ANNUAL ENVIRONMENTAL MONITORING REPORT (AEMR) 2021-2022

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

ENVIRONMENT PROTECTION LICENCE (EPL) 5984

Prepared For: **Shellharbour City Council**
Project Number: **ENRS0033**
Date: **November 2022**

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

This (AEMR) summarises the results of field testing and laboratory analysis conducted by ALS for the 2021-2022 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.

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

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

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

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

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

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

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

The objectives of this AEMR are to:

- Meet the environmental monitoring requirements of Sites EPLs; No. 5984 and 12903;
- Assess and analyse the environmental monitoring data for the Site against NSW EPA endorsed criteria;
- Identify trends of the environmental monitoring data over the reporting period;
- Identify any on-site or off-site impacts associated with operation of the Site;

- Advise SCC if the current environmental monitoring program is providing adequate information to identify potential environmental impacts from existing operations (if any) and provide recommendations on improvement to the monitoring program if required; and
- Document monitoring results in an Annual Environmental Monitoring Report.

The scope of work for this AEMR comprised the collation, assessment and reporting of Site data made available to ENRS from the 2021-2022 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 2020 reporting period and available data from the last three (3) years;
- Identification of any deficiencies in environmental performance identified by the monitoring data, trends or environmental incidents, and identification of remedial actions taken or proposed to be taken to address these deficiencies; and
- Recommendations on improving the environmental performance of the facility including improvement to the monitoring program.

Based on the findings obtained during the 2021-2022 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 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-19r, BH-21 and BH-22. This was considered to be consistent with historical values;
- Offsite sample locations within Rocklow Creek generally reported satisfactory results. Exceedances for ammonia were recorded in some offsite surface water samples associated with Rocklow Creek, specifically samples SWC-down 14/09/2021, SWC_Down 07/12/2021, SWC_2 10/03/2022 and SWC_Up 10/03/2022.
- Surface gas methane monitoring reported satisfactory results all within the adopted assessment criteria;
- Methane levels of enclosed structures on or withing 250m of deposited waste or leachate storage were tested and found to be below the acceptable threshold for 1% (volume/volume) in all cases;
- Dust deposition gauges recorded satisfactory results below the guidelines provided in AS3580.10.1. Monitoring should continue in accordance with EPL 5984 requirements;

- No non-compliances with the EPL were reported during the 2021-2022 annual monitoring period;
- Based on this review of the 2021-2022 annual 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;
- Flare temperatures fell below the required KPI of 760 degrees Celsius on 19 of 25 occasions over the 2021-2022 monitoring period. Further detail relating to root causes and current works are available in the attached Flare Reports in Appendix G of this report.
- 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 Annual Environmental Monitoring Report (AEMR) for the Dunmore Recycling and Waste Depot (*herein referred to as the Site*).

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1.1 PROJECT BACKGROUND

1.1.1 Site History

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

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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).

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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 AEMR comprised the collation, assessment and reporting of Site data made available to ENRS from the 2021-2022 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.
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- Recommendations on improving the environmental performance of the facility including improvement to the monitoring program.

2.0 SITE DESCRIPTION

2.1 LOCATION

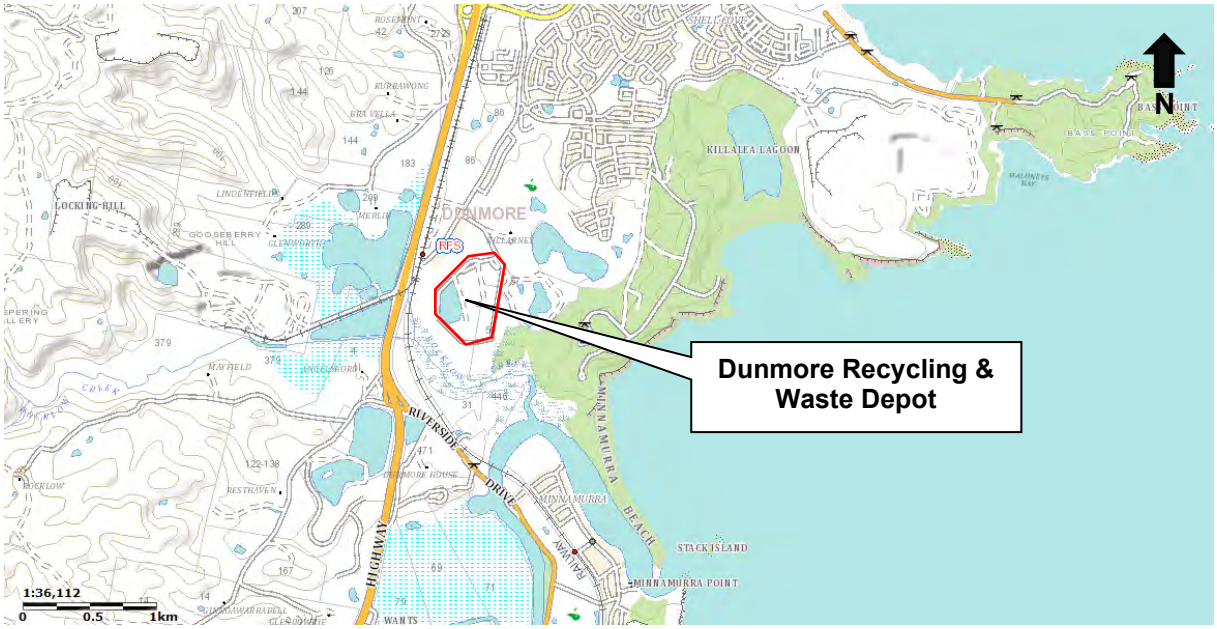
The Site is located at 44 Buckleys Road, Dunmore, NSW, 2529, legally defined as Lot 21 in Deposited Plan 653009 and Lot 1 Deposited Plan 419907. The Site is situated approximately three and a half (3.5) kilometres southwest of the Shellharbour town centre. The area's regional location is defined in **Figure 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. 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 was 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 included; five (5) surface waters, one (1) located onsite and four (4) located off-site; twelve (12) groundwater monitoring wells surrounding the landfill operations; and two (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 is conducted in accordance with *ALS* sampling protocols.

