-007	EW2202630-008	EW2202630-009	EW2202630-010
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		**6.6**	**6.4**	**6.8**	**7.2**	**6.5**
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		**1510**	**1210**	**4490**	**1020**	**808**
EA116: Temperature									
Temperature	----	0.5	°C		**21.2**	**20.6**	**16.2**	**18.6**	**19.9**
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**547**	**309**	**384**	**284**	**349**
Total Alkalinity as CaCO3	----	1	mg/L		**547**	**309**	**384**	**284**	**349**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**97**	**84**	**1270**	**97**	<1
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**105**	**93**	**499**	**80**	**41**
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**155**	**93**	**155**	**89**	**83**
Potassium	7440-09-7	1	mg/L		**10**	**21**	**203**	**23**	**9**
EG020F: Dissolved Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		**0.175**	**0.094**	**0.552**	**0.074**	**0.119**
Iron	7439-89-6	0.05	mg/L		**1.39**	**0.06**	**20.6**	**0.88**	**1.10**
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.2**	**0.5**	**0.2**	**0.2**	**0.2**
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**1.37**	**0.51**	**13.2**	**2.32**	**0.56**
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	**0.74**	<0.10	**0.02**	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**0.26**	**20.1**	<0.10	<0.01	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**0.26**	**20.8**	<0.10	**0.02**	<0.01
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**17**	**39**	**46**	**22**	**15**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)				Sample ID	BH13	BH14	BH15	BH19R	BH18
				Sampling date / time	08-Jun-2022 12:00	08-Jun-2022 12:25	08-Jun-2022 11:05	08-Jun-2022 13:30	08-Jun-2022 09:55
Compound	*CAS Number*	*LOR*	*Unit*		**EW2202630-006**	**EW2202630-007**	**EW2202630-008**	**EW2202630-009**	**EW2202630-010**
					Result	Result	Result	Result	Result
QWI-EN 67.11 Sampling of Groundwaters									
Standing Water Level	----	0.01	m AHD		**3.84**	**4.18**	**0.47**	**4.31**	**1.80**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	BH21	BH22	Duplicate	----	----
			Sampling date / time	08-Jun-2022 10:35	08-Jun-2022 08:15	08-Jun-2022 09:55	----	----
Compound	CAS Number	LOR	Unit	EW2202630-011	EW2202630-012	EW2202630-013	--------	--------
				Result	Result	Result	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	7.0	6.8	6.5	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	2500	2130	808	----	----
EA116: Temperature								
Temperature	----	0.5	°C	21.4	18.8	19.9	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	568	688	348	----	----
Total Alkalinity as CaCO3	----	1	mg/L	568	688	348	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	297	102	<1	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	308	224	41	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	112	150	84	----	----
Potassium	7440-09-7	1	mg/L	16	22	9	----	----
EG020F: Dissolved Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	0.408	0.122	0.120	----	----
Iron	7439-89-6	0.05	mg/L	0.31	0.34	1.10	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.4	0.2	0.2	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	4.15	6.77	0.59	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	<0.01	<0.01	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	<0.01	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	27	52	15	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	BH21	BH22	Duplicate	----	----
			Sampling date / time	08-Jun-2022 10:35	08-Jun-2022 08:15	08-Jun-2022 09:55	----	----
Compound	CAS Number	LOR	Unit	EW2202630-011	EW2202630-012	EW2202630-013	--------	--------
				Result	Result	Result	----	----
QWI-EN 67.11 Sampling of Groundwaters								
Standing Water Level	----	0.01	m AHD	**2.72**	**2.41**	**1.80**	**----**	**----**

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

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EW2202630**	Page	: 1 of 6
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Quarterly Groundwaters EPL	Date Samples Received	: 08-Jun-2022
Order number	: 138956	Date Analysis Commenced	: 08-Jun-2022
C-O-C number	: ----	Issue Date	: 27-Jun-2022
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER GROUNDWATERS		
No. of samples received	: 14		
No. of samples analysed	: 13		

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

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Aneta Prosaroski	Client Liaison Officer	Laboratory - Wollongong, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 4390077)									
EW2202630-007	BH14	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	309	306	0.8	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	309	306	0.8	0% - 20%
ES2220262-003	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	39	38	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	39	38	0.0	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 4389018)									
ES2220036-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	45	44	0.0	0% - 20%
EW2202630-003	BH4	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	172	172	0.0	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 4389014)									
EW2202630-002	BH3	ED045G: Chloride	16887-00-6	1	mg/L	65	65	0.0	0% - 20%
ES2219900-016	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	27	27	0.0	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 4389022)									
EW2202630-013	Duplicate	ED045G: Chloride	16887-00-6	1	mg/L	41	41	0.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 4398766)									
ES2220207-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	3	3	0.0	No Limit
		ED093F: Potassium	7440-09-7	1	mg/L	3	3	0.0	No Limit
ES2220207-011	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	10	10	0.0	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	5	5	0.0	No Limit
ED093F: Dissolved Major Cations (QC Lot: 4398768)									
EW2202630-009	BH19R	ED093F: Calcium	7440-70-2	1	mg/L	89	89	0.0	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED093F: Dissolved Major Cations (QC Lot: 4398768) - continued									
EW2202630-009	BH19R	ED093F: Potassium	7440-09-7	1	mg/L	23	23	0.0	0% - 20%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4398765)									
ES2220207-001	Anonymous	EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.073	0.074	0.0	0% - 20%
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.87	0.89	2.5	0% - 50%
ES2220207-011	Anonymous	EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.081	0.082	1.7	0% - 20%
		EG020A-F: Iron	7439-89-6	0.05	mg/L	1.33	1.34	0.8	0% - 20%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4398767)									
EW2202660-005	Anonymous	EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.069	0.067	1.9	0% - 20%
		EG020A-F: Iron	7439-89-6	0.05	mg/L	4.95	4.84	2.3	0% - 20%
EW2202630-009	BH19R	EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.074	0.075	0.0	0% - 20%
		EG020A-F: Iron	7439-89-6	0.05	mg/L	0.88	0.90	1.7	0% - 50%
EK040P: Fluoride by PC Titrator (QC Lot: 4390078)									
EW2202630-007	BH14	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.5	0.5	0.0	No Limit
ES2220262-003	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.1	0.1	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 4401354)									
ES2220678-004	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.47	0.48	3.2	No Limit
ES2220678-010	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.02	0.02	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 4401356)									
EW2202630-010	BH18	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.56	0.55	2.0	0% - 20%
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 4389020)									
ES2220096-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2220183-005	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 4389021)									
EW2202630-012	BH22	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EW2202630-003	BH4	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4401355)									
EW2202630-005	BH12R	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.73	0.73	0.0	0% - 20%
ES2220678-010	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.03	0.01	78.4	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 4391635)									
ES2220344-007	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	4	4	0.0	No Limit
ES2220347-009	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	8	8	0.0	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 4391636)									
EW2202630-002	BH3	EP005: Total Organic Carbon	----	1	mg/L	16	14	12.6	0% - 50%
EW2202630-012	BH22	EP005: Total Organic Carbon	----	1	mg/L	52	53	0.0	0% - 20%

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
ED037P: Alkalinity by PC Titrator (QCLot: 4390077)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	98.8	81.0	111
				----	50 mg/L	118	80.0	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4389018)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	98.2	82.0	122
				<1	500 mg/L	100	82.0	122
ED045G: Chloride by Discrete Analyser (QCLot: 4389014)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	50 mg/L	96.1	80.9	127
				<1	1000 mg/L	94.8	80.9	127
ED045G: Chloride by Discrete Analyser (QCLot: 4389022)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	50 mg/L	110	80.9	127
				<1	1000 mg/L	94.8	80.9	127
ED093F: Dissolved Major Cations (QCLot: 4398766)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	92.6	80.0	114
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	93.6	85.0	113
ED093F: Dissolved Major Cations (QCLot: 4398768)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	92.2	80.0	114
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	92.2	85.0	113
EG020F: Dissolved Metals by ICP-MS (QCLot: 4398765)								
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	83.0	82.0	110
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	109	82.0	112
EG020F: Dissolved Metals by ICP-MS (QCLot: 4398767)								
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	83.4	82.0	110
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	108	82.0	112
EK040P: Fluoride by PC Titrator (QCLot: 4390078)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	102	82.0	116
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4401354)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	100	90.0	114
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4401356)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	96.7	90.0	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4389020)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	101	82.0	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4389021)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	103	82.0	114

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4401355)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	106	91.0	113
EP005: Total Organic Carbon (TOC) (QCLot: 4391635)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	94.2	72.0	120
EP005: Total Organic Carbon (TOC) (QCLot: 4391636)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	94.3	72.0	120

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4389018)							
ES2220036-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 4389014)							
ES2219900-016	Anonymous	ED045G: Chloride	16887-00-6	50 mg/L	120	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 4389022)							
EW2202630-013	Duplicate	ED045G: Chloride	16887-00-6	50 mg/L	120	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 4398765)							
ES2220207-002	Anonymous	EG020A-F: Manganese	7439-96-5	1 mg/L	81.6	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 4398767)							
EW2202630-008	BH15	EG020A-F: Manganese	7439-96-5	1 mg/L	81.9	70.0	130
EK040P: Fluoride by PC Titrator (QCLot: 4390078)							
EW2202630-001	BH1C	EK040P: Fluoride	16984-48-8	5 mg/L	111	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4401354)							
ES2220678-004	Anonymous	EK055G: Ammonia as N	7664-41-7	10 mg/L	83.6	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4401356)							
EW2202630-010	BH18	EK055G: Ammonia as N	7664-41-7	1 mg/L	89.7	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4389020)							
ES2220096-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	99.5	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4389021)							
EW2202630-003	BH4	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	94.3	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4401355)							

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4401355) - continued							
ES2220678-010	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	102	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 4391635)							
ES2220344-010	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	120	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 4391636)							
EW2202630-003	BH4	EP005: Total Organic Carbon	----	100 mg/L	123	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EW2202630**	Page	: 1 of 8
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Telephone	: +61 2 4225 3125
Project	: Dunmore Quarterly Groundwaters EPL	Date Samples Received	: 08-Jun-2022
Site	: DUNMORE LANDFILL TENDER	Issue Date	: 27-Jun-2022
Sampler	: Robert DaLio	No. of samples received	: 14
Order number	: 138956	No. of samples analysed	: 13

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	ES2220036--001	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005FD: Field pH							
Field Test Dummy Bottle (EN67 PK)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22, Duplicate	**08-Jun-2022**	**----**	----	----	**08-Jun-2022**	----	----
EA010FD: Field Conductivity							
Field Test Dummy Bottle (EN67 PK)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22, Duplicate	**08-Jun-2022**	**----**	----	----	**08-Jun-2022**	----	----

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA116: Temperature							
Field Test Dummy Bottle (EN67 PK)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22, Duplicate	**08-Jun-2022**	**----**	----	----	**08-Jun-2022**	----	----
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22, Duplicate	**08-Jun-2022**	**----**	----	----	**09-Jun-2022**	22-Jun-2022	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22, Duplicate	**08-Jun-2022**	**----**	----	----	**09-Jun-2022**	06-Jul-2022	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22, Duplicate	**08-Jun-2022**	**----**	----	----	**09-Jun-2022**	06-Jul-2022	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22, Duplicate	**08-Jun-2022**	**----**	----	----	**15-Jun-2022**	06-Jul-2022	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22, Duplicate	**08-Jun-2022**	**----**	----	----	**15-Jun-2022**	05-Dec-2022	✓
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural (EK040P)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22, Duplicate	**08-Jun-2022**	**----**	----	----	**09-Jun-2022**	06-Jul-2022	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22, Duplicate	**08-Jun-2022**	**----**	----	----	**15-Jun-2022**	06-Jul-2022	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22, Duplicate	**08-Jun-2022**	**----**	----	----	**09-Jun-2022**	10-Jun-2022	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22, Duplicate	**08-Jun-2022**	**----**	----	----	**15-Jun-2022**	06-Jul-2022	✓
EP005: Total Organic Carbon (TOC)							
Amber TOC Vial - Sulfuric Acid (EP005)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22, Duplicate	**08-Jun-2022**	**----**	----	----	**10-Jun-2022**	06-Jul-2022	✓
QWI-EN 67.11 Sampling of Groundwaters							
Field Test Dummy Bottle (EN67 PK)							
BH1C, BH3, BH4, BH9, BH12R, BH13, BH14, BH15, BH19R, BH18, BH21, BH22, Duplicate	**08-Jun-2022**	**----**	----	----	**08-Jun-2022**	----	----

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by Auto Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	3	24	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	3	21	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	4	39	**10.26**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	3	26	**11.54**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	4	31	**12.90**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	4	32	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by Auto Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	2	24	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	4	21	**19.05**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	26	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	31	**6.45**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	2	24	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	21	**9.52**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	26	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	31	**6.45**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	2	24	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	21	**9.52**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Matrix Spikes (MS) - Continued							
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	31	**6.45**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	32	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Alkalinity by Auto Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm.
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Fluoride by Auto Titrator	EK040P	WATER	In house: Referenced to APHA 4500-F C: CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Field Tests - Port Kembla	EN67 PK	WATER	Field determinations as per methods described in APHA. The analysis is performed in the field by ALS samplers. ALS NATA accreditation apply for this service.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)

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 Desma Ct, Bohle QLD 4818 Ph:07 4796 0600 E:townsville.environmental@alsenviro.com
☐ **Melbourne:** 2-4 Westall Rd, Springvale VIC 3171 Ph:03 8549 9600 E: samples.melbourne@alsenviro.com
☐ **Adelaide:** 2-4 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 2138 E: launceston@alsenviro.com

CLIENT:	Shellharbour City Council	**TURNAROUND REQUIREMENTS :** (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT **(List due date):** ☐ Non Standard or urgent TAT **(List due date):**
OFFICE:	41 Burelli St WOLLONGONG NSW 2500		
PROJECT:	Dunmore Quarterly Surface Waters EPL	**ALS QUOTE NO.:** WO/030/19 TENDER	
ORDER NUMBER:			
PROJECT MANAGER:	Joel Culton		
SAMPLER:	Robert Dalvio	**SAMPLER MOBILE:**	
COC emailed to ALS? (YES / NO)		**EDD FORMAT (or default):**	
Email Reports to :			
Email Invoice to :			

COC SEQUENCE NUMBER (Circle)

COC:	1	2	3	4	5	6	7
OF:	1	2	3	4	5	6	7

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt	6.2 °C		
Other comment:			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Robert Dalvio	Michael Santos		
DATE/TIME: 7.6.22 13:05	DATE/TIME: 7.6.22 13:05	DATE/TIME:	DATE/TIME:

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

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where **Metals** are required, specify **Total** (unfiltered bottle required) or **Dissolved** (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL BOTTLES	TSS	NT-1, NT-2A (Ionic Balance)	TOC, NT-4, NH3, Total Mn	Dissolved and Total Fe	Turbidity	NH3, NH4 & NO3	TSS, TDS, TOC, Total Mn		Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	SWP1	7.6.22 10:05	W			✓	✓	✓	✓					Field Tests - pH, EC, DO & Temp
	SWC_2	9:05	W				✓		✓	✓	✓	✓		Field Tests - pH, EC, DO & Temp
	SWC_UP	8:05	W				✓		✓	✓	✓	✓		Field Tests - pH, EC, DO & Temp
	SWC_DOWN	8:15	W				✓		✓	✓	✓	✓		Field Tests - pH, EC, DO & Temp
	SWC_DOWN_2	8:25	W				✓		✓	✓	✓	✓		Field Tests - pH, EC, DO & Temp
	Duplicate	9:05	W				✓		✓	✓	✓	✓		Field Tests - pH, EC, DO & Temp
				TOTAL	10									

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfrei
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 Speci
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

e Preserved Glass;

Environmental Division
Wollongong
Work Order Reference
EW2202596

Telephone : 02 42253125

ENFM204

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2202596**	Page	: 1 of 7
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Quarterly Surface Water EPL	Date Samples Received	: 07-Jun-2022 13:41
Order number	: 138956	Date Analysis Commenced	: 07-Jun-2022
C-O-C number	: ----	Issue Date	: 17-Jun-2022 19:26
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER SURFACE WATER		
No. of samples received	: 6		
No. of samples analysed	: 6		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Aneta Prosaroski	Client Liaison Officer	Laboratory - Wollongong, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/67.6 Rivers and Streams.
- Temperature performed by ALS Wollongong via in-house method EA116 and EN67 PK.
- Dissolved oxygen (DO) performed by ALS Wollongong via in-house method EA025FD and EN67 PK.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.
- 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**)

Compound	CAS Number	LOR	Unit	Sample ID	SWP1 Point 1	SWC_2 Point 19	SWC_UP Point 20	SWC_Down Point 21	SWC_DOWN_2 Point 22
				Sampling date / time	07-Jun-2022 10:05	07-Jun-2022 09:05	07-Jun-2022 08:05	07-Jun-2022 08:15	07-Jun-2022 08:25
					EW2202596-001	EW2202596-002	EW2202596-003	EW2202596-004	EW2202596-005
					Result	Result	Result	Result	Result
EA005FD: Field pH									
pH	----	0.1	pH Unit		**7.6**	**7.4**	**7.3**	**7.4**	**7.4**
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		**1750**	**3280**	**2740**	**4170**	**4670**
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**----**	**2520**	**2100**	**3240**	**3730**
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		**12**	**26**	**7**	**9**	**9**
EA045: Turbidity									
Turbidity	----	0.1	NTU		**4.3**	**23.7**	**14.9**	**14.0**	**12.7**
EA116: Temperature									
Temperature	----	0.5	°C		**13.0**	**10.9**	**10.8**	**10.6**	**10.3**
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**559**	**134**	**124**	**123**	**124**
Total Alkalinity as CaCO3	----	1	mg/L		**559**	**134**	**124**	**123**	**124**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		**192**	**212**	**188**	**265**	**296**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		**277**	**1150**	**971**	**1550**	**1810**
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**79**	**55**	**50**	**62**	**66**
Magnesium	7439-95-4	1	mg/L		**49**	**82**	**70**	**105**	**117**
Sodium	7440-23-5	1	mg/L		**264**	**630**	**526**	**822**	**936**
Potassium	7440-09-7	1	mg/L		**19**	**25**	**20**	**32**	**36**
EG020F: Dissolved Metals by ICP-MS									
Iron	7439-89-6	0.05	mg/L		**0.10**	**0.08**	**0.06**	**0.05**	**0.05**
EG020T: Total Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		**0.994**	**0.100**	**0.090**	**0.074**	**0.071**
Iron	7439-89-6	0.05	mg/L		**0.31**	**2.09**	**1.22**	**1.00**	**0.97**
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		**0.5**	**0.2**	**0.2**	**0.3**	**0.3**

Analytical Results

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

Compound	CAS Number	LOR	Unit	Sample ID	SWP1 Point 1	SWC_2 Point 19	SWC_UP Point 20	SWC_Down Point 21	SWC_DOWN_2 Point 22
				Sampling date / time	07-Jun-2022 10:05	07-Jun-2022 09:05	07-Jun-2022 08:05	07-Jun-2022 08:15	07-Jun-2022 08:25
					EW2202596-001	EW2202596-002	EW2202596-003	EW2202596-004	EW2202596-005
					Result	Result	Result	Result	Result
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**20.8**	**0.51**	**0.29**	**0.38**	**0.30**
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	0.01	mg/L		**20.6**	**0.51**	**0.29**	**0.38**	**0.30**
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		**0.02**	**0.02**	**0.02**	**0.02**	**0.02**
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	**1.09**	**1.13**	**0.98**	**0.97**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**0.02**	**1.11**	**1.15**	**1.00**	**0.99**
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**23.0**	**39.5**	**33.8**	**51.7**	**59.7**
ø Total Cations	----	0.01	meq/L		**19.9**	**37.5**	**31.6**	**48.3**	**54.6**
ø Ionic Balance	----	0.01	%		**7.07**	**2.59**	**3.26**	**3.39**	**4.50**
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**31**	**9**	**8**	**9**	**8**
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		**2.38**	**9.25**	**9.29**	**9.37**	**9.24**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	Duplicate	----	----	----	----
			Sampling date / time	07-Jun-2022 09:05	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2202596-006	--------	--------	--------	--------
				Result	----	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	**7.4**	----	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	**3230**	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**2550**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**8**	----	----	----	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	**14.3**	----	----	----	----
EA116: Temperature								
Temperature	----	0.5	°C	**10.9**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**134**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**134**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**207**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**1150**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**56**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**82**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**615**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**25**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	**0.06**	----	----	----	----
EG020T: Total Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	**0.088**	----	----	----	----
Iron	7439-89-6	0.05	mg/L	**1.13**	----	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.2**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Duplicate	----	----	----	----
				Sampling date / time	07-Jun-2022 09:05	----	----	----	----
Compound	CAS Number	LOR	Unit		EW2202596-006	--------	--------	--------	--------
					Result	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**0.44**	----	----	----	----
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	0.01	mg/L		**0.44**	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		**0.02**	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**1.10**	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**1.12**	----	----	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**39.4**	----	----	----	----
ø Total Cations	----	0.01	meq/L		**36.9**	----	----	----	----
ø Ionic Balance	----	0.01	%		**3.26**	----	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**7**	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		**9.14**	----	----	----	----

Inter-Laboratory Testing

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

(WATER) EA045: Turbidity

(WATER) EP005: Total Organic Carbon (TOC)

(WATER) EG020F: Dissolved Metals by ICP-MS

(WATER) EG020T: Total Metals by ICP-MS

(WATER) EK057G: Nitrite as N by Discrete Analyser

(WATER) EK058G: Nitrate as N by Discrete Analyser

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

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

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

(WATER) EK055G: Ammonia as N by Discrete Analyser

(WATER) EN055: Ionic Balance

(WATER) ED045G: Chloride by Discrete Analyser

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

(WATER) EK040P: Fluoride by PC Titrator

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) ED093F: Dissolved Major Cations

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

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EW2202596**	Page	: 1 of 7
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Quarterly Surface Water EPL	Date Samples Received	: 07-Jun-2022
Order number	: 138956	Date Analysis Commenced	: 07-Jun-2022
C-O-C number	: ----	Issue Date	: 17-Jun-2022
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER SURFACE WATER		
No. of samples received	: 6		
No. of samples analysed	: 6		

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

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Aneta Prosaroski	Client Liaison Officer	Laboratory - Wollongong, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 4394315)									
ES2220296-008	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	502	505	0.7	0% - 20%
EW2202596-002	SWC_2 Point 19	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	2520	2480	1.4	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 4394311)									
ES2220076-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	34	25	28.8	No Limit
ES2220447-022	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	24	30	20.4	No Limit
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 4394314)									
ES2220296-008	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	15	10	44.0	No Limit
EW2202596-002	SWC_2 Point 19	EA025H: Suspended Solids (SS)	----	5	mg/L	26	26	0.0	No Limit
EA045: Turbidity (QC Lot: 4390246)									
EW2202595-002	Anonymous	EA045: Turbidity	----	0.1	NTU	6.1	6.1	0.0	0% - 20%
EW2202634-001	Anonymous	EA045: Turbidity	----	0.1	NTU	0.4	0.4	0.0	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 4387313)									
ES2219986-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	198	200	1.3	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	198	200	1.3	0% - 20%
ES2219992-003	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	401	404	0.7	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	401	404	0.7	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 4387315)									
EW2202596-004	SWC_Down Point 21	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED037P: Alkalinity by PC Titrator (QC Lot: 4387315) - continued									
EW2202596-004	SWC_Down Point 21	ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	123	125	1.7	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	123	125	1.7	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 4388023)									
ES2220103-009	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	34	33	0.0	0% - 20%
ME2200925-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	91	92	0.0	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 4388021)									
ES2219986-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	72	71	0.0	0% - 20%
ME2200925-002	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	109	110	0.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 4396305)									
EW2202595-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	117	119	1.3	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	43	43	0.0	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	195	196	0.7	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	35	35	0.0	0% - 20%
EW2202670-004	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	<1	<1	0.0	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	2	2	0.0	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	19	19	0.0	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	1	1	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4396304)									
EW2202595-001	Anonymous	EG020A-F: Iron	7439-89-6	0.05	mg/L	0.08	0.08	0.0	No Limit
EW2202670-004	Anonymous	EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 4398835)									
EW2202596-002	SWC_2 Point 19	EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.100	0.098	2.8	0% - 20%
		EG020A-T: Iron	7439-89-6	0.05	mg/L	2.09	2.01	4.0	0% - 20%
ES2220562-001	Anonymous	EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.180	0.178	1.1	0% - 20%
		EG020A-T: Iron	7439-89-6	0.05	mg/L	1.63	1.60	1.9	0% - 20%
EK040P: Fluoride by PC Titrator (QC Lot: 4387314)									
ME2200925-001	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	1.3	1.4	0.0	0% - 50%
EW2202596-004	SWC_Down Point 21	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.3	0.3	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 4399341)									
ES2220141-005	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.48	0.49	0.0	0% - 20%
ES2220191-034	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	0.03	111	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 4388022)									
ES2220065-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	0.01	0.01	0.0	No Limit
ES2220103-009	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4399340)									
ES2220141-005	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.01	<0.01	0.0	No Limit
ES2220191-034	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4399342)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4399342) - continued									
EW2202646-005	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.01	0.01	0.0	No Limit
EW2202598-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.12	0.11	0.0	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 4388801)									
ES2220074-009	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	2	<1	72.7	No Limit
ES2220141-006	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	3	2	0.0	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 4388802)									
EW2202596-003	SWC_UP Point 20	EP005: Total Organic Carbon	----	1	mg/L	8	8	0.0	No Limit

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 4394315)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	93.0	87.0	109
				<10	293 mg/L	112	75.2	126
				<10	2460 mg/L	101	83.0	124
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 4394311)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	100	83.0	129
				<5	1000 mg/L	99.3	82.0	110
				<5	835 mg/L	102	83.0	118
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 4394314)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	101	83.0	129
				<5	1000 mg/L	98.4	82.0	110
				<5	835 mg/L	102	83.0	118
EA045: Turbidity (QCLot: 4390246)								
EA045: Turbidity	----	0.1	NTU	<0.1	40 NTU	97.8	91.0	105
ED037P: Alkalinity by PC Titrator (QCLot: 4387313)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	99.0	81.0	111
				----	50 mg/L	120	80.0	120
ED037P: Alkalinity by PC Titrator (QCLot: 4387315)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	98.0	81.0	111
				----	50 mg/L	115	80.0	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4388023)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	95.7	82.0	122
				<1	500 mg/L	103	82.0	122
ED045G: Chloride by Discrete Analyser (QCLot: 4388021)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	50 mg/L	97.3	80.9	127
				<1	1000 mg/L	100	80.9	127
ED093F: Dissolved Major Cations (QCLot: 4396305)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	102	80.0	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	96.6	90.0	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	95.8	82.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	93.1	85.0	113
EG020F: Dissolved Metals by ICP-MS (QCLot: 4396304)								
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	89.8	82.0	112
EG020T: Total Metals by ICP-MS (QCLot: 4398835)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EG020T: Total Metals by ICP-MS (QCLot: 4398835) - continued								
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	96.6	85.0	113
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	100	85.0	117
EK040P: Fluoride by PC Titrator (QCLot: 4387314)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	99.2	82.0	116
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4399341)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	103	90.0	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4388022)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	101	82.0	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4399340)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	104	91.0	113
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4399342)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	107	91.0	113
EP005: Total Organic Carbon (TOC) (QCLot: 4388801)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	101	72.0	120
EP005: Total Organic Carbon (TOC) (QCLot: 4388802)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	102	72.0	120

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4388023)							
ME2200925-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 4388021)							
ES2219986-001	Anonymous	ED045G: Chloride	16887-00-6	50 mg/L	111	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 4398835)							
ES2220562-002	Anonymous	EG020A-T: Manganese	7439-96-5	1 mg/L	96.7	70.0	130
EK040P: Fluoride by PC Titrator (QCLot: 4387314)							
EW2202595-001	Anonymous	EK040P: Fluoride	16984-48-8	5 mg/L	112	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4399341)							
ES2220141-005	Anonymous	EK055G: Ammonia as N	7664-41-7	1 mg/L	91.3	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4388022)							

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4388022) - continued							
ES2220065-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	95.0	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4399340)							
ES2220141-005	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	91.8	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4399342)							
EW2202598-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	5 mg/L	94.1	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 4388801)							
ES2220074-010	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	116	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 4388802)							
EW2202596-004	SWC_Down Point 21	EP005: Total Organic Carbon	----	200 mg/L	108	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EW2202596**	Page	: 1 of 8
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Telephone	: +61 2 4225 3125
Project	: Dunmore Quarterly Surface Water EPL	Date Samples Received	: 07-Jun-2022
Site	: DUNMORE LANDFILL TENDER	Issue Date	: 17-Jun-2022
Sampler	: Robert DaLio	No. of samples received	: 6
Order number	: 138956	No. of samples analysed	: 6

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	ME2200925--002	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Matrix Spikes (MS)					
Dissolved Metals by ICP-MS - Suite A	0	20	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / *Container* / Client Sample ID(s)	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EA005FD: Field pH							
Field Test Dummy Bottle (EN67 PK)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22, Duplicate	**07-Jun-2022**	**----**	----	----	**07-Jun-2022**	----	----
EA010FD: Field Conductivity							
Field Test Dummy Bottle (EN67 PK)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22, Duplicate	**07-Jun-2022**	**----**	----	----	**07-Jun-2022**	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22, Duplicate	**07-Jun-2022**	**----**	----	----	**12-Jun-2022**	14-Jun-2022	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22, Duplicate	**07-Jun-2022**	**----**	----	----	**12-Jun-2022**	14-Jun-2022	✓
EA045: Turbidity							
Clear Plastic Bottle - Natural (EA045)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22, Duplicate	**07-Jun-2022**	**----**	----	----	**09-Jun-2022**	09-Jun-2022	✓
EA116: Temperature							
Field Test Dummy Bottle (EN67 PK)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22, Duplicate	**07-Jun-2022**	**----**	----	----	**07-Jun-2022**	----	----
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22, Duplicate	**07-Jun-2022**	**----**	----	----	**08-Jun-2022**	21-Jun-2022	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22, Duplicate	**07-Jun-2022**	**----**	----	----	**08-Jun-2022**	05-Jul-2022	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22, Duplicate	**07-Jun-2022**	**----**	----	----	**08-Jun-2022**	05-Jul-2022	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22, Duplicate	**07-Jun-2022**	**----**	----	----	**14-Jun-2022**	05-Jul-2022	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22, Duplicate	**07-Jun-2022**	**----**	----	----	**14-Jun-2022**	04-Dec-2022	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22, Duplicate	**07-Jun-2022**	**15-Jun-2022**	04-Dec-2022	✓	**15-Jun-2022**	04-Dec-2022	✓
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural (EK040P)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22, Duplicate	**07-Jun-2022**	**----**	----	----	**08-Jun-2022**	05-Jul-2022	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22, Duplicate	**07-Jun-2022**	**----**	----	----	**15-Jun-2022**	05-Jul-2022	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22, Duplicate	**07-Jun-2022**	**----**	----	----	**08-Jun-2022**	09-Jun-2022	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22, Duplicate	**07-Jun-2022**	**----**	----	----	**15-Jun-2022**	05-Jul-2022	✓
EP005: Total Organic Carbon (TOC)							
Amber TOC Vial - Sulfuric Acid (EP005)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22, Duplicate	**07-Jun-2022**	**----**	----	----	**09-Jun-2022**	05-Jul-2022	✓
EP025FD: Field Dissolved Oxygen							
Field Test Dummy Bottle (EN67 PK)							
SWP1 - Point 1, SWC_2 - Point 19, SWC_UP - Point 20, SWC_Down - Point 21, SWC_DOWN_2 - Point 22, Duplicate	**07-Jun-2022**	**----**	----	----	**07-Jun-2022**	----	----