4.1.4 Groundwater Sampling

Groundwater wells were sampled in order of distance from any areas of known contamination to ensure that lower contaminated wells are sampled before likely higher contaminated wells. Groundwater bores were purged prior to sampling by removing at least three (3) well volumes or low flow parameter stabilisation methods applied with field sheets provided to document

pumping volumes and field parameters. Samples were collected using clear disposal bailers. and were sealed in laboratory-prepared sampling containers appropriate for the analysis. All samples were stored on ice immediately after their collection and transported to the laboratory under Chain of Custody (CoC) documentation.

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

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

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

4.1.5 Field Testing

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

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

4.2 DUST DEPOSITION SAMPLING

Measurement of dust deposition was carried out in accordance with the Australian Standard AS3580.10.1 (2016). This Australian Standard provides a mean of determining the mean surface concentration of deposited matter from the atmosphere. The 2021-2022 monitoring period was the first year of the four (4) dust monitoring points.

Dust collection gauges were set up for a one (1) month period between the dates; Q1 18/11/21-07/12/21; Q2 08/02/22-09/03/22; Q3 04/05/22-07/06/22; and Q4 03/08/22-07/09/22. 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. Whenever possible the concentration of methane gas was also recorded in any buildings located within a distance of 250 m of the deposited waste. Any depressions or surface fissures away from the sampling grid were also investigated.

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

Quarterly monitoring data is represented in Table 8 and visually represented in Chart 1. Quality Assurance and Quality Control (QA/QC)

4.7 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.

4.8 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 11** and **Table 12**. Results were generally reported within the acceptance criteria documented in Table 4 of AS4482.1-2005, the RPD for inorganics was set at <30% and for organics set at <50%.

Duplicate results for groundwater QC showed 100% compliance between sample and duplicate results but some non-compliances were noted in the results of the surface water sample and its duplicate. For 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. However, non-conforming QC data may be evidence of external factors including non-homogenous sample matrix which may be present through the inclusion of sediments or suspended solids in the surface water samples.

4.9 EPL NON-COMPLIANCE

Monitoring requirements were generally met during the 2021-2022 monitoring period as defined by the EPL.

5.0 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 - Table 12** with comparison against the relevant Site Assessment Criteria (SAC). The laboratory certificates of analysis are provided in Appendix B.

5.1 OVERFLOW RESULTS

A total of Four (4) overflow samples were taken at SWP-1 during the 2021-2022 period and are displayed in **Table 6** below. On all occasions samples results were compliant to the EPA trigger values for pH and Suspended Solids concentrations.

Table 6: Summary Table of Overflow Events

Sample Date	pH	TSS	Ambient Temperature	Rainfall (mm) Previous 24Hrs
13/05/2022	7.90	23	20.6	28.6
24/05/2022	7.60	7	16.9	22.6
21/10/2022	7.90	21	22.0	52.2
25/10/2022	7.90	23	24.9	60.0

5.2 FIELD TESTING

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

- Oxidation-reduction reaction (ORP Redox);
- Electrical Conductivity (Salinity);
- pH (Acidity); and
- Dissolved Oxygen (surface waters only).

5.3 PHYSICAL INDICATORS

5.3.1 Depth

Groundwater

The 2022 September Quarter (Q4) measured depth of groundwater between **0.64 mbgl** (BH-15, 06/09/2022) to **4.56 mbgl** (BH-14, 06/09/2022). Although results are generally consistent

with historical data of groundwaters a higher degree of variance is evident in the longer term, which appears consistent with the increased rainfall events noted in recent years.

5.3.2 Temperature

Groundwater

In the 2022 September Quarter, temperature of groundwater ranged between **14.8°C** (BH-15, 06/09/2022) and **25.3°C** (BH-1C, 06/09/2022). Groundwater temperatures remained consistent with historical data.

Surface Waters

The 2022 September Quarterly Surface water temperature at SWP-1 was **12.1°C** (06/09/2022). The results of additional overflow samples taken at this location in October 2022 are summarised in **Table 6** above. Surface Water temperatures remain consistent with historical data.

Leachate

The 2022 September Quarter Leachate Temperatures at the leachate Tank (LP-1) was **13.0°C** (05/0/2022). Allowing for seasonal variability Leachate temperatures remain consistent with historical data.

5.3.3 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 for 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 September Quarter 2022 monitoring period, salinity ranged between; **822 µS/cm** (BH-18, 06/09/2022) and **7,360 µS/cm** (BH-1C, 05/09/2022). With the exception of BH1c, BH13 and BH18, all other groundwater monitoring locations generally trended downwards with respect to salinity over the 2021-2022 monitoring period. In the final monitoring round of September 2022 four (4) sites reported salinity values in excess of freshwater SAC of **2,200 µS/cm**.

Surface Waters

In the 2022 September Quarter, Electrical Conductivity results for onsite surface water (SWP-1, 05/09/2022) was **585 µS/cm** which corresponds to a calculated Total Dissolved Solids result of **392 mg/L**. These results are below the TV.