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by Auto Titrator	ED037-P	3	27	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	4	30	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	3	25	**12.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by Auto Titrator	ED037-P	4	27	**14.81**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	30	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	6	40	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	3	20	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	25	**8.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	30	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Nitrite as N by Discrete Analyser	EK057G	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	25	**8.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	0	20	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	30	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	25	**8.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Turbidity	EA045	WATER	In house: Referenced to APHA 2130 B. This method is compliant with NEPM Schedule B(3)
Alkalinity by Auto Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm.
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Fluoride by Auto Titrator	EK040P	WATER	In house: Referenced to APHA 4500-F C: CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Ammonium as N	EK055G-NH4	WATER	Ammonium in the sample is reported as the ionised / unionised fractions by the use of a nomograph and the initial pH and Temperature. Ammonia is determined by direct colorimetry by Discrete Analyser according to APHA 4500-NH3 G. This method is compliant with NEPM Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Field Tests - Port Kembla	EN67 PK	WATER	Field determinations as per methods described in APHA. The analysis is performed in the field by ALS samplers. ALS NATA accreditation apply for this service.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)

CERTIFICATE OF ANALYSIS

Work Order	: **EW2202598**	Page	: 1 of 4
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Quarterly Leachate Tank EPL	Date Samples Received	: 07-Jun-2022 13:40
Order number	: 138956	Date Analysis Commenced	: 07-Jun-2022
C-O-C number	: ----	Issue Date	: 16-Jun-2022 19:22
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER LEACHATE		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Aneta Prosaroski	Client Liaison Officer	Laboratory - Wollongong, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- EK057G: LOR raised for Nitrite due to sample matrix.
- ED041G: LOR raised for Sulfate due to sample matrix
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- Temperature performed by ALS Wollongong via in-house method EA116 and EN67 PK.
- Dissolved oxygen (DO) performed by ALS Wollongong via in-house method EA025FD and EN67 PK.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/67.10 Wastewaters
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	Leachate Storage Tank LP1	----	----	----	----
			Sampling date / time	07-Jun-2022 09:50	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2202598-001	--------	--------	--------	--------
				Result	----	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	**9.0**	----	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	**8360**	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**5420**	----	----	----	----
EA116: Temperature								
Temperature	----	0.5	°C	**11.8**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	**1030**	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**2520**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**3550**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<10	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**1570**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**57**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**389**	----	----	----	----
EG020T: Total Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	**0.107**	----	----	----	----
Iron	7439-89-6	0.05	mg/L	**1.14**	----	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.2**	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**670**	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.10	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.12**	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Leachate Storage Tank LP1	----	----	----	----
				Sampling date / time	07-Jun-2022 09:50	----	----	----	----
Compound	CAS Number	LOR	Unit		EW2202598-001	--------	--------	--------	--------
					Result	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser - Continued									
Nitrite + Nitrate as N	----	0.01	mg/L		**0.12**	----	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**563**	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		**6.54**	----	----	----	----
Dissolved Oxygen - % Saturation	----	0.1	% saturation		**63.1**	----	----	----	----

Inter-Laboratory Testing

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

(WATER) ED093F: Dissolved Major Cations

(WATER) EP005: Total Organic Carbon (TOC)

(WATER) EK055G: Ammonia as N by Discrete Analyser

(WATER) EG020T: Total Metals by ICP-MS

(WATER) EK057G: Nitrite as N by Discrete Analyser

(WATER) EK058G: Nitrate as N by Discrete Analyser

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

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

(WATER) ED045G: Chloride by Discrete Analyser

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) EK040P: Fluoride by PC Titrator

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

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EW2202598**	Page	: 1 of 5
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Quarterly Leachate Tank EPL	Date Samples Received	: 07-Jun-2022
Order number	: 138956	Date Analysis Commenced	: 07-Jun-2022
C-O-C number	: ----	Issue Date	: 16-Jun-2022
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER LEACHATE		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Aneta Prosaroski	Client Liaison Officer	Laboratory - Wollongong, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 4390445)									
ES2219669-014	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	458	450	1.8	0% - 20%
ES2220258-012	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	370	360	2.7	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 4387315)									
EW2202596-004	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	123	125	1.7	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	123	125	1.7	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 4388023)									
ES2220103-009	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	34	33	0.0	0% - 20%
ME2200925-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	91	92	0.0	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 4388021)									
ES2219986-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	72	71	0.0	0% - 20%
ME2200925-002	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	109	110	0.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 4398650)									
ES2220041-023	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	14	14	0.0	0% - 50%
		ED093F: Potassium	7440-09-7	1	mg/L	2	2	0.0	No Limit
ES2220074-007	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	108	108	0.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	8	8	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 4398835)									
EW2202596-002	Anonymous	EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.100	0.098	2.8	0% - 20%
		EG020A-T: Iron	7439-89-6	0.05	mg/L	2.09	2.01	4.0	0% - 20%
ES2220562-001	Anonymous	EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.180	0.178	1.1	0% - 20%
		EG020A-T: Iron	7439-89-6	0.05	mg/L	1.63	1.60	1.9	0% - 20%

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EK040P: Fluoride by PC Titrator (QC Lot: 4387314)									
ME2200925-001	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	1.3	1.4	0.0	0% - 50%
EW2202596-004	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.3	0.3	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 4399343)									
EW2202598-001	Leachate Storage Tank LP1	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	670	648	3.4	0% - 20%
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 4388022)									
ES2220065-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	0.01	0.01	0.0	No Limit
ES2220103-009	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4399342)									
EW2202646-005	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.01	0.01	0.0	No Limit
EW2202598-001	Leachate Storage Tank LP1	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.12	0.11	0.0	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 4391623)									
ES2220128-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	4	5	27.1	No Limit
EW2202646-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	16	20	17.4	0% - 50%

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 4390445)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	100	87.0	109
				<10	293 mg/L	97.4	75.2	126
				<10	2460 mg/L	101	83.0	124
ED037P: Alkalinity by PC Titrator (QCLot: 4387315)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	98.0	81.0	111
				----	50 mg/L	115	80.0	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4388023)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	95.7	82.0	122
				<1	500 mg/L	103	82.0	122
ED045G: Chloride by Discrete Analyser (QCLot: 4388021)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	50 mg/L	97.3	80.9	127
				<1	1000 mg/L	100	80.9	127
ED093F: Dissolved Major Cations (QCLot: 4398650)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	96.9	80.0	114
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	108	85.0	113
EG020T: Total Metals by ICP-MS (QCLot: 4398835)								
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	96.6	85.0	113
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	100	85.0	117
EK040P: Fluoride by PC Titrator (QCLot: 4387314)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	99.2	82.0	116
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4399343)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	106	90.0	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4388022)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	101	82.0	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4399342)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	107	91.0	113
EP005: Total Organic Carbon (TOC) (QCLot: 4391623)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	93.5	72.0	120

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4388023)							
ME2200925-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 4388021)							
ES2219986-001	Anonymous	ED045G: Chloride	16887-00-6	50 mg/L	111	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 4398835)							
ES2220562-002	Anonymous	EG020A-T: Manganese	7439-96-5	1 mg/L	96.7	70.0	130
EK040P: Fluoride by PC Titrator (QCLot: 4387314)							
EW2202595-001	Anonymous	EK040P: Fluoride	16984-48-8	5 mg/L	112	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4399343)							
EW2202598-001	Leachate Storage Tank LP1	EK055G: Ammonia as N	7664-41-7	1 mg/L	# Not Determined	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4388022)							
ES2220065-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	95.0	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4399342)							
EW2202598-001	Leachate Storage Tank LP1	EK059G: Nitrite + Nitrate as N	----	5 mg/L	94.1	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 4391623)							
ES2220128-002	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	110	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EW2202598**	Page	: 1 of 7
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Telephone	: +61 2 4225 3125
Project	: Dunmore Quarterly Leachate Tank EPL	Date Samples Received	: 07-Jun-2022
Site	: DUNMORE LANDFILL TENDER	Issue Date	: 16-Jun-2022
Sampler	: Robert DaLio	No. of samples received	: 1
Order number	: 138956	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	ME2200925--002	Anonymous	**Sulfate as SO4 - Turbidimetric**	14808-79-8	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EK055G: Ammonia as N by Discrete Analyser	EW2202598--001	Leachate Storage Tank LP1	**Ammonia as N**	7664-41-7	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Days overdue	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Days overdue
ED093F: Dissolved Major Cations						
Clear Plastic Bottle - Natural						
Leachate Storage Tank - LP1	----	----	----	15-Jun-2022	14-Jun-2022	**1**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation
EA005FD: Field pH							
Field Test Dummy Bottle (EN67 PK)							
Leachate Storage Tank - LP1	**07-Jun-2022**	**----**	----	----	**07-Jun-2022**	----	----
EA010FD: Field Conductivity							
Field Test Dummy Bottle (EN67 PK)							
Leachate Storage Tank - LP1	**07-Jun-2022**	**----**	----	----	**07-Jun-2022**	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
Leachate Storage Tank - LP1	**07-Jun-2022**	**----**	----	----	**09-Jun-2022**	14-Jun-2022	✓
EA116: Temperature							
Field Test Dummy Bottle (EN67 PK)							
Leachate Storage Tank - LP1	**07-Jun-2022**	**----**	----	----	**07-Jun-2022**	----	----

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
Leachate Storage Tank - LP1	**07-Jun-2022**	**----**	----	----	**08-Jun-2022**	21-Jun-2022	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
Leachate Storage Tank - LP1	**07-Jun-2022**	**----**	----	----	**08-Jun-2022**	05-Jul-2022	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
Leachate Storage Tank - LP1	**07-Jun-2022**	**----**	----	----	**08-Jun-2022**	05-Jul-2022	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F)							
Leachate Storage Tank - LP1	**07-Jun-2022**	**----**	----	----	**15-Jun-2022**	14-Jun-2022	×
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T)							
Leachate Storage Tank - LP1	**07-Jun-2022**	**15-Jun-2022**	04-Dec-2022	✓	**15-Jun-2022**	04-Dec-2022	✓
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural (EK040P)							
Leachate Storage Tank - LP1	**07-Jun-2022**	**----**	----	----	**08-Jun-2022**	05-Jul-2022	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G)							
Leachate Storage Tank - LP1	**07-Jun-2022**	**----**	----	----	**15-Jun-2022**	05-Jul-2022	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G)							
Leachate Storage Tank - LP1	**07-Jun-2022**	**----**	----	----	**08-Jun-2022**	09-Jun-2022	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
Leachate Storage Tank - LP1	**07-Jun-2022**	**----**	----	----	**15-Jun-2022**	05-Jul-2022	✓
EP005: Total Organic Carbon (TOC)							
Amber TOC Vial - Sulfuric Acid (EP005)							
Leachate Storage Tank - LP1	**07-Jun-2022**	**----**	----	----	**10-Jun-2022**	05-Jul-2022	✓
EP025FD: Field Dissolved Oxygen							
Field Test Dummy Bottle (EN67 PK)							
Leachate Storage Tank - LP1	**07-Jun-2022**	**----**	----	----	**07-Jun-2022**	----	----

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by Auto Titrator	ED037-P	1	7	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by Auto Titrator	ED037-P	2	7	**28.57**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	3	20	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Matrix Spikes (MS) - Continued							
Chloride by Discrete Analyser	ED045G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Alkalinity by Auto Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm.
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Fluoride by Auto Titrator	EK040P	WATER	In house: Referenced to APHA 4500-F C: CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Field Tests - Port Kembla	EN67 PK	WATER	Field determinations as per methods described in APHA. The analysis is performed in the field by ALS samplers. ALS NATA accreditation apply for this service.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)

Appendix C

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

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ **Sydney**: 277 Woodpark Rd, Smithfield NSW 2176 Ph: 02 8784 8555 E:samples.sydney@alsenviro.com
☐ **Newcastle**: 5 Rosegum Rd, Warabrook NSW 2304 Ph:02 4968 9433 E:samples.newcastle@alsenviro.com
☐ **Brisbane**: 32 Shand St, Stafford QLD 4053 Ph:07 3243 7222 E:samples.brisbane@alsenviro.com
☐ **Townsville**: 14-15 Desma Ct, Bohle QLD 4818 Ph:07 4796 0600 E: townsville.environmental@alsenviro.com
☐ **Melbourne**: 2-4 Westall Rd, Springvale VIC 3171 Ph:03 8549 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 :** (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics)	☐ Standard TAT **(List due date):** ☐ Non Standard or urgent TAT **(List due date):**
OFFICE:	Dunmore		
PROJECT:	Dunmore Dust	**ALS QUOTE NO.:** WO/030/19 TENDER	
ORDER NUMBER:			
PROJECT MANAGER:	Joel Culton		
SAMPLER:	Robert Dalis	**SAMPLER MOBILE:**	
COC emailed to ALS?	(YES / NO)	**EDD FORMAT (or default):**	
Email Reports to :			
Email Invoice to :			

COC SEQUENCE NUMBER (Circle)

COC:	1	2	3	4	5	6	7
OF:	1	2	3	4	5	6	7

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt:		°C	
Other comment:			

RELINQUISHED BY:	**RECEIVED BY:**	**RELINQUISHED BY:**	**RECEIVED BY:**
Robert Dalis	Aneta.		
DATE/TIME: 7.6.22. 13:00	DATE/TIME: 7.6.22	DATE/TIME:	DATE/TIME:

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

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where **Metals** are required, specify **Total** (unfiltered bottle required) or **Dissolved** (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE *(refer to codes below)*	TOTAL BOTTLES	A04 (Ash, CM, TIS)								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	DDG1	7.6.22 11:03	AIR			✓								
	DDG2	11:20	AIR			✓								
	DDG3	9:15	AIR			✓								
	DDG4	10.00	AIR			✓								
				TOTAL	10									

Environmental Division Wollongong
Work Order Reference
EW2202629

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.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2202629**	Page	: 1 of 3
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Landfill Dust	Date Samples Received	: 07-Jun-2022 13:28
Order number	: 126450	Date Analysis Commenced	: 09-Jun-2022
C-O-C number	: ----	Issue Date	: 16-Jun-2022 19:22
Sampler	: ----		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER DUST		
No. of samples received	: 4		
No. of samples analysed	: 4		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Zoran Grozdanovski	Laboratory Operator	Newcastle - Inorganics, Mayfield West, NSW

General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Newcastle.**
- Sample exposure period is 34 days which is outside the typical exposure period of 30 +/- 2 days as per AS3580.10.1.
- 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/m².mth.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/66.1 Sampling and Siting of Dust Depositon Gauges.
- The dust gauges for samples 001, 002 were full when received by the laboratory. They may have overflowed in the field. Results for these gauges are thus reported on an 'as received' basis.
- For dust analysis, the Limit of Reporting (LOR) referenced in the reports for deposited matter parameters represents the reporting increment rather than reporting limit.