Electrical conductivity for offsite surface waters ranged between **1,370 µS/cm** (SWC-Up, 05/09/2022) to **1,990 µS/cm** (SWC-Down_2, 05/0/2022).

Calculated Total Dissolved Solids results for offsite surface waters located along Rocklow Creek ranged between **990 mg/L** (SWC-Up, 05/09/2022) to **1,410 mg/L** (SWC-Down_2, 05/0/2022). The results are consistent with a tidal creek.

Leachate

Leachate salinity for the 2022 September Quarter was **8,230 µS/cm** (LP1, 05/09/2022) which was above the TV. Leachate Salinity has been trending down since the implementation of the

new Leachate Treatment Plant and the subsequent disposal of treated leachate to sewer which commenced in July/August 2021.

5.3.4 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 in the 2022 September Quarter was **8.7 mg/L** (05/09/2022). The DO concentration of additional overflow samples was **5.77 mg/L** (21/10/2022) and **4.34 mg/L** (25/10/2022). Both results are below the TV. Results are consistent with historical data.

During the 2022 September Quarter Dissolved Oxygen for the offsite surface waters at Rocklow Creek ranged from **9.01 mg/L** (SWC-2, 05/09/2022) to **9.37 mg/L** (SWC-down, 05/09/2022). All Dissolved Oxygen results were compliant to the TV requirements. Results are consistent with historical data.

Leachate

Dissolved oxygen at LP1 (Leachate Tank) was **7.14 mg/L** (05/09/2022). Leachate results are consistent with historical data.

5.3.5 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

For the September 2022 monitoring period Groundwater pH was reported between **pH 6.7** (BH-13, BH-14 & BH-18, 05/09/2022) and **pH 7.4** (BH-3 & BH-19r, 05/09/2022). All groundwater results were reported within the ANZECC recommended range of pH 6.5-8.0. The results are generally consistent with historical data.

Surface Water

Surface water for the 2022 September Quarter reported pH values of between **pH 7.60** (SWP-1, 05/09/2022) and **pH 7.40** (SWC-2, SWC-down, SWC-down2, 05/09/2022). The pH of additional overflow samples collected from SWP-1 was **7.90** (21/10/2022) and **7.90 (25/10/2022)** respectively. All groundwater results were reported within the ANZECC recommended range of pH 6.5-8.0. The results are consistent with historical data.

Leachate

During the 2022 September monitoring period leachate pH at LP-1 was reported at **pH 8.90** (05/09/202). Results are consistent with the historical values.

Leachate pH has been trending upward since the implementation of the new Leachate Treatment Plant and the subsequent disposal of treated leachate to sewer which commenced in July/August 2021 but has remained consistent between **pH 8.8** (07/03/2022) and **pH 9.00** (07/06/2022) for the last three (3) quarters.

5.3.6 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 September 2022 Quarter were reported between **6 mg/L** (SWC_Down, 05/09/2022 and **9 mg/L** (SWP-1 & SWC-Down_2, 05/09/202). All results were below the 50mg/L TV. TSS results are consistent with historical results.

The TSS of additional Overflow samples collected from SWP-1 was **23.0 mg/L** (21/10/2022) and **17.0 mg/L (25/10/2022)** respectively. All results were below the **50mg/L** TV.

5.4 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.

5.4.1 Ammonia

Groundwater

For the September 2022 monitoring period, ammonia was measured within groundwater monitoring bores between **0.59 mg/L** (BH14, 05/09/2022) and **376 mg/L** (BH-1c, 05/09/2022). With the exception of BH-14 all groundwater wells exceeded the adopted trigger value of **0.91 mg/L** throughout the monitoring period. This is consistent with historical values.

Surface Water

Ammonia in surface water at SP-1 was **1.82 mg/L** (05/09/2022) which is generally consistent with previous routine monitoring samples. Additional overflow samples taken from this location

yielded ammonia concentrations of **16.4 mg/L** (21/10/2022) and **15.8 mg/L** (25/10/2022). Overflow samples taken in May 2022 yielded similar results with ammonia concentrations of **15.8 mg/L** (13/05/2022) and **22.4 mg/L** (24/05/2022) indicating elevated ammonia levels are associated with overflow samples.

Ammonia concentrations in Offsite surface waters associate with Rocklow Creek ranged from **0.15 mg/L** (SWC_Up, 05/09/2022) to **0.46 mg/L** (SWC_2, 05/09/2022) during the monitoring period and are generally consistent with historical data.

Leachate

Ammonia in leachate during the September 2022 monitoring period was reported at **877 mg/L** (LP1, 05/09/2022). Although high ammonia concentrations are expected in untreated leachate ammonia concentrations appear to be trending down slightly since the implementation of the new Leachate Treatment Plant and the subsequent disposal of treated leachate to sewer which commenced in July/August 2021.

5.4.2 Nitrate

Groundwater

During the September 2022 monitoring period results for Nitrate in groundwater were reported between **<0.1 mg/L** in multiple bores and **6.37 mg/L** (BH-3, 05/09/2022). Only one (1) groundwater well reported an exceedance above the TV of 0.7mg/L throughout the 2021-2022 monitoring period (BH-3, 05/09/2022) down from four (4) wells in the previous Annual Report.

Surface Water

During the September 2022 monitoring period exceedances to the Nitrate TV of 0.7 mg/L was reported for all surface water samples including **2.06 mg/L** (SWP-1, 05/09/2022). The Nitrate concentration of additional overflow samples from SWP-1 were also elevated at **0.98 mg/L** (SWP-1, 21/10/2022) and **1.04 mg/L** (SWP-1, 25/10/2022). Prior to the exceedance noted on the 05/09/2022 historical nitrate concentrations were generally compliant with the TV of 0.7mg/L. Elevated nitrate concentrations in overflow samples at SWP-1 may be indicative that the entrainment of nitrates in surface water may be facilitating their migrating to the offsite surface waters of Rocklow Creek.

Nitrate concentrations for offsite surface waters in Rocklow Creek during the same monitoring period values ranged from **0.84 mg/L** (05/09/2022, SWC_Down_2) to **0.88 mg/L** (05/09/2022, SWC_Up). The Nitrate concentrations of all offsite surface water samples exceeded the TV of 0.7mg/L for the September 2022 monitoring round.

Leachate

Nitrate concentration of leachate (LP-1) was elevated at **1.0mg/L** during the September 2021-2022 monitoring period. Generally, nitrate levels have been consistently trending around **0.1mg/L** but uncharacteristic spikes have been observed on three (3) occasions in the past, **1.2mg/L** (01/02/2018), **0.71mg/L** (13/11/2018) and **0.86mg/L** (11/03/2020).

Groundwater

Results for the September 2022 monitoring period indicated Nitrate concentrations in groundwater were between **<0.01 mg/L** in multiple bores and **6.37 mg/L** (BH-3, 05/09/2022). Nitrate levels are consistent with historical data.

Anions

5.4.3 Chloride

Groundwater

In the September 2022 monitoring period, results for Chloride in groundwater were reported between **58 mg/L** in (BH-14, 05/09/2022) and **940 mg/L** (BH-1c, 05/09/2022). Results are generally consistent with historical data.

Surface Water

During the September 2022 monitoring period chloride results for surface water SWP-1 was **93 mg/L** (05/09/2022). Two additional overflow samples from this location yielded results of **214 mg/L** (21/10/2022) and **178 mg/L** (21/10/2022). Results are generally consistent with historical data.

Leachate

September 2022 Chloride concentration at the Leachate Tank (LP-1) was **1840 mg/L** (05/09/2022). The result was consistent with historical data.

5.4.4 Fluoride

Groundwater

In the September 2022 monitoring period results for Fluoride in groundwater were reported between **<0.1 mg/L** (BH-4, 05/09/2022) and **0.5 mg/L** (BH-14, 05/06/2022). Results are consistent with previous data.

Surface Water

During the September 2022 monitoring period fluoride results for surface water SWP-1 was **<0.1 mg/L** (05/09/2022). Two additional overflow samples from this location yielded results of **0.4 mg/L** (21/10/2022) and **0.4 mg/L** (21/10/2022). Results are generally consistent with historical data.

Leachate

Leachate results for fluoride at the leachate tank (LP-1) during the September 2022 monitoring period was **0.2 mg/L** (05/09/32022). Results are consistent with historical data.

5.4.5 Sulphate

Groundwater

The September 2022 results for Sulphate in groundwater were reported between **<10 mg/L** BH-1c, 05/09/2022) and **473 mg/L** (BH-15, 05/092022). A spike on Sulphate concentration of **1,270 mg/L** was noted (BH15, 08/06/2022). However, sulphate levels returned to typical levels in the following sampling round. Results are generally consistent with historical data.

Surface Water

During the September 2022 monitoring period Sulphate levels in surface water was determined at **44 mg/L** (SWP-1, 05/09/2022). The sulphate concentration of overflow samples taken from SWP-1 were **115 mg/L,** (21/10/202) and **104 mg/L,** (25/10/202).

During the September 2022 monitoring period Sulphate levels for the offsite surface waters ranged between **74 mg/L** (SWC-Up, 05/09/2022) and **104 mg/L** (SWC-Down_2, 05/09/2022).

Sulphate levels in the offsite surface waters have generally been trending down since 15/12/2020.

Leachate

Sulphate level at the leachate tank (LP-1) was **<10 mg/L** (0/09/2022). Results are consistent with historical data.

5.4.6 Total Alkalinity

Surface Water

Total Alkalinity at SWP-1 during h septime 2022 monitoring period was **361 mg/L** (05/09/2022). Results are consistent with historical data.

Leachate

Total Alkalinity in Leachate (LP-1) ranged was **3,700 mg/L** (05/09/2022). Results are consistent with historical data.

5.4.7 Bicarbonate Alkalinity

Groundwater

During the September 2022 monitoring period Bicarbonate in groundwaters ranged from **308 mg/L** (BH-19r, 05/09/2022) to **2,540 mg/L** (BH-1C, 05/09/2022). Results are generally consistent with historical data.

Metals & Metalloids

5.4.8 Manganese (Total Mn)

Groundwater

Manganese was analysed in groundwater, surface water and leachate sampling points. Concentrations of Manganese in groundwater for the September 2022 monitoring period were reported between **0.022 mg/L** (BH-3, 05/09/2022) and **0.597 mg/L** (BH-21, 05/09/2022). The results are generally consistent with historical data.

Surface Water

During the September 2022 monitoring period the Manganese concentration at SWP-1 was **0.067 mg/L** (05/09/2022). Despite slightly elevated values of **0.903 mg/L** (24/05/2022) and **0.994 mg/L** (07/06/2022) Manganese concentration have been generally trending down at this sample location from a concentration maximum of 1.38 mg/L (15/12/2020).

Leachate

During the September 2022 monitoring period Manganese concentration of Leachate was reported as **0.106 mg/L** (Tank, 15/12/2020). These values are below the adopted TV (1.9 mg/L 95% of Species - freshwater) and are considered acceptable. Concentrations of Manganese have been trending down since 14/09/2021 which coincides with onsite changes to leachate management systems culminating in average discharges of 60kL/day of treated water, equating to approximately 22ML of leachate removal from site per annum. Manganese concentrations should continue to be reviewed during subsequent monitoring events.