Analytical Results

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

			Sample ID	**DDG1 04/05/2022 - 07/06/2022**	**DDG2 04/05/2022 - 07/06/2022**	**DDG3 04/05/2022 - 07/06/2022**	**DDG4 04/05/2022 - 07/06/2022**	**----**
			Sampling date / time	07-Jun-2022 11:03	07-Jun-2022 11:20	07-Jun-2022 09:15	07-Jun-2022 10:00	----
Compound	*CAS Number*	*LOR*	*Unit*	**EW2202629-001**	**EW2202629-002**	**EW2202629-003**	**EW2202629-004**	**--------**
				Result	Result	Result	Result	----
EA120: Ash Content								
Ash Content	----	0.1	g/m².month	**0.1**	**0.3**	**0.2**	**0.5**	**----**
Ash Content (mg)	----	2	mg	**3**	**7**	**5**	**11**	**----**
EA125: Combustible Matter								
Combustible Matter	----	0.1	g/m².month	<0.1	**0.1**	**0.4**	**0.3**	**----**
Combustible Matter (mg)	----	2	mg	<2	**2**	**7**	**5**	**----**
EA141: Total Insoluble Matter								
Total Insoluble Matter	----	0.1	g/m².month	**0.1**	**0.4**	**0.6**	**0.8**	**----**
Total Insoluble Matter (mg)	----	2	mg	**3**	**9**	**12**	**16**	**----**

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

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EW2202629**	Page	: 1 of 3
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Landfill Dust	Date Samples Received	: 07-Jun-2022
Order number	: 126450	Date Analysis Commenced	: 09-Jun-2022
C-O-C number	: ----	Issue Date	: 16-Jun-2022
Sampler	: ----		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER DUST		
No. of samples received	: 4		
No. of samples analysed	: 4		

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

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
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.

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

Laboratory Duplicate (DUP) Report

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

- **No Laboratory Duplicate (DUP) Results are required to be reported.**

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

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

- **No Method Blank (MB) or Laboratory Control Spike (LCS) Results are required to be reported.**

Matrix Spike (MS) Report

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

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EW2202629**	Page	: 1 of 4
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Telephone	: +61 2 4225 3125
Project	: Dunmore Landfill Dust	Date Samples Received	: 07-Jun-2022
Site	: DUNMORE LANDFILL TENDER	Issue Date	: 16-Jun-2022
Sampler	: ----	No. of samples received	: 4
Order number	: 126450	No. of samples analysed	: 4

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **AIR**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA120: Ash Content							
Dust Gauge (Bottle) - Copper Sulfate (EA120)							
DDG1 - 04/05/2022 - 07/06/2022, DDG2 - 04/05/2022 - 07/06/2022, DDG3 - 04/05/2022 - 07/06/2022, DDG4 - 04/05/2022 - 07/06/2022	**07-Jun-2022**	**----**	----	----	**09-Jun-2022**	07-Jul-2022	✓
EA125: Combustible Matter							
Dust Gauge (Bottle) - Copper Sulfate (EA125)							
DDG1 - 04/05/2022 - 07/06/2022, DDG2 - 04/05/2022 - 07/06/2022, DDG3 - 04/05/2022 - 07/06/2022, DDG4 - 04/05/2022 - 07/06/2022	**07-Jun-2022**	**----**	----	----	**09-Jun-2022**	07-Jul-2022	✓
EA141: Total Insoluble Matter							
Dust Gauge (Bottle) - Copper Sulfate (EA141)							
DDG1 - 04/05/2022 - 07/06/2022, DDG2 - 04/05/2022 - 07/06/2022, DDG3 - 04/05/2022 - 07/06/2022, DDG4 - 04/05/2022 - 07/06/2022	**07-Jun-2022**	**----**	----	----	**09-Jun-2022**	07-Jul-2022	✓

Quality Control Parameter Frequency Compliance

- **No Quality Control data available for this section.**

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Ash Content (AC)	EA120	AIR	In house: Referenced to AS 3580.10.1. A gravimetric procedure reporting Ash content in deposited dust.
Combustible Matter (CM)	EA125	AIR	In house: Referenced to AS 3580.10.1. A gravimetric procedure reporting Combustible Matter in deposited dust.
Total Insoluble Matter (TIM)	EA141	AIR	In house: Referenced to AS 3580.10.1. A gravimetric procedure reporting Total Insoluble solids in deposited dust.

Appendix D

Surface Gas (Methane) Field Sheets

ALS Landfill Emissions Report

Client:	Shellharbour City Council	Date:	15/06/2022
Site:	Dunmore	Sampler(s)	Robert DaLio, Michael Santos

Transact / Location	Point	GPS North	GPS East	CH4 Conc (ppm)	Comments
A					**No Access,**
B	1	6168 225	302 436	1.5	
B	2	6168 243	302 436	1.5	Methane Cage
B	3	6168 276	302 438	1.8	
B	4	6168 306	302 440	1.5	
B	5	6168 344	302 439	1.4	
B	6	6168 363	302 437	1.8	
B	7				No Access Overgrown
C	1	6168 429	302 275	0.8	
C	2	6168 344	302 404	1.0	
C	3	6168 292	302 413	1.1	
C	4	6167 216	302 424	2.1	
C	5	6167 140	302 419	1.4	

C	6	6168 069	302 409	2.7	
C	7				No Access Overgrown
D	1	6168 140	302 391	1.1	
D	2	6168 153	302 389	1.7	
D	3	6168 169	302 392	1.8	
D	4	6168 188	302 389	1.5	
D 5-9					No Further Access, Very Overgrown and rubble
E	1	6168 196	302 351	1.3	
E	2	6168 184	302 356	1.4	
E	3	6168 170	302 367	1.6	
E	4	6168 157	302 371	1.2	
E	5	6168 144	302 377	1.1	
F	1	6168 143	302 356	1.6	
F	2	6168 152	302 345	1.5	
F	3	6168 180	302 347	2.3	
F	4	6168 202	302 344	1.8	
F	5	6168 223	302 337	1.7	
G	1	6168 404	302 258	1.4	

G	2	6168 419	302 286	1.0	
G	3	6168 437	302 321	0.9	
G	4	6168 463	302 359	0.9	
H	1	6168 414	302 560	2.4	
H	2	6168 351	302 566	2.4	
H	3	6168 289	302 540	2.4	Weigh Bridge
H	4	6168 233	302 560	2.4	
H	5	6168 176	302 629	2.3	
H	6	6168 126	302 626	2.3	
H	7	6168 288	301 581	2.3	
H	8	6168 076	301 557	2.3	
H	9	6168 121	302 531	2.3	
H	10	6168 057	302 520	2.3	
H	11	6168 028	302 526	2.2	
H	12	6168 001	302 543	2.3	
H	13	6167 984	302 511	2.3	
H	14	6167 947	302 324	2.2	
H	15	6167 904	302 278	2.2	
H	16	6167 888	302 249	2.2	
H	17	6167 877	302 211	2.2	
H	18	6167 898	302 061	2.5	
H	19	6167 945	302 67	2.5	

H	20	6168 004	302 85	2.5	
H	21	6168 105	302 122	2.5	
H	22	6168 161	302 152	2.5	
H	23	6168 333	302 199	2.5	
H	24	6168 409	302 230	2.5	
H	25	6167 451	302 486	7.1	
H	26	6168 475	302 417	5.1	
H	27	6168 445	302 327	3.5	
H	28	6168 389	302 243	3.8	
H	29	6168 338	301 183	5.5	
H	30	6168 303	302 130	9.7	
H	31	6168 252	302 063	2.9	
I	1				NO ACCESS EXCLUSION ZONE
J	1	6168 345	302 202	1.9	
J	2	6168 313	302 214	2.5	
J	3	6168 263	302 233	4.8	
J	4	6167 215	302 249	4.1	
J	5	6167 178	302 258	5.1	

K	1	6168 517	302 383	1.8	
K	2	6168 528	302 414	1.9	
K	3	6168 540	302 454	2.1	
K	4	6168 577	302 446	1.8	
K	5	6168 575	302 380	1.9	
K	5	6168 548	302 379	1.6	
L	1	6168 764	302 336	1.8	
L	2	6168 744	302 318	0.8	
L	3	6168 714	302 298	1.3	
L	4	6168 685	302 269	0.7	
L	5	6168 635	302 235	0.7	
L	6	6168 569	302 195	0.9	
Compressor Shed	1			10.8	
Office	1			7.5	
Community Recycling Centre	1				NO ACCESS
OLD Weighbridge	1			0.8	
OLD Weighbridge Toilet	1			22.0	
Revolve Shop	1			1.5	
Building Truckwash	1			2.5	

New Weighbridge	1			1.8	
Methane Blank (Pre testing)				1.2	Taken at entrance to Dunmore site before main gate
Methane Blank (Post testing)				1.2	Taken at entrance to Dunmore site before main gate

Comments:

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

Appendix E

Laboratory Chain of Custody (COC) & Certificates of Analysis (COA) – Overflow Event

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 Desma Ct, Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsenviro.com
☐ Melbourne: 2-4 Westall Rd, Springvale VIC 3171 Ph: 03 8549 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 : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	41 Burelli St WOLLONGONG NSW 2500		
PROJECT:	Dunmore Quarterly Surface Waters SWP01 Overflow full Testing	ALS QUOTE NO.: WO/030/19 TENDER	COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7 OF: 1 2 3 4 5 6 7
ORDER NUMBER:			
PROJECT MANAGER:	Joel Culton		
SAMPLER:	Robert DeLio / M. Sm	SAMPLER MOBILE:	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	
Email Reports to :			
Email Invoice to :			

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt		°C	
Other comment:	6.5		

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Robert DeLio	Anete		
DATE/TIME: 13.5.22. 15:15	DATE/TIME: 13/5/22	DATE/TIME:	DATE/TIME:

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

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	TSS	NT-1, NT-2A (Ionic Balance)	TOC, NT-4, NH3, Total Mn	Dissolved and Total Fe					Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	SWP1	13.5.22 11:30	W			✓	✓	✓	✓					Field Tests - pH, EC, DO & Temp
				TOTAL	10									

Environmental Division Wollongong
Work Order Reference
EW2202241

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.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2202241**	Page	: 1 of 5
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Surface Water SWP01 Overflow	Date Samples Received	: 13-May-2022 15:53
Order number	: 138956	Date Analysis Commenced	: 13-May-2022
C-O-C number	: ----	Issue Date	: 20-May-2022 15:33
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER SURFACE WATER		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Aneta Prosaroski	Client Liaison Officer	Laboratory - Wollongong, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- SWP1 - Site was overflowing.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- Temperature performed by ALS Wollongong via in-house method EA116 and EN67 PK.
- Dissolved oxygen (DO) performed by ALS Wollongong via in-house method EA025FD and EN67 PK.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/67.4 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	----	----	----	----
			Sampling date / time	13-May-2022 11:30	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2202241-001	--------	--------	--------	--------
				Result	----	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	**7.9**	----	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	**1590**	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**984**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**23**	----	----	----	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	**19.9**	----	----	----	----
EA116: Temperature								
Temperature	----	0.1	°C	**17.6**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**435**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**435**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**186**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**230**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**64**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**42**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**227**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**17**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----
EG020T: Total Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	**0.304**	----	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.4**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SWP1 Point 1	----	----	----	----
				Sampling date / time	13-May-2022 11:30	----	----	----	----
Compound	CAS Number	LOR	Unit		EW2202241-001	--------	--------	--------	--------
					Result	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**15.8**	----	----	----	----
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	0.01	mg/L		**15.4**	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		**0.16**	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**0.19**	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**0.35**	----	----	----	----
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**19.0**	----	----	----	----
ø **Total Cations**	----	0.01	meq/L		**17.0**	----	----	----	----
ø **Ionic Balance**	----	0.01	%		**5.81**	----	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**29**	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		**4.45**	----	----	----	----

Inter-Laboratory Testing

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

(WATER) EA045: Turbidity

(WATER) EP005: Total Organic Carbon (TOC)

(WATER) EG020F: Dissolved Metals by ICP-MS

(WATER) EG020T: Total Metals by ICP-MS

(WATER) EK057G: Nitrite as N by Discrete Analyser

(WATER) EK058G: Nitrate as N by Discrete Analyser

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

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

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

(WATER) EK055G: Ammonia as N by Discrete Analyser

(WATER) EN055: Ionic Balance

(WATER) ED045G: Chloride by Discrete Analyser

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

(WATER) EK040P: Fluoride by PC Titrator

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) ED093F: Dissolved Major Cations

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

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EW2202241**	Page	: 1 of 5
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Surface Water SWP01 Overflow	Date Samples Received	: 13-May-2022
Order number	: 138956	Date Analysis Commenced	: 13-May-2022
C-O-C number	: ----	Issue Date	: 20-May-2022
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER SURFACE WATER		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Aneta Prosaroski	Client Liaison Officer	Laboratory - Wollongong, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 4345636)									
ES2216581-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	392	364	7.7	0% - 20%
ES2216583-005	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	410	390	4.9	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 4345637)									
ES2216581-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
ES2216583-005	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EA045: Turbidity (QC Lot: 4338669)									
ES2216587-002	Anonymous	EA045: Turbidity	----	0.1	NTU	0.2	0.2	0.0	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 4341344)									
ES2216494-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	69	68	1.7	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	69	68	1.7	0% - 20%
ES2216824-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	47	39	18.2	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	47	39	18.2	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 4338767)									
ES2216570-008	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	0.0	No Limit
ES2216570-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2	2	0.0	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 4338765)									
ES2216570-008	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	45	46	0.0	0% - 20%
ES2216570-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	547	538	1.6	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 4346990)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED093F: Dissolved Major Cations (QC Lot: 4346990) - continued									
EW2202241-001	SWP1 Point 1	ED093F: Calcium	7440-70-2	1	mg/L	64	63	0.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	42	41	0.0	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	227	225	0.9	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	17	17	0.0	0% - 50%
ES2216217-010	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	173	174	0.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	34	34	0.0	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	57	58	1.8	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	1	1	0.0	No Limit
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4346989)									
ES2217131-002	Anonymous	EG020A-F: Iron	7439-89-6	0.05	mg/L	1.86	1.80	3.5	0% - 20%
ES2216217-010	Anonymous	EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 4344209)									
ES2216583-005	Anonymous	EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
ES2216907-003	Anonymous	EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.055	0.054	2.2	0% - 20%
		EG020A-T: Iron	7439-89-6	0.05	mg/L	0.73	0.72	1.4	0% - 20%
EK040P: Fluoride by PC Titrator (QC Lot: 4341346)									
EW2202241-001	SWP1 Point 1	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.4	0.5	0.0	No Limit
ES2216824-001	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	<0.1	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 4344379)									
ES2216574-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	1.06	1.05	0.0	0% - 20%
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 4338764)									
ES2216570-008	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES2216570-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4344381)									
ES2216574-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	2.29	2.28	0.0	0% - 20%
EP005: Total Organic Carbon (TOC) (QC Lot: 4339175)									
ES2216581-003	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	<1	<1	0.0	No Limit
ES2216601-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	8	8	0.0	No Limit