5.4.9 Iron (Total Fe)

During the September 2022 monitoring period Iron was measured in selected surface water samples including SWP-1 and Leachate Tank.

Surface Water

Concentrations of total iron within onsite surface water was reported as **1.01 mg/L** (SWP-1, 05/09/2022). Iron levels in additional overflow samples from this location were reported as **1.99 mg/L** (SWP-1, 21/10/2022) and **0.76 mg/L** (SWP-1, 25/10/2022). Results are generally consistent with historical data.

Leachate

Concentration of iron at the leachate Tank (LP-1) was **1.29 mg/L** (05/09/2022). Results are generally consistent with historical data.

5.4.10 Iron (Dissolved Fe)

During the September 2022 monitoring period the concentration of Dissolved Iron was measured in selected Groundwater locations across the site.

Groundwater

Dissolved iron was measured within selected groundwater and surface water sampling points. Groundwater results were reported between the laboratory lower limit of detection of **<0.05 mg/L** (BH14, 06/09/2022) and **9.45 mg/L** (BH15, 06/09/2022). Results are generally consistent with historical data.

5.4.11 Calcium

During the September 2022 monitoring period Calcium concentration was measured within selected groundwater and surface water sampling points.

Groundwater

Groundwater results were reported between **88 mg/L** (BH-19r, 06/09/2022) and **177 mg/L** (BH9, 06/09/2022). Results are generally consistent with historical data.

Surface Water

Calcium in surface water ranged from **52 mg/L** (SWP-1, 05/09/2022). Calcium levels in additional overflow samples from this location were reported as 63 **mg/L** (SWP-1, 21/10/2022) and **0.62 mg/L** (SWP-1, 25/10/2022). Results are generally consistent with historical data.

Calcium levels of offsite surface waters ranged between **38 mg/L** (SWC-Up, 05/09/2022) to **43 mg/L** (SWC-2 & SWC-down 2, 05/09/2022). Results are generally consistent with historical data.

Leachate

Calcium concentration in Leachate (LP-1) was **44 mg/L** (05/09/2022). Results have been generally trending down since late 2021 14/09/2021 which coincides with onsite changes to leachate management systems culminating in average discharges of 60kL/day of treated water, equating to approximately 22ML of leachate removal from site per annum.

5.4.12 Potassium

During the September 2022 monitoring period Potassium was measured within selected groundwater and surface water sampling points.

Groundwater

Groundwater results were reported between the laboratory **12 mg/L** BH-18, 06/09/2022 and **208 mg/L** (BH1c, 06/09/2022). Potassium levels in groundwaters are generally consistent with historical data.

Surface Water

Potassium levels in the offsite groundwaters ex Rocklow Creek ranged from **45 mg/L** (SWC-up, 17/06/2021) to **375 mg/L** (SWC-down 2, 15/12/2020). Surface water results for Potassium are generally trending down with respect to historical data.

Organic Analytes

5.4.13 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 September 2022 monitoring period at the following concentrations:

Groundwater

TOC levels ranged between **14 mg/**L (BH-4; 06/09/2022) and **194 mg/L** (BH-1c; 06/09/2022). Results are generally consistent with historical data.

Onsite Surface Water

TOC level at **SWP-1** was recorded as **19 mg/L** (SWP-1, 05/09/2022). Additional overflow samples taken from this location were **28 mg/L** (SWP-1, 21/10/2022) and **23 mg/L** (SWP-1, 25/10/2022). Results are generally consistent with historical data.

Offsite Surface Water

TOC levels of all offsite surface waters were reported as **8 mg/L** (05/09/2022).

Leachate

TOC level was **401 mg/L** (Leachate Storage Tank, 05/09/2022).

6.0 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 for each sampling round, in general accordance with AS3580.10.1. A total of four (4) quarterly (Q) rounds were conducted over the 2021-2022 monitoring period; Q1 18/11/2021 – 07/12/2021; Q2 08/02/2022 – 09/03/2022; Q3 04/05/2022 – 07/06/2022; and Q4 03/08/2022 – 07/09/2022. A summary of the September 2022 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	**0.6**	Satisfactory
DDG2		**0.6**	Satisfactory
DDG3		**0.6**	Satisfactory
DDG4		**1.7**	Satisfactory

Results for depositional dust during the 2021-2022 annual monitoring period reported levels of dust below the adopted assessment criteria of **4 g/m^2/month**. Since No exceedances were recorded during the Q1, Q2, Q3 or Q4 monitoring periods 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.

7.0 METHANE MONITORING

7.1 SURFACE GAS METHANE

The surface gas monitoring for the 2021-2022 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.

A review of corresponding the Quarterly monitoring Reports for the 2021-2021 Q1, Q2 and Q3 monitoring periods confirmed that levels of surface methane above the EPA license limits of 500 ppm were NOT DETECTED during these monitoring periods. The annual monitoring results are considered satisfactory.

7.2 GAS ACCUMULATION MONITORING IN ENCLOSED STRUCTURES

The internal methane testing for enclosed structures within 250m of the landfill during the September 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. A review of corresponding the Quarterly monitoring Reports for the 2021-2021 Q1, Q2 and Q3 monitoring periods confirmed that levels of methane above the EPA

license limits of 1% V/V were NOT DETECTED during these monitoring periods. The annual monitoring results are considered satisfactory.