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 4345636)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	95.8	87.0	109
				<10	293 mg/L	99.8	75.2	126
				<10	2460 mg/L	102	83.0	124
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 4345637)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	105	83.0	129
				<5	1000 mg/L	92.8	82.0	110
				<5	835 mg/L	102	83.0	118
EA045: Turbidity (QCLot: 4338669)								
EA045: Turbidity	----	0.1	NTU	<0.1	40 NTU	96.0	91.0	105
ED037P: Alkalinity by PC Titrator (QCLot: 4341344)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	104	81.0	111
				----	50 mg/L	109	80.0	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4338767)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	111	82.0	122
				<1	500 mg/L	103	82.0	122
ED045G: Chloride by Discrete Analyser (QCLot: 4338765)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	50 mg/L	100	80.9	127
				<1	1000 mg/L	102	80.9	127
ED093F: Dissolved Major Cations (QCLot: 4346990)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	99.4	80.0	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	103	90.0	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	102	82.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	97.1	85.0	113
EG020F: Dissolved Metals by ICP-MS (QCLot: 4346989)								
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	93.9	82.0	112
EG020T: Total Metals by ICP-MS (QCLot: 4344209)								
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	90.7	85.0	113
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	93.7	85.0	117
EK040P: Fluoride by PC Titrator (QCLot: 4341346)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	107	82.0	116
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4344379)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	106	90.0	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4338764)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4338764) - continued								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	101	82.0	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4344381)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	101	91.0	113
EP005: Total Organic Carbon (TOC) (QCLot: 4339175)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	97.5	72.0	120

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4338767)							
ES2216570-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	121	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 4338765)							
ES2216570-001	Anonymous	ED045G: Chloride	16887-00-6	50 mg/L	# Not Determined	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 4344209)							
ES2216583-006	Anonymous	EG020A-T: Manganese	7439-96-5	1 mg/L	99.6	70.0	130
EK040P: Fluoride by PC Titrator (QCLot: 4341346)							
ES2216788-001	Anonymous	EK040P: Fluoride	16984-48-8	5 mg/L	106	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4344379)							
ES2216574-001	Anonymous	EK055G: Ammonia as N	7664-41-7	1 mg/L	112	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4338764)							
ES2216570-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	97.6	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4344381)							
ES2216574-001	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	# Not Determined	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 4339175)							
ES2216581-004	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	120	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EW2202241**	Page	: 1 of 8
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Telephone	: +61 2 4225 3125
Project	: Dunmore Surface Water SWP01 Overflow	Date Samples Received	: 13-May-2022
Site	: DUNMORE LANDFILL TENDER	Issue Date	: 20-May-2022
Sampler	: Robert DaLio	No. of samples received	: 1
Order number	: 138956	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED045G: Chloride by Discrete Analyser	ES2216570--001	Anonymous	**Chloride**	16887-00-6	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Ar	ES2216574--001	Anonymous	**Nitrite + Nitrate as N**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Matrix Spikes (MS)					
Dissolved Metals by ICP-MS - Suite A	0	14	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / *Container* / Client Sample ID(s)	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EA005FD: Field pH							
Field Test Dummy Bottle (EN67 PK) SWP1 - Point 1	**13-May-2022**	**----**	----	----	**13-May-2022**	----	----
EA010FD: Field Conductivity							
Field Test Dummy Bottle (EN67 PK) SWP1 - Point 1	**13-May-2022**	**----**	----	----	**13-May-2022**	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H) SWP1 - Point 1	**13-May-2022**	**----**	----	----	**18-May-2022**	20-May-2022	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H) SWP1 - Point 1	**13-May-2022**	**----**	----	----	**18-May-2022**	20-May-2022	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA045: Turbidity							
Clear Plastic Bottle - Natural (EA045)							
SWP1 - Point 1	**13-May-2022**	**----**	----	----	**14-May-2022**	15-May-2022	✓
EA116: Temperature							
Field Test Dummy Bottle (EN67 PK)							
SWP1 - Point 1	**13-May-2022**	**----**	----	----	**13-May-2022**	----	----
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
SWP1 - Point 1	**13-May-2022**	**----**	----	----	**16-May-2022**	27-May-2022	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
SWP1 - Point 1	**13-May-2022**	**----**	----	----	**14-May-2022**	10-Jun-2022	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
SWP1 - Point 1	**13-May-2022**	**----**	----	----	**14-May-2022**	10-Jun-2022	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)							
SWP1 - Point 1	**13-May-2022**	**----**	----	----	**19-May-2022**	10-Jun-2022	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
SWP1 - Point 1	**13-May-2022**	**----**	----	----	**19-May-2022**	09-Nov-2022	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T)							
SWP1 - Point 1	**13-May-2022**	**18-May-2022**	09-Nov-2022	✓	**18-May-2022**	09-Nov-2022	✓
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural (EK040P)							
SWP1 - Point 1	**13-May-2022**	**----**	----	----	**16-May-2022**	10-Jun-2022	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G)							
SWP1 - Point 1	**13-May-2022**	**----**	----	----	**18-May-2022**	10-Jun-2022	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G)							
SWP1 - Point 1	**13-May-2022**	**----**	----	----	**14-May-2022**	15-May-2022	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
SWP1 - Point 1	**13-May-2022**	**----**	----	----	**18-May-2022**	10-Jun-2022	✓
EP005: Total Organic Carbon (TOC)							
Amber TOC Vial - Sulfuric Acid (EP005)							
SWP1 - Point 1	**13-May-2022**	**----**	----	----	**15-May-2022**	10-Jun-2022	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP025FD: Field Dissolved Oxygen							
Field Test Dummy Bottle (EN67 PK)							
SWP1 - Point 1	**13-May-2022**	**----**	----	----	**13-May-2022**	----	----

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by Auto Titrator	ED037-P	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	2	10	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	4	**50.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	5	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	1	9	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by Auto Titrator	ED037-P	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	3	20	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	3	20	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	4	**25.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Nitrite as N by Discrete Analyser	EK057G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	0	14	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	5	**20.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Turbidity	EA045	WATER	In house: Referenced to APHA 2130 B. This method is compliant with NEPM Schedule B(3)
Alkalinity by Auto Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Fluoride by Auto Titrator	EK040P	WATER	In house: Referenced to APHA 4500-F C: CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Ammonium as N	EK055G-NH4	WATER	Ammonium in the sample is reported as the ionised / unionised fractions by the use of a nomograph and the initial pH and Temperature. Ammonia is determined by direct colorimetry by Discrete Analyser according to APHA 4500-NH3 G. This method is compliant with NEPM Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Field Tests - Port Kembla	EN67 PK	WATER	Field determinations as per methods described in APHA. The analysis is performed in the field by ALS samplers. ALS NATA accreditation apply for this service.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)

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 Desma Ct, Bohle QLD 4818 Ph: 07 4796 0600 E: townsville.environmental@alsenviro.com
☐ Melbourne: 2-4 Westall Rd, Springvale VIC 3171 Ph: 03 8549 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 : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	41 Burelli St WOLLONGONG NSW 2500		
PROJECT:	Dunmore Quarterly Surface Waters SWP01 Overflow full Testing	ALS QUOTE NO.: WO/030/19 TENDER	
ORDER NUMBER:			
PROJECT MANAGER:	Joel Culton		
SAMPLER:	M. Santos / R. Dalo	SAMPLER MOBILE:	
COC emailed to ALS? (YES / NO)		EDD FORMAT (or default):	
Email Reports to :			
Email Invoice to :			

COC SEQUENCE NUMBER (Circle)

COC:	1	2	3	4	5	6	7
OF:	1	2	3	4	5	6	7

FOR LABORATORY USE ONLY (Circle)

Custody Seal Intact?	Yes	No	N/A
Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt:		°C	
Other comment:	6.2		

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Robert Dalo	Anete		
DATE/TIME: 24.5.22. 14:15	DATE/TIME: 24/5/22	DATE/TIME:	DATE/TIME:

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

ALS USE ONLY	SAMPLE DETAILS MATRIX: Solid(S) Water(W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).								Additional Information
LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL BOTTLES	TSS	NT-1, NT-2A (Ionic Balance)	TOC, NT-4, NH3, Total Mn	Dissolved and Total Fe					Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	SWP1	24.5.22 9:10.	W			✓	✓	✓	✓					Field Tests - pH, EC, DO & Temp
				TOTAL	10									

Environmental Division Wollongong
Work Order Reference
EW2202382

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.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2202382**	Page	: 1 of 5
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Surface Water SWP01 Overflow	Date Samples Received	: 24-May-2022 15:37
Order number	: 138956	Date Analysis Commenced	: 24-May-2022
C-O-C number	: ----	Issue Date	: 31-May-2022 15:14
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER SURFACE WATER		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Aneta Prosaroski	Client Liaison Officer	Laboratory - Wollongong, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- SWP1 site overflowing at time of sampling.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- Temperature performed by ALS Wollongong via in-house method EA116 and EN67 PK.
- Dissolved oxygen (DO) performed by ALS Wollongong via in-house method EA025FD and EN67 PK.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/67.4 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	----	----	----	----
			Sampling date / time	24-May-2022 08:10	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2202382-001	--------	--------	--------	--------
				Result	----	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	**7.6**	----	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	**2150**	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**1200**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**7**	----	----	----	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	**11.9**	----	----	----	----
EA116: Temperature								
Temperature	----	0.1	°C	**15.8**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**549**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**549**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**182**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**262**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**77**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**49**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**274**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**22**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----
EG020T: Total Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	**0.903**	----	----	----	----
Iron	7439-89-6	0.05	mg/L	**0.23**	----	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.6**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	SWP1 Point 1	----	----	----	----
			Sampling date / time	24-May-2022 08:10	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2202382-001	--------	--------	--------	--------
				Result	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**22.4**	----	----	----	----
EK055G-NH4: Ammonium as N by DA								
Ammonium as N	14798-03-9_N	0.01	mg/L	**22.1**	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	**0.06**	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.03**	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.09**	----	----	----	----
EN055: Ionic Balance								
ø **Total Anions**	----	0.01	meq/L	**22.1**	----	----	----	----
ø **Total Cations**	----	0.01	meq/L	**20.4**	----	----	----	----
ø **Ionic Balance**	----	0.01	%	**4.22**	----	----	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	**33**	----	----	----	----
EP025FD: Field Dissolved Oxygen								
Dissolved Oxygen	----	0.01	mg/L	**3.62**	----	----	----	----

Inter-Laboratory Testing

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

(WATER) EA045: Turbidity

(WATER) EP005: Total Organic Carbon (TOC)

(WATER) EG020F: Dissolved Metals by ICP-MS

(WATER) EG020T: Total Metals by ICP-MS

(WATER) EK057G: Nitrite as N by Discrete Analyser

(WATER) EK058G: Nitrate as N by Discrete Analyser

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

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

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

(WATER) EK055G: Ammonia as N by Discrete Analyser

(WATER) EN055: Ionic Balance

(WATER) ED045G: Chloride by Discrete Analyser

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

(WATER) EK040P: Fluoride by PC Titrator

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) ED093F: Dissolved Major Cations

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

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EW2202382**	Page	: 1 of 5
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Surface Water SWP01 Overflow	Date Samples Received	: 24-May-2022
Order number	: 138956	Date Analysis Commenced	: 24-May-2022
C-O-C number	: ----	Issue Date	: 31-May-2022
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER SURFACE WATER		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
Aneta Prosaroski	Client Liaison Officer	Laboratory - Wollongong, NSW
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

General Comments

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

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

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

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 4362837)									
ES2217842-008	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	406	376	7.7	0% - 20%
ES2218011-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	27	24	10.7	No Limit
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 4362838)									
ES2217842-008	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	21	24	13.3	No Limit
ES2218011-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EA045: Turbidity (QC Lot: 4360028)									
ES2217444-011	Anonymous	EA045: Turbidity	----	0.1	NTU	2.4	2.3	0.0	0% - 20%
EW2202368-001	Anonymous	EA045: Turbidity	----	0.1	NTU	254	255	0.4	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 4359910)									
EW2202385-003	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	832	831	0.1	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	832	831	0.1	0% - 20%
ES2218073-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	222	216	3.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	222	216	3.0	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 4359773)									
ES2218073-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	28	28	0.0	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 4359772)									
ES2218073-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	74	74	0.0	0% - 20%
EW2202385-006	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	39	39	0.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 4365543)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
ED093F: Dissolved Major Cations (QC Lot: 4365543) - continued									
ES2217942-004	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	60	60	0.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	84	85	1.6	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	769	776	0.9	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	11	11	0.0	0% - 50%
ES2217838-002	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	44	43	0.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	32	32	0.0	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	39	40	3.8	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	12	11	0.0	0% - 50%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 4365545)									
EW2202404-002	Anonymous	EG020A-F: Iron	7439-89-6	0.05	mg/L	0.54	0.56	3.2	0% - 50%
EW2202439-003	Anonymous	EG020A-F: Iron	7439-89-6	0.05	mg/L	0.14	0.14	0.0	No Limit
EG020T: Total Metals by ICP-MS (QC Lot: 4366251)									
ES2218099-003	Anonymous	EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EW2202428-001	Anonymous	EG020A-T: Manganese	7439-96-5	0.001	mg/L	0.026	0.023	9.2	0% - 20%
		EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	0.0	No Limit
EK040P: Fluoride by PC Titrator (QC Lot: 4359911)									
EW2202385-003	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	1.0	1.0	0.0	0% - 50%
EW2202385-014	Anonymous	EK040P: Fluoride	16984-48-8	0.1	mg/L	0.5	0.5	0.0	No Limit
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 4366860)									
ES2218594-001	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	514	574	11.1	0% - 20%
ES2218197-003	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.03	0.03	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 4359774)									
ES2218073-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EW2202385-006	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	0.01	0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 4366861)									
ES2218426-003	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.18	<0.10	54.5	No Limit
ES2218197-003	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.02	0.03	0.0	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 4361434)									
ES2218197-014	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	19	19	0.0	0% - 50%

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

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

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 4362837)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	101	87.0	109
				<10	293 mg/L	105	75.2	126
				<10	2460 mg/L	98.1	83.0	124
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 4362838)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	109	83.0	129
				<5	1000 mg/L	102	82.0	110
				<5	835 mg/L	96.8	83.0	118
EA045: Turbidity (QCLot: 4360028)								
EA045: Turbidity	----	0.1	NTU	<0.1	40 NTU	95.8	91.0	105
ED037P: Alkalinity by PC Titrator (QCLot: 4359910)								
ED037-P: Total Alkalinity as CaCO3	----	----	mg/L	----	200 mg/L	93.7	81.0	111
				----	50 mg/L	101	80.0	120
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4359773)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	101	82.0	122
				<1	500 mg/L	97.8	82.0	122
ED045G: Chloride by Discrete Analyser (QCLot: 4359772)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	50 mg/L	95.8	80.9	127
				<1	1000 mg/L	97.9	80.9	127
ED093F: Dissolved Major Cations (QCLot: 4365543)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	105	80.0	114
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	101	90.0	116
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	96.2	82.0	120
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	99.7	85.0	113
EG020F: Dissolved Metals by ICP-MS (QCLot: 4365545)								
EG020A-F: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	95.1	82.0	112
EG020T: Total Metals by ICP-MS (QCLot: 4366251)								
EG020A-T: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	110	85.0	113
EG020A-T: Iron	7439-89-6	0.05	mg/L	<0.05	0.5 mg/L	116	85.0	117
EK040P: Fluoride by PC Titrator (QCLot: 4359911)								
EK040P: Fluoride	16984-48-8	0.1	mg/L	<0.1	5 mg/L	99.8	82.0	116
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4366860)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	100	90.0	114
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4359774)								

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Acceptable Limits (%): Low	Acceptable Limits (%): High
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4359774) - continued								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	100	82.0	114
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4366861)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	94.7	91.0	113
EP005: Total Organic Carbon (TOC) (QCLot: 4361434)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	113	72.0	120

Matrix Spike (MS) Report

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

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Acceptable Limits (%): Low	Acceptable Limits (%): High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 4359773)							
ES2218073-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	10 mg/L	91.7	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 4359772)							
ES2218073-001	Anonymous	ED045G: Chloride	16887-00-6	50 mg/L	106	70.0	130
EG020T: Total Metals by ICP-MS (QCLot: 4366251)							
ES2218099-004	Anonymous	EG020A-T: Manganese	7439-96-5	1 mg/L	104	70.0	130
EK040P: Fluoride by PC Titrator (QCLot: 4359911)							
EW2202382-001	SWP1 Point 1	EK040P: Fluoride	16984-48-8	5 mg/L	106	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 4366860)							
ES2218197-003	Anonymous	EK055G: Ammonia as N	7664-41-7	1 mg/L	79.4	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 4359774)							
ES2218073-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	89.0	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 4366861)							
ES2218197-003	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	92.5	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 4361434)							
ES2218237-001	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	119	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EW2202382**	Page	: 1 of 7
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Joel Coulton	Telephone	: +61 2 4225 3125
Project	: Dunmore Surface Water SWP01 Overflow	Date Samples Received	: 24-May-2022
Site	: DUNMORE LANDFILL TENDER	Issue Date	: 31-May-2022
Sampler	: Robert DaLio	No. of samples received	: 1
Order number	: 138956	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	1	17	5.88	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Dissolved Metals by ICP-MS - Suite A	0	18	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / ***Container*** / Client Sample ID(s)	***Sample Date***	*Extraction / Preparation* ***Date extracted***	*Due for extraction*	*Evaluation*	*Analysis* ***Date analysed***	*Due for analysis*	*Evaluation*
EA005FD: Field pH							
Field Test Dummy Bottle (EN67 PK) SWP1 - Point 1	**24-May-2022**	**----**	----	----	**24-May-2022**	----	----
EA010FD: Field Conductivity							
Field Test Dummy Bottle (EN67 PK) SWP1 - Point 1	**24-May-2022**	**----**	----	----	**24-May-2022**	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H) SWP1 - Point 1	**24-May-2022**	**----**	----	----	**26-May-2022**	31-May-2022	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H) SWP1 - Point 1	**24-May-2022**	**----**	----	----	**26-May-2022**	31-May-2022	✓
EA045: Turbidity							
Clear Plastic Bottle - Natural (EA045) SWP1 - Point 1	**24-May-2022**	**----**	----	----	**25-May-2022**	26-May-2022	✓
EA116: Temperature							
Field Test Dummy Bottle (EN67 PK) SWP1 - Point 1	**24-May-2022**	**----**	----	----	**24-May-2022**	----	----
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) SWP1 - Point 1	**24-May-2022**	**----**	----	----	**25-May-2022**	07-Jun-2022	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G)							
SWP1 - Point 1	**24-May-2022**	**----**	----	----	**25-May-2022**	21-Jun-2022	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G)							
SWP1 - Point 1	**24-May-2022**	**----**	----	----	**25-May-2022**	21-Jun-2022	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Nitric Acid; Filtered (ED093F)							
SWP1 - Point 1	**24-May-2022**	**----**	----	----	**27-May-2022**	21-Jun-2022	✓
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Filtered (EG020A-F)							
SWP1 - Point 1	**24-May-2022**	**----**	----	----	**27-May-2022**	20-Nov-2022	✓
EG020T: Total Metals by ICP-MS							
Clear Plastic Bottle - Nitric Acid; Unfiltered (EG020A-T)							
SWP1 - Point 1	**24-May-2022**	**28-May-2022**	20-Nov-2022	✓	**28-May-2022**	20-Nov-2022	✓
EK040P: Fluoride by PC Titrator							
Clear Plastic Bottle - Natural (EK040P)							
SWP1 - Point 1	**24-May-2022**	**----**	----	----	**25-May-2022**	21-Jun-2022	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G)							
SWP1 - Point 1	**24-May-2022**	**----**	----	----	**29-May-2022**	21-Jun-2022	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G)							
SWP1 - Point 1	**24-May-2022**	**----**	----	----	**25-May-2022**	26-May-2022	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
SWP1 - Point 1	**24-May-2022**	**----**	----	----	**29-May-2022**	21-Jun-2022	✓
EP005: Total Organic Carbon (TOC)							
Amber TOC Vial - Sulfuric Acid (EP005)							
SWP1 - Point 1	**24-May-2022**	**----**	----	----	**26-May-2022**	21-Jun-2022	✓
EP025FD: Field Dissolved Oxygen							
Field Test Dummy Bottle (EN67 PK)							
SWP1 - Point 1	**24-May-2022**	**----**	----	----	**24-May-2022**	----	----

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Alkalinity by Auto Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	17	**5.88**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	3	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by Auto Titrator	ED037-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	3	20	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	3	20	**15.00**	**15.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Turbidity	EA045	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	0	18	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard
Fluoride by Auto Titrator	EK040P	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of `filterable` residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Turbidity	EA045	WATER	In house: Referenced to APHA 2130 B. This method is compliant with NEPM Schedule B(3)
Alkalinity by Auto Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm.
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Fluoride by Auto Titrator	EK040P	WATER	In house: Referenced to APHA 4500-F C: CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)

Analytical Methods	Method	Matrix	Method Descriptions
Ammonium as N	EK055G-NH4	WATER	Ammonium in the sample is reported as the ionised / unionised fractions by the use of a nomograph and the initial pH and Temperature. Ammonia is determined by direct colorimetry by Discrete Analyser according to APHA 4500-NH3 G. This method is compliant with NEPM Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Field Tests - Port Kembla	EN67 PK	WATER	Field determinations as per methods described in APHA. The analysis is performed in the field by ALS samplers. ALS NATA accreditation apply for this service.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)

Appendix F

Calibration Certificates

ANRI INSTRUMENTS & CONTROLS PTY LTD ABN 21 004 771 564

UNIT 29, 756-758 BURWOOD HWY • FERNTREE GULLY • VIC 3156 • AUSTRALIA • PH: +61 3 9752 3782 • FAX: +61 3 9752 3783
EMAIL: sales@anri.com.au www.anri.com.au

Date: 21.6.21

Attn: MeeLan Liew
Air-Met Scientific Pty. Ltd.
7-11 Ceylon Street
Nunawading
Vic. 3131

O/N 728865

Calibration Verification Certificate # 5193

Manufacture/Model : Gazomat Inspectra Laser CH4 analyser
S/N : 5070713
Gases Monitored : CH4, 0-100%

		Specification +/-10%	
Gas used N2 BOC High Purity reads	: 0.0ppm		
Gas used CAC 10ppm CH4 in Air reads	: 10.7ppm	(9-11ppm)	Conforms
Gas used CAC 500ppm CH4 in Air reads	: 540ppm	(450-550ppm)	Conforms
Gas used CAC 2500ppm CH4 in Air reads	: 2548ppm	(2250-2750ppm)	Conforms
Gas used CAC 1.0% CH4 in Air reads	: 10433ppm (1.0%)	(0.9-1.1%)	Conforms
Gas used CAC 2.5% CH4 in Air reads	: 2.6%	(2.25-2.75%)	Conforms
Gas used Linde 99.9% CH4 reads	: 105.8%	(90-110%)	Conforms

Comments : Calibration OK

Next Service/calibration Due : 21.6.22

Stephen Hurst
ANRI Instruments & Controls Pty Ltd

Field Calibration Form

SIN, DIN or Batch number		WO 0010	WO 0009	WO 0011		oL			WO 0012		211/044												
Operational Limits		+/- 0.02	+/- 0.02	+/- 0.05	pH 7 + (0.15 - 0.25)	Chk Std/CRM	79 - 88	139 - 154	1341 - 1482	9500 - 10500	12236 - 13524	112100 - 123900	Chk Std/CRM	<0.2	95% - 105%	217 - 240				+/- 0.09	+/- 0.10	+/- 0.14	Operational Limits
Certified Value		7.00	4.00	10.00	pH Junction		84	146.9	1412	10000	12880	118000		0.0mg/L	100%	229	NTU	NTU	NTU	0.22	0.85	1.5	Certified Value
Meter ID	Date	pH					EC (µS/cm)							DO (% or mg/L)		ORP (mV)	Turbidity (NTU)			Chlorine (mg/L)			Analyst/ Comments
ALSWQL0662	2.6.22	7.04	4.00	10.10		12.9																	RM
ALSWQL 662									1356		13150												RM
ALSWQL0262	2-6-22	7.07	4.09	10.09		13.1								<0.2									MS
" 632	2.6.22	7.10	4.00	10.10					1417		13010		cal	(0792)	1015.8 hPa			1015.9 hPa		(0792)			RM
ALSWQL0222	3.6.22	7.01	4.10	10.10		22.0																	RM
ALSWQL0662	3.6.22	7.03	4.02	10.08		15.4																	RM
ALSWQL0732	6.6.22	7.12	3.95	10.08		12.71			1438		12750			<0.2	105								MS
ALSWQL0662	6.6.22	6.99	4.02	10.08	7.19	14.5																	JP
ALSWQL0202	6.6.22	7.02	4.10	10.06		15.8							within	(1007.5 kPa)	cal		(1004.6) hPa						RM
ALSWQL0702	6.6.22	7.10	4.10	10.10		13.94			1433		13010			<0.2	103								RM
ALSWQL0662	7.6.22	7.02	4.01	10.09		14.7						{	work	(1009.1 kPa)		cert	(1006.0) hPa						MS
ALSWQL0702	7.6.22	7.04	3.97	10.06	7.17	13.98								<0.2	105	219							RML
ALSWQL0262	8.6.22	7.00	4.01	10.01		11.2																	MS
ALSWQL0662	8.6.22	7.00	4.00	10.03		15.8							(w)	0792	1012.7	0792	(C)	1013.0					JP
ALSWQL0732	8.6.22	7.06	3.94	10.05		13.69			1434		13012			<0.2	105	219							RML
ALSWQL0262	9.6.22	7.07	4.06	10.023		11.1																	MS
ALSWQL0262	9-6-22	7.01	4.09	10.05		11.3			1413		13340												MS
ALSWQL0262	10.6.22	6.99	4.02	10.10		12.0			1465		13360												MS
ALSWQL0702	14.6.22	6.99	3.94	10.01		14.65			1424		13120												RML
ALSWQL0662	14.6.22	7.02	4.01	10.04		15.65																	RML
ALSWQL0202	15.6.22	7.06	4.10	10.04		15.11																	RML
ALSWQL0662	20/6/22	7.00	4.02	10.05	7.20	16.0																	JP

Appendix G

Gas Flare Reports

PEOPLE ENGINEERING
A ZERO CARBON, CLEAN
ENERGY FUTURE.

WWW.LGI.COM.AU

PROJECT PROFILE

DUNMORE, NSW

We are **people engineering a clean energy, zero carbon future**, achieving our mission of **expediting the transformation to renewables by delivering clean energy and lower carbon solutions, reliability, effectively, commercially for our customers.**

Results Achieved since the Project Commenced

BIOGAS CAPTURED

21.7 million m3

CARBON ABATEMENT

207 thousand tonnes (T CO2e)

SEEDLINGS PLANTED

3.4 million seedlings planted for 10 years.

CARS OFF THE ROAD

6,500 (for the last 12 months of carbon abatement)

BIOGAS CAPTURE AND ABATEMENT FROM LANDFILL PROJECT

- Long-term contract with Shellharbour City Council to recover and beneficially reuse biogas.
- LGI 1000 ERF compliant biogas flare and gas extraction infrastructure installed in 2013.
- Council benefits from a bespoke biogas management system at minimal cost.
- LGI collaborates closely with the Council regarding the design, installation and expansion of the biogas collection and management system.
- LGI supplies operations & maintenance, monitoring and reporting of the biogas collection and management systems to provide the best environmental outcome for Council from the landfill at their Dunmore Waste Management Facility.

P: +61 7 3711 2225 E: enquiries@lgi.com.au in: linkedin.com/company/lgi-ltd | 1/20 Ashtan Place, Banyo QLD 4014

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

Results to 1 May 2022

Site:	Dunmore	**Report issue date:**	13/05/2022
Report month:	April 2022	**Prepared by:**	Grace Tap
Prepared for:	Shellharbour City Council	**Checked by:**	Jessica North

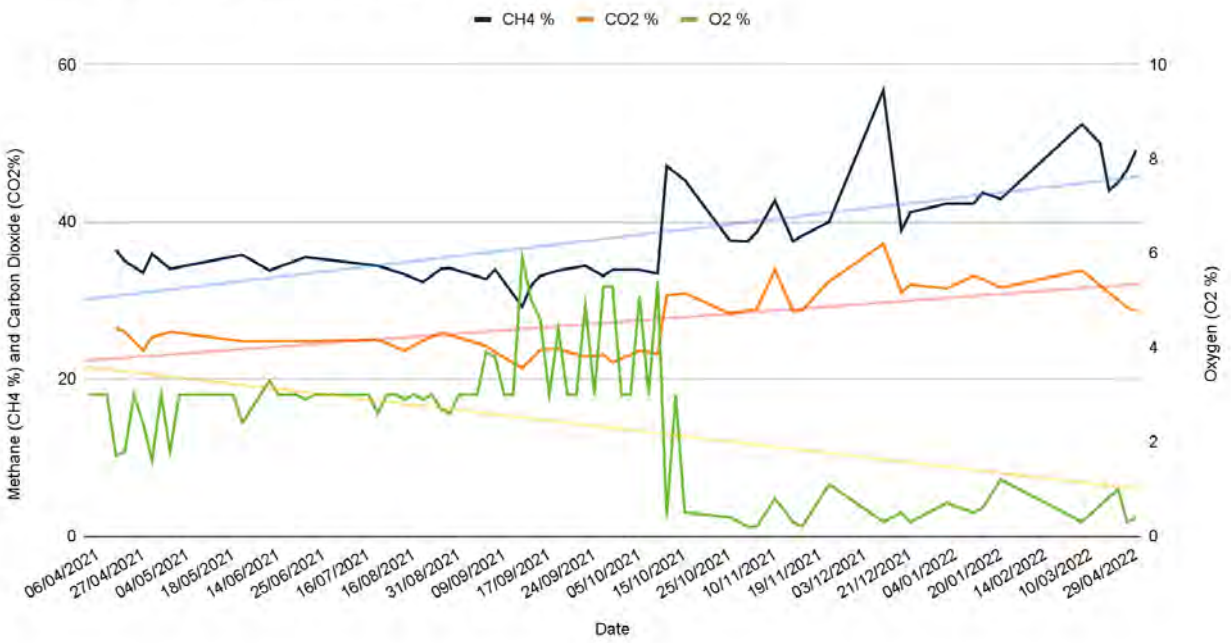
Comments on changes to existing system:	• **January 2016 -** LGI disconnected the 4 lateral wells and 8 vertical wells. • **April 2016 -** LGI reconnected 8 vertical wells in the SE corner and 4 lateral wells. • **June 2016 -** LGI disconnected the extended gas capture system to assist council. • **September 2016 -** LGI disconnected the extended gas capture system to assist council. • **November 2016 -** LGI commissioned the connection to leachate sump 6 as of 23-11-2016. • **May 2017 -** LGI installed an additional 10 vertical wells to the existing LFG system • **November 2019 -** LGI on site to move mainline up batter, and reconnected infrastructure that had been previously disconnected, including 4 wells on the dimple and a 160mm leachate riser. • **April 2020 -** LGI installed a flowline to sump 6 after earlier disconnection. • **February 2021 -** LGI installed 13 new vertical wells, including a new submain • **March 2022 -** LGI replaced the flare gas analyser panel with a Draeger model analyser for greater accuracy and reliability
Comments on operation / maintenance:	Availability - 81.15% Down Time: 135.75hrs 133.33 hrs Planned Outage repairs to flare , new Gas Content Analyser installed 2.42hrs - Forced Outage External - BCU Fault
Recommendations:	LGI and Council agree to progress with gas infrastructure improvements. After discussion with Council, LGI will not implement any leachate pumping until the end of the current rainy season. LGI is investigating into an automated louver control system in order to optomise the stack temperature control. LGI are planning to repair pipe work on the top cell to allow operational capping in July 2022.