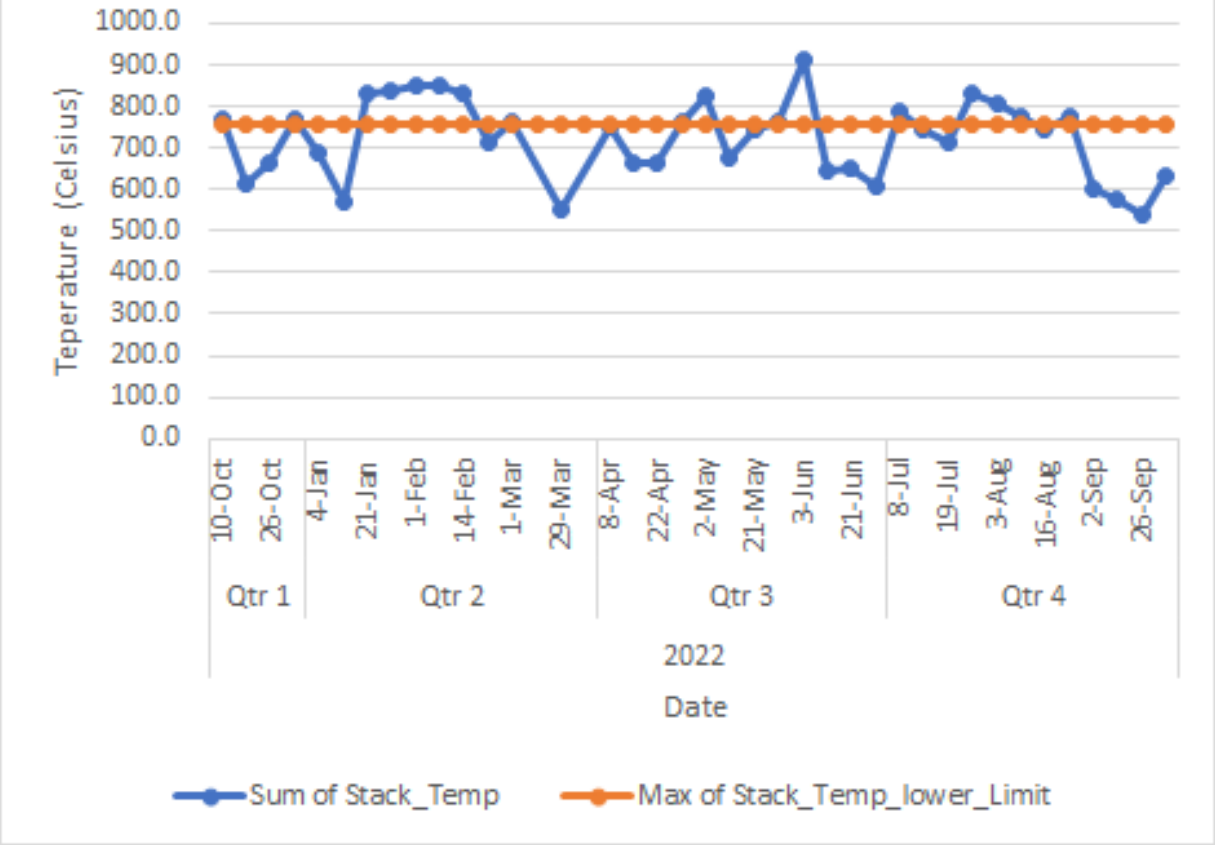
8.0 FLARE OPERATIONS

Table 8: Summary of Flare Operating Temperatures

Year	Quarter	Date	Compliant	Non-Compliant
2021	Qtr 1	10-Oct	769.0	-
		18-Oct	-	614.0
		26-Oct	-	662.0
		31-Oct	767.0	-
2022	Qtr 2	4-Jan	-	688.0
		13-Jan	-	573.0
		21-Jan	832.0	-
		28-Jan	840.0	-
		1-Feb	850.0	-
		8-Feb	853.0	-
		14-Feb	833.0	-
		25-Feb	-	711.0
		1-Mar	765.0	-
		10-Mar	-	-
		29-Mar	-	549.0
		31-Mar	-	-
	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
	Qtr 4	8-Jul	786.0	-
		13-Jul	-	745.0
		19-Jul	-	715.0
		29-Jul	832.0	-

Year	Quarter	Date	Compliant	Non-Compliant
		3-Aug	809.0	-
		10-Aug	778.0	-
		16-Aug	-	745.0
		18-Aug	776.0	-
		2-Sep	-	600.0
		8-Sep	-	575.0
		26-Sep	-	538.0
		30-Sep	-	633.0

Chart 1: Weekly Flare Operating Temperatures 2021-2022



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 5 out of 12 occasions during the September monitoring period.

The actions taken in September 2022 to address the root causes are outlined in the LGI Gas Flare reports included as **Appendix G**. Actions taken prior to the September 2022 period can be found in previous quarterly reports.

9.0 ANNUAL ENVIRONMENTAL ASSESSMENT

9.1 MONITORING POINT SUMMARY

Field measurements and NATA laboratory results for dust and methane results from the annual 2021-2022 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 2-60** attached.

Monitoring point Exceedances to the SAC are highlighted in Table 9, Table 10, Table 11 and Table 12.

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

A Concentration Monitoring Summary table has been prepared for the 2021 – 2022 monitoring period and is attached as Appendix I.

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 and mainained 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 2021-2022 monitoring results indicate no significant change in environmental conditions at the Site over the past three (3) years but did indicate downward trends in the concentrations of some pollutants at various locations across the Site. These are discussed in more detail within the relevant sections of this report. 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 sample holding time.