Flare Operational Data:

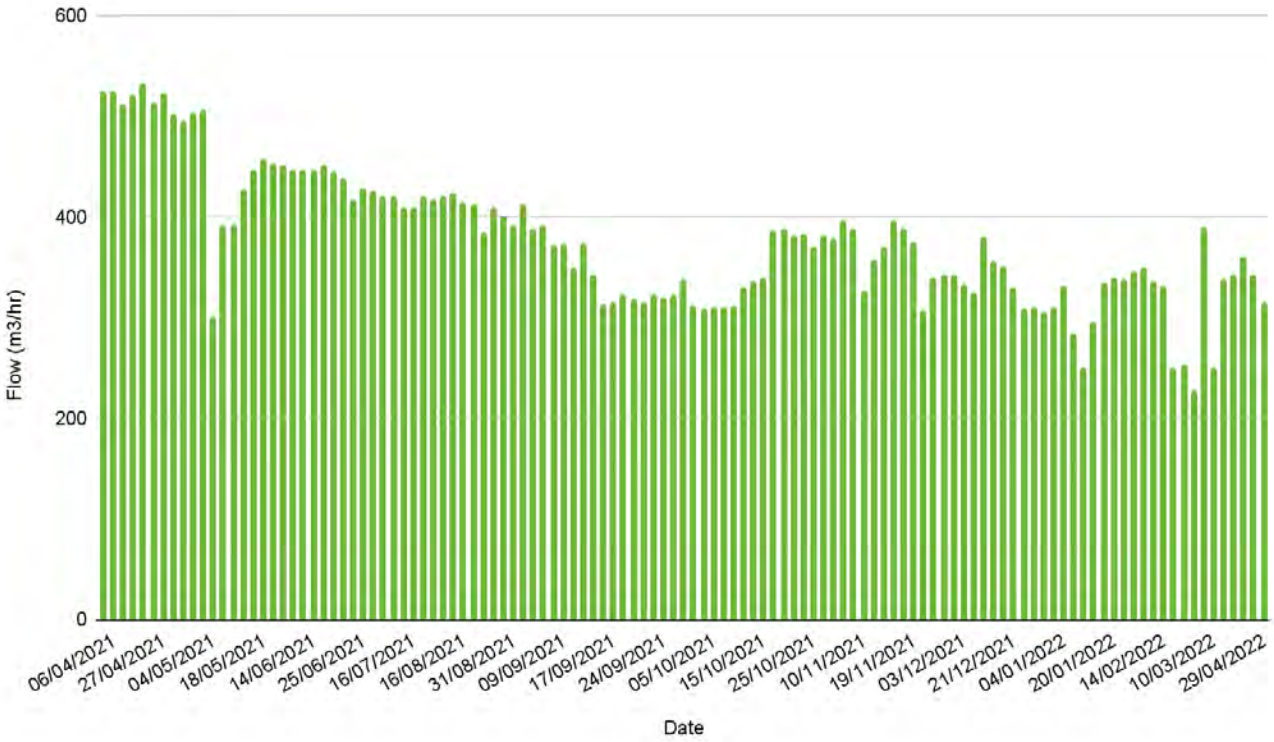
No gas makeup readings this month, as LGI Technicians unable to get to site for handheld readings and remote readings are not available until repairs can be completed.

Date	CH4 %	CO2 %	O2 %	STACK TEMP C	CUMULATIVE FLOW m3	FLOW m3/h
08/04/2022	50	-	-	750	21,588,882	338
12/04/2022	44	-	-	662	21,619,215	343
22/04/2022	45	-	1	665	21,696,086	361
29/04/2022	49.1	28.6	0.4	765	21,756,005	315
Average	**47.025**	**28.6**	0.7	**711**	**-**	**339**

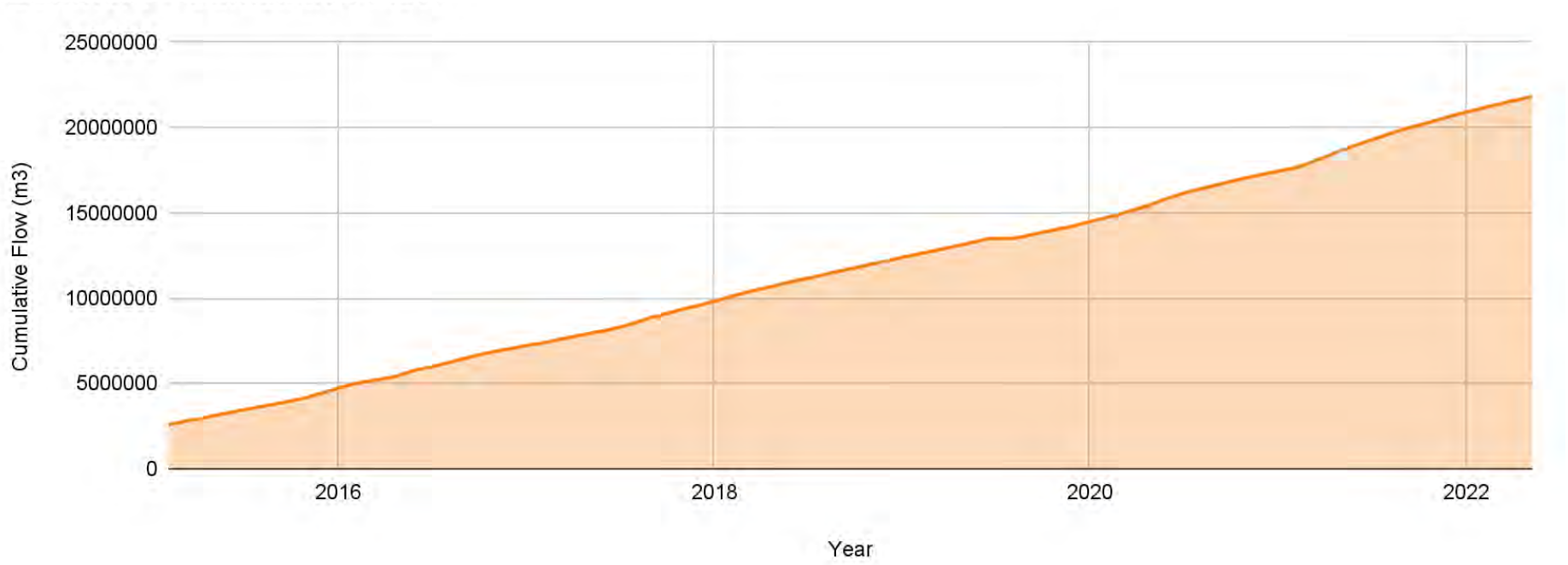
Dunmore- Methane, Carbon Dioxide & Oxygen



Dunmore - Flow Rate



Dunmore - Cumulative Flow



- 21,768,098 of flared landfill gas up to 1 May 2022, which represents;
    - 206,745 tonnes of CO2 equivalent (total methane abated by gas capture system to date).
    - 3,445,745 seedlings planted for 10 years
    - 6,453 (cars off the road for the last 12 months)
- Biogas captured is the cumulative flow reading at the last day of the month.

Please note:

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PROJECT PROFILE: DUNMORE, NSW

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

Results Achieved since the Project Commenced*

BIOGAS CAPTURED	CARBON ABATEMENT	ACCUs CREATED	SEEDLINGS PLANTED	CARS OFF THE ROAD
22 million m3	209 thousand tonnes (t CO2e - environmental benefit)	92 thousand Australian Carbon Credit Units	3.5 million seedlings planted for 10 years (t CO2e)	6,279 for the last 12 months of carbon abatement (t CO2e)

BIOGAS CAPTURE AND CARBON ABATEMENT FROM LANDFILL

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

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* ACCUs created to 15 May 2022. Other Results Achieved to 1 June 2022

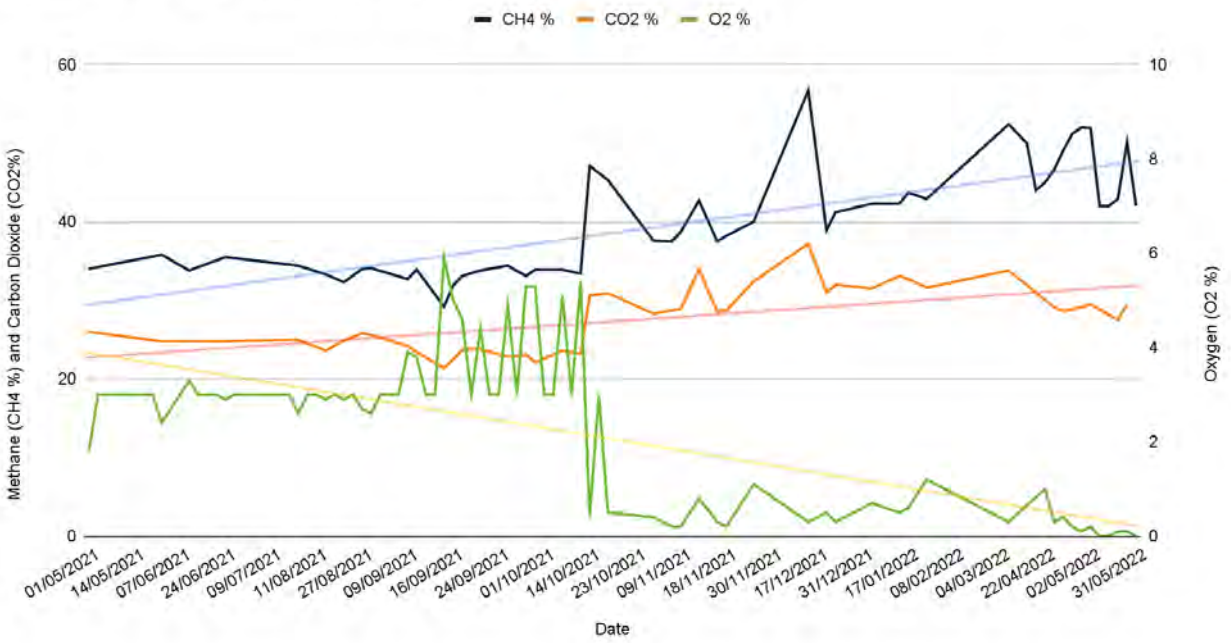
Site:	Dunmore	**Report issue date:**	10/06/2022
Report month:	May 2022	**Prepared by:**	Grace Tap
Prepared for:	Shellharbour City Council	**Checked by:**	Jessica North

Comments on changes to existing system:	• **January 2016 -** LGI disconnected the 4 lateral wells and 8 vertical wells. • **April 2016 -** LGI reconnected 8 vertical wells in the SE corner and 4 lateral wells. • **June 2016 -** LGI disconnected the extended gas capture system to assist council. • **September 2016 -** LGI disconnected the extended gas capture system to assist council. • **November 2016 -** LGI commissioned the connection to leachate sump 6 as of 23-11-2016. • **May 2017 -** LGI installed an additional 10 vertical wells to the existing LFG system • **November 2019 -** LGI on site to move mainline up batter, and reconnected infrastructure that had been previously disconnected, including 4 wells on the dimple and a 160mm leachate riser. • **April 2020 -** LGI installed a flowline to sump 6 after earlier disconnection. • **February 2021 -** LGI installed 13 new vertical wells, including a new submain • **March 2022 -** LGI replaced the flare gas analyser panel with a Draeger model analyser for greater accuracy and reliability
Comments on operation / maintenance:	Availability: 96.09% Down Time: 29.08hrs 23.5 hrs - Unknown cause LGI is investigating 2hrs - Planned Outage - Annual Service 3.5hrs - Forced Outage External - BCU Fault Field Tuned: 02/05/2022 26/05/2022 - Annual Service completed
Recommendations:	LGI and Council agree to progress with gas infrastructure improvements. After discussion with Council, LGI will not implement any leachate pumping until the end of the current rainy season. LGI is investigating an automated louver control system in order to optimise the stack temperature control. LGI are planning to repair pipe work on the top cell to allow operational capping in July 2022.

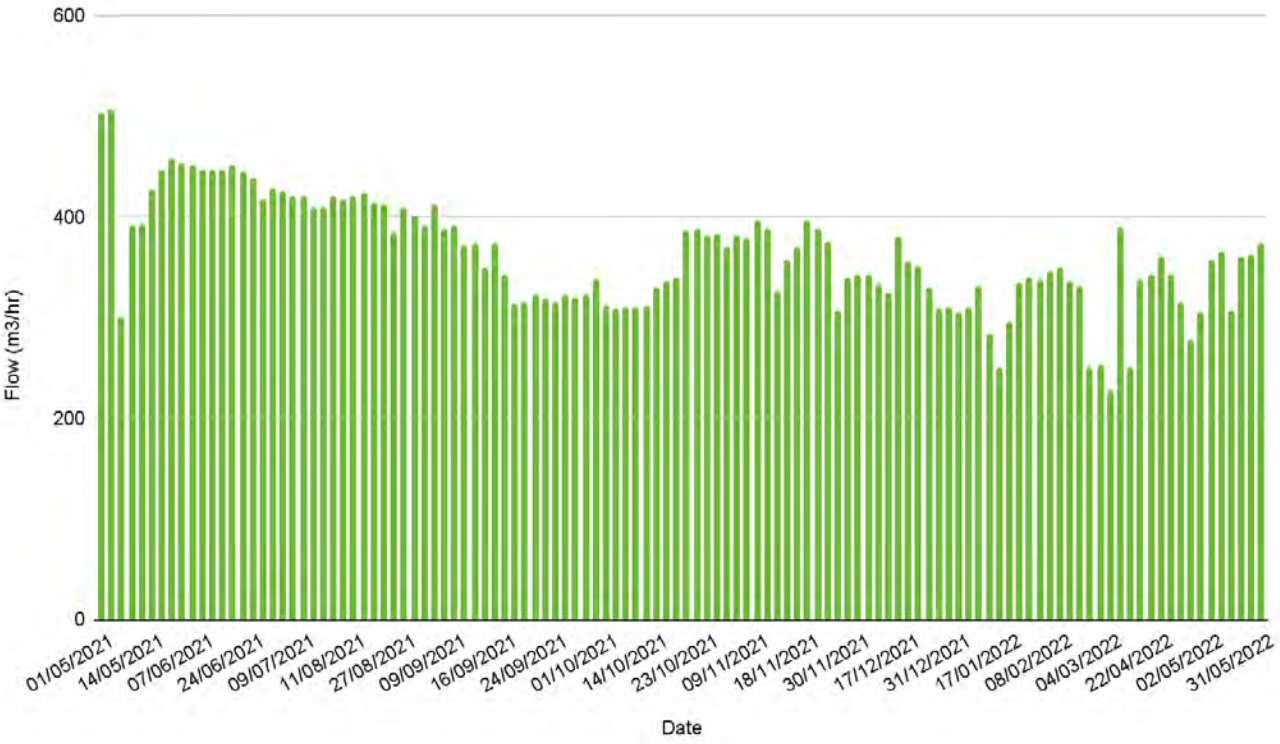
Flare Operational Data:

Date	CH4 %	CO2 %	O2 %	STACK TEMP C	CUMULATIVE FLOW m3	FLOW m3/h
02/05/2022	51.9	29.5	0.2	827	21,777,631	358
10/05/2022	42	-	0	676	21,849,268	365
21/05/2022	42.9	27.5	0.1	746	21,942,310	361
31/05/2022	42	-	0	761	22,019,913	373
Average	**44.7**	**28.5**	0.075	**753**	**-**	**364**

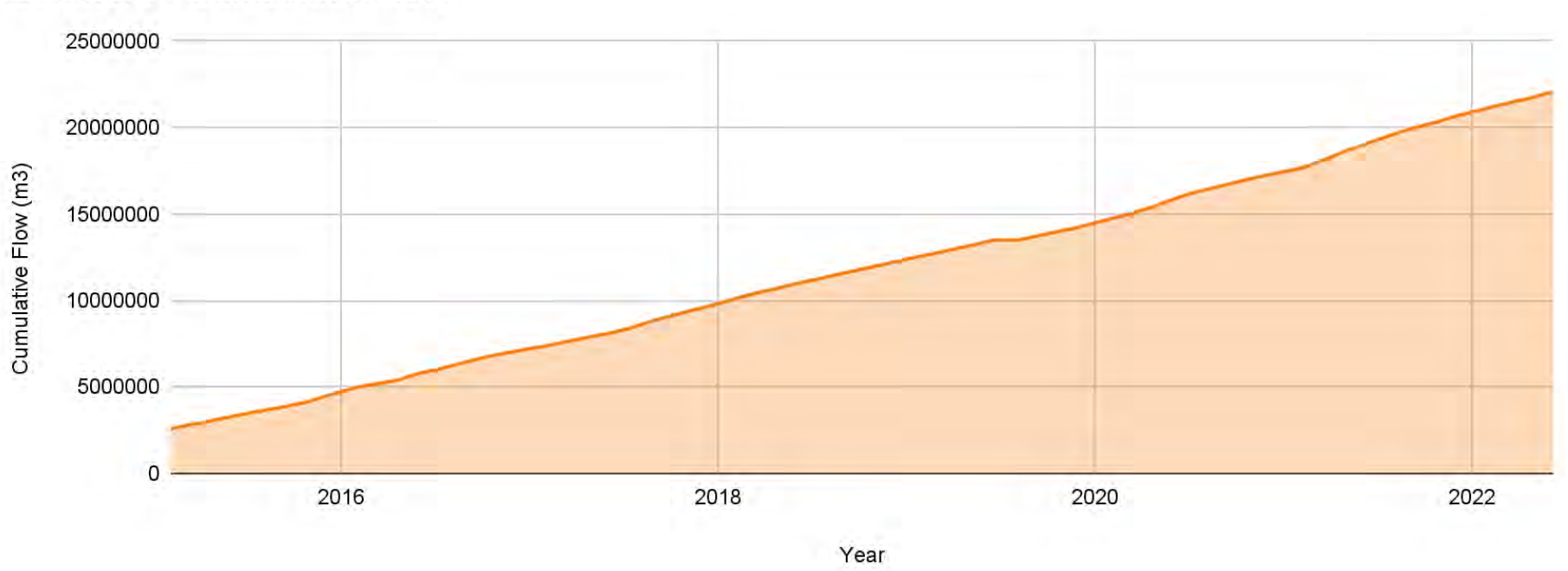
Dunmore- Methane, Carbon Dioxide & Oxygen



Dunmore - Flow Rate



Dunmore - Cumulative Flow



- 22,023,454 of flared landfill gas up to 1 June 2022, which represents;
    - 209,170 tonnes of CO2 equivalent (total methane abated by gas capture system to date).
    - 3,486,166 seedlings planted for 10 years
    - (cars off the road for the last 12 months)
- Biogas captured is the cumulative flow reading at the last day of the month.

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Results Achieved since the Project Commenced*

BIOGAS CAPTURED	CARBON ABATEMENT	ACCUs CREATED	SEEDLINGS PLANTED	CARS OFF THE ROAD
22.3 million m3	212 thousand tonnes (t CO2e - environmental benefit)	92 thousand Australian Carbon Credit Units	3.5 million seedlings planted for 10 years (t CO2e)	6,654 for the last 12 months of carbon abatement (t CO2e)

BIOGAS CAPTURE AND CARBON ABATEMENT FROM LANDFILL

- Long-term contract with Shellharbour City Council to recover and beneficially use biogas and abate carbon from this regional landfill in Dunmore. This improves air quality, reduces greenhouse gas emissions and contributes to the local economy.
- No regulatory requirement to capture biogas, however ACCUs enable additional carbon abatement (above its **30% baseline**) from a commercially viable flaring project under the Emissions Reduction Fund (ERF).
- Since 2013, LGI installed a bespoke biogas management system with an LGI 1000 ERF compliant biogas flare. Council benefits from this bespoke system at minimal cost.
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* ACCUs created to 15 May 2022. Other Results Achieved to 1 July 2022

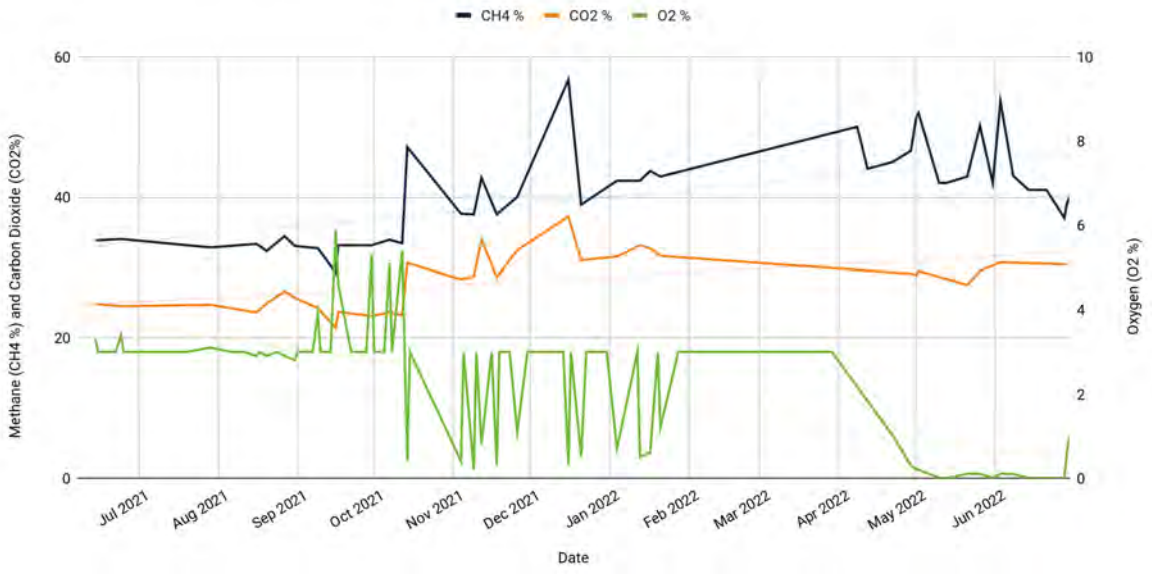
Site:	Dunmore	**Report issue date:**	15/07/2022
Report month:	June 2022	**Prepared by:**	Grace Tap
Prepared for:	Shellharbour City Council	**Checked by:**	Jarryd Doran

Comments on changes to existing system:	• **January 2016 -** LGI disconnected the 4 lateral wells and 8 vertical wells. • **April 2016 -** LGI reconnected 8 vertical wells in the SE corner and 4 lateral wells. • **June 2016 -** LGI disconnected the extended gas capture system to assist council. • **September 2016 -** LGI disconnected the extended gas capture system to assist council. • **November 2016 -** LGI commissioned the connection to leachate sump 6 as of 23-11-2016. • **May 2017 -** LGI installed an additional 10 vertical wells to the existing LFG system • **November 2019 -** LGI on site to move mainline up batter, and reconnected infrastructure that had been previously disconnected, including 4 wells on the dimple and a 160mm leachate riser. • **April 2020 -** LGI installed a flowline to sump 6 after earlier disconnection. • **February 2021 -** LGI installed 13 new vertical wells, including a new submain • **March 2022 -** LGI replaced the flare gas analyser panel with a Draeger model analyser for greater accuracy and reliability
Comments on operation / maintenance:	Availability - 93.95% Down Time: 43.58hrs Causes: 43.58hrs Forced Outage External - damage to well head and Power Outage Field Tuned: - 03/06/2022 - 29/06/2022
Recommendations:	LGI and Council agree to progress with gas infrastructure improvements. After discussion with Council, LGI will not implement any leachate pumping until the end of the current rainy season. LGI is investigating into an automated louver control system in order to optimise the stack temperature control. LGI are planning to repair pipe work on the top cell to allow operational capping in August 2022. LGI will repair damaged well head in July 2022

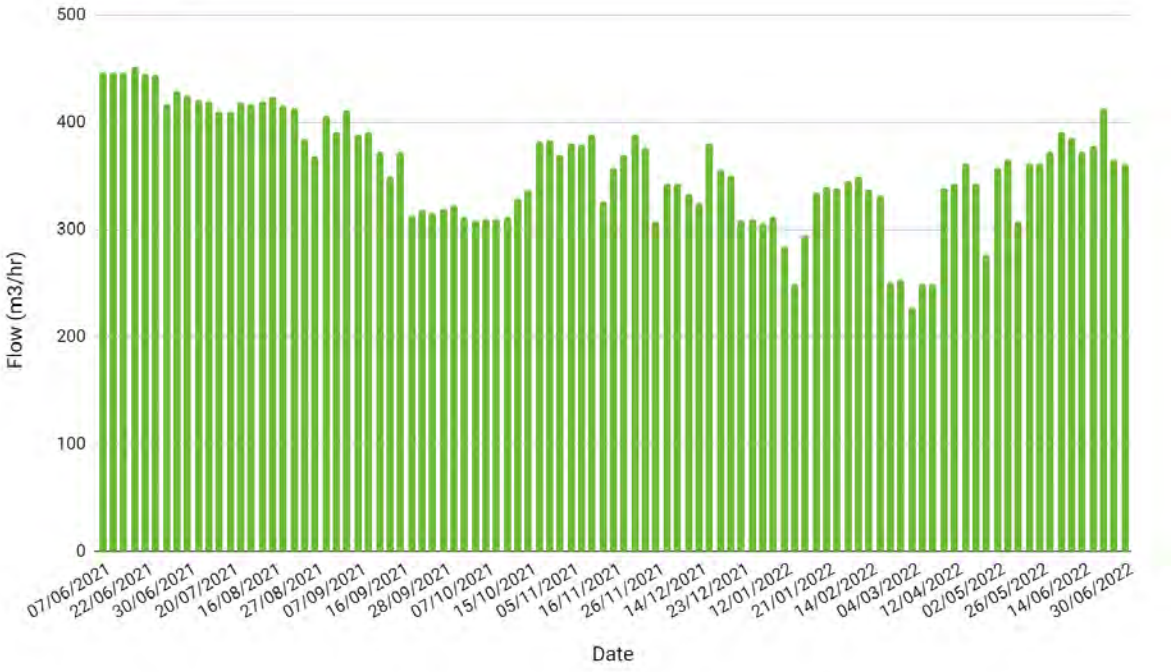
Flare Operational Data:

Date	CH4 %	CO2 %	O2 %	FLOW m3/h	STACK TEMP C	CUMULATIVE FLOW m3
03/06/2022	53.6	30.7	0.1	391	910	22,029,753
14/06/2022	41	-	0	373	646	22,130,039
21/06/2022	41	-	0	378	651	22,195,067
29/06/2022	39	30.4	0.6	365	606	22,271,485
Average	43.65	30.55	0.175	376.75	703.25	-

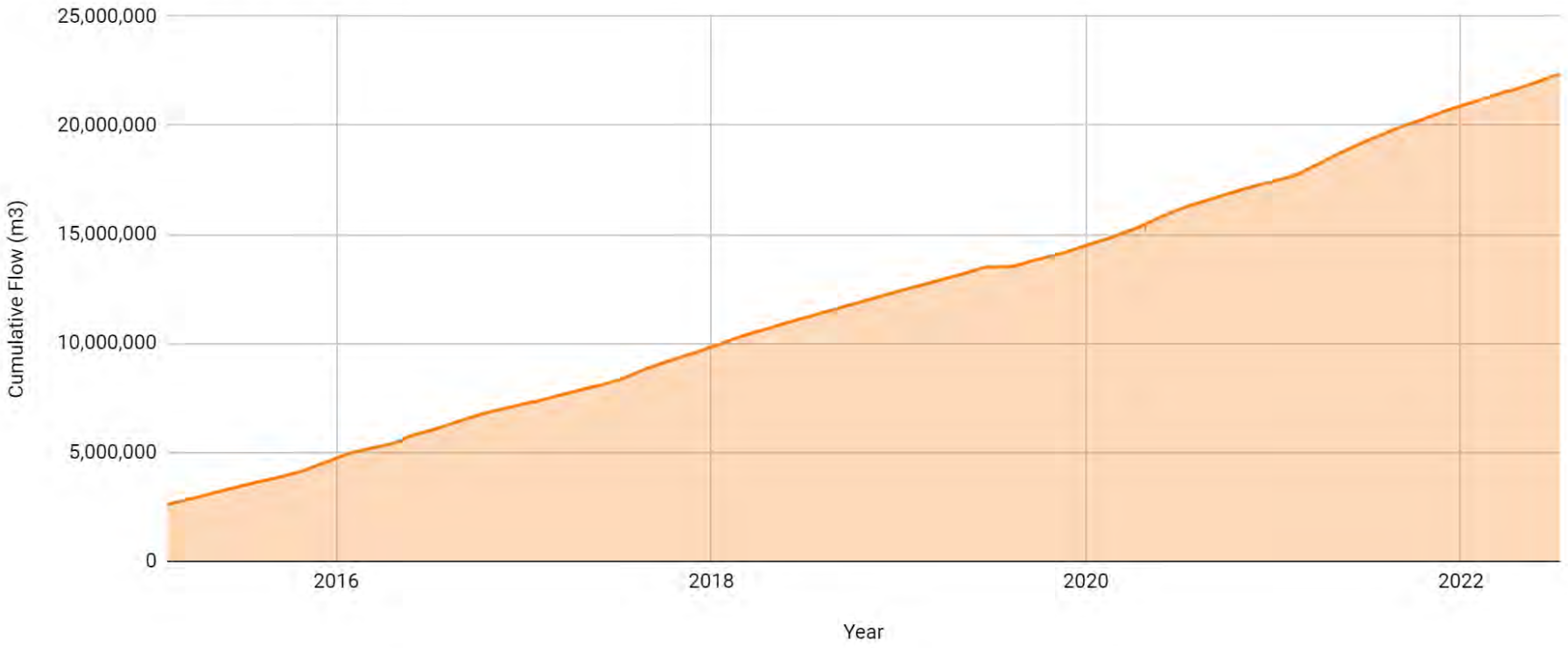
Dunmore- Methane, Carbon Dioxide & Oxygen



Dunmore - Flow Rate



Dunmore - Cumulative Flow



- 22,285,684 of combusted landfill gas up to 1 July 2022, which represents;
    - 211,661 tonnes of CO2 equivalent (total methane abated by gas capture system to date).
    - 3,527,675 seedlings planted for 10 years
    - 6,654 (cars off the road for the last 12 months)
    - 92,714 Australian Carbon Credit Units
- Biogas captured is the cumulative flow reading at the last day of the month.

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