10.0 CONCLUSIONS

Based on the findings obtained during the 2021-2022 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 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-19r, BH-21 and BH-22. This was considered to be consistent with historical values;
- Offsite sample locations within Rocklow Creek generally reported satisfactory results. Exceedances for ammonia were recorded in some offsite surface water samples associated with Rocklow Creek, specifically samples SWC-down 14/09/2021, SWC_Down 07/12/2021, SWC_2 10/03/2022 and SWC_Up 10/03/2022.
- Surface gas methane monitoring reported satisfactory results all within the adopted assessment criteria;
- Methane levels of enclosed structures on or withing 250m of deposited waste or leachate storage were tested and found to be below the acceptable threshold for 1% (volume/volume) in all cases;

- Dust deposition gauges recorded satisfactory results below the guidelines provided in AS3580.10.1. Monitoring should continue in accordance with EPL 5984 requirements;
- No non-compliances with the EPL were reported during the 2021-2022 annual monitoring period;
- Based on this review of the 2021-2022 annual 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;
- Flare temperatures fell below the required KPI of 760 degrees Celsius on 19 of 25 occasions over the 2021-2022 monitoring period. Further detail relating to root causes and current works are available in the attached Flare Reports in Appendix G of this report.
- 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

ANZECC (1996). Guidelines for the Laboratory Analysis of Contaminated Materials.

ANZECC (2000) Australian Water Quality Guidelines for Fresh and Marine Waters. Australian and New Zealand Environment & Conservation Council. ISBN 09578245 0 5 (set).

ANZG (2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia.

Australian Government (2011) National Health & Medical Research Council. National Resource Management Ministerial Council. National Water Quality Strategy. Australian Drinking Water Guidelines.

Australian Standard AS 3580.10.1. Methods for sampling and analysis of ambient air; method 10.1- Determination of particulate matter - Deposited matter - Gravimetric method

Environmental Earth Sciences (2018) Annual Report 2018- Environmental Monitoring at the Dunmore Recycling and Waste Depot, Dunmore, New South Wales

NEPC (2013). National Environment Protection (Assessment of Site Contamination) Measure.

Netherlands (1994) Environmental Quality Objectives in the Netherlands. Ministry of Housing, Spatial Planning and the Environment, Netherlands Government. ISBN 90-6092-783-4.

NSW Department of Environment and Climate Change (2009a). Contaminated Sites: Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997

NSW Department of Environment and Conservation (1997). Guidelines for the Assessment and Management of Groundwater Contamination

NSW EPA (1995) Sampling Design Guidelines. ISBN 0-7310-3756-1.

NSW EPA (2020) Guidelines for Consultants Reporting on Contaminated Sites.

NSW Department of Environment and Conservation (1997). Guidelines for the Assessment and Management of Groundwater Contamination.

NSW EPA (1996) Environmental Guidelines: Solid Waste Landfills. ISBN 0 7310 3774 X

NSW EPA (2016) Environmental Guidelines: Solid Waste Landfills (2nd Edition). ISBN 978 1 76039 350 2

NSW EPA (Mar. 2020) Environmental Protection Licence (EPL) 5984

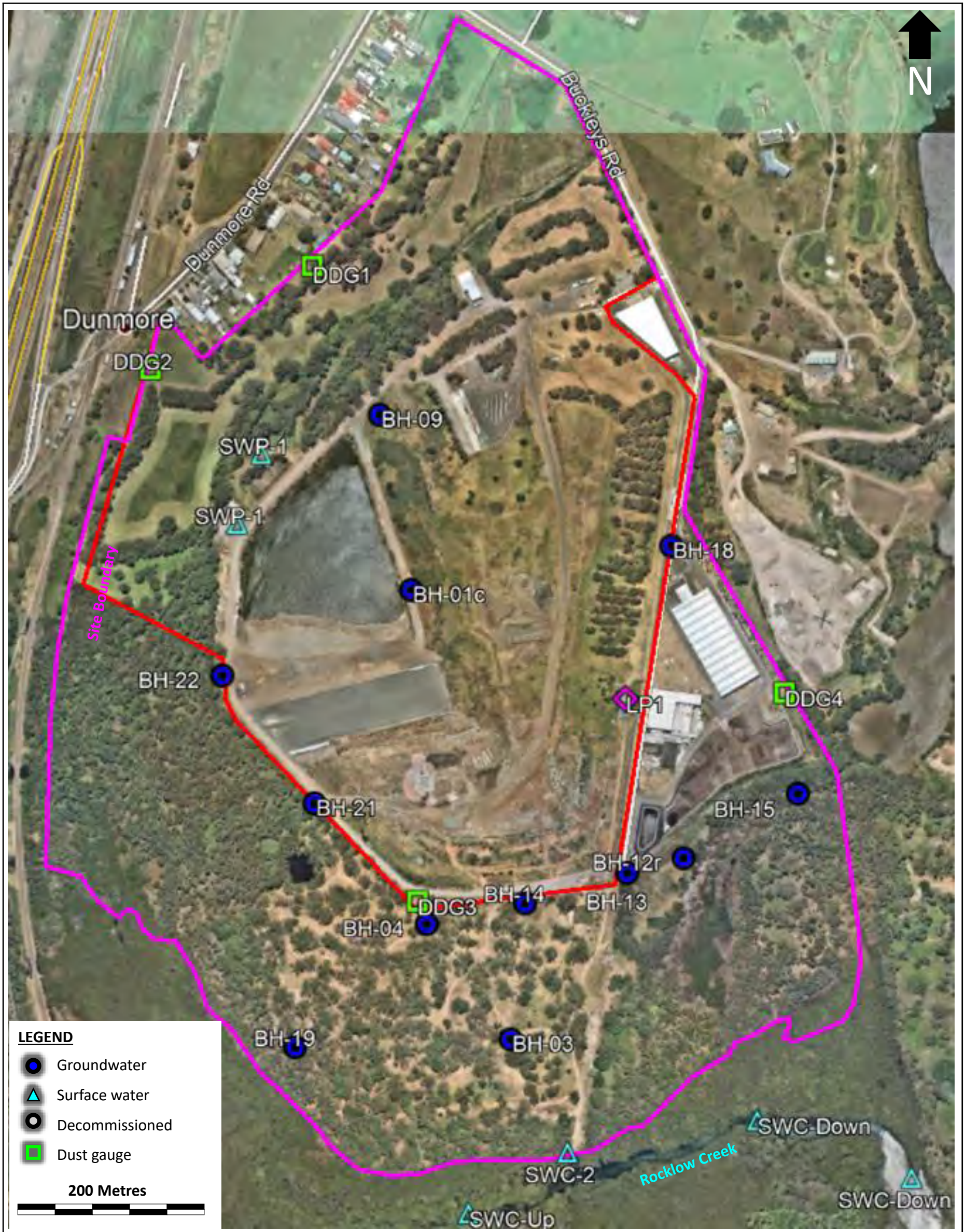
NSW EPA (Dec. 2017) Environmental Protection Licence (EPL) 12903

NSW Government (1997). Protection of the Environment Operations Act.

NSW Government (2005). Protection of the Environment (Waste) Regulation.

NSW Landcom (2008). Managing Urban Stormwater: Soils and Construction, Volume 2B – Waste Landfills.

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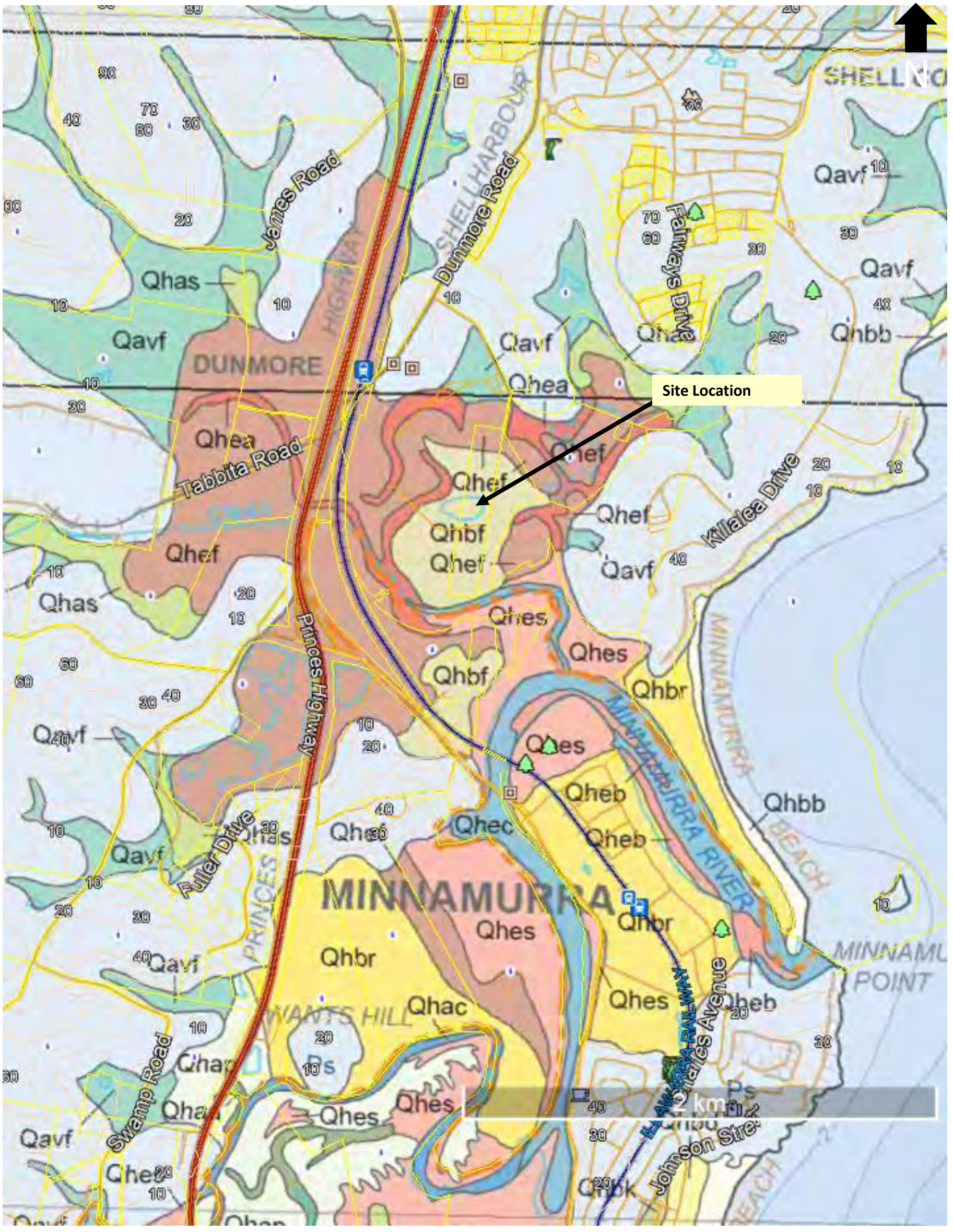
Client:	**Shellharbour City Council**	Drawn:	**PL**	Figure:	**3**
Project:	**ENRS0033**	Source:	**SixMaps**	Date:	**16/03/2020**
Location:	Dunmore Recycling & Waste Depot 44 Buckleys Rd, Dunmore, NSW	Scale:	**NA**	Title:	**Surface Gas Sample transects**
		Status:	**Rev 1**		



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**
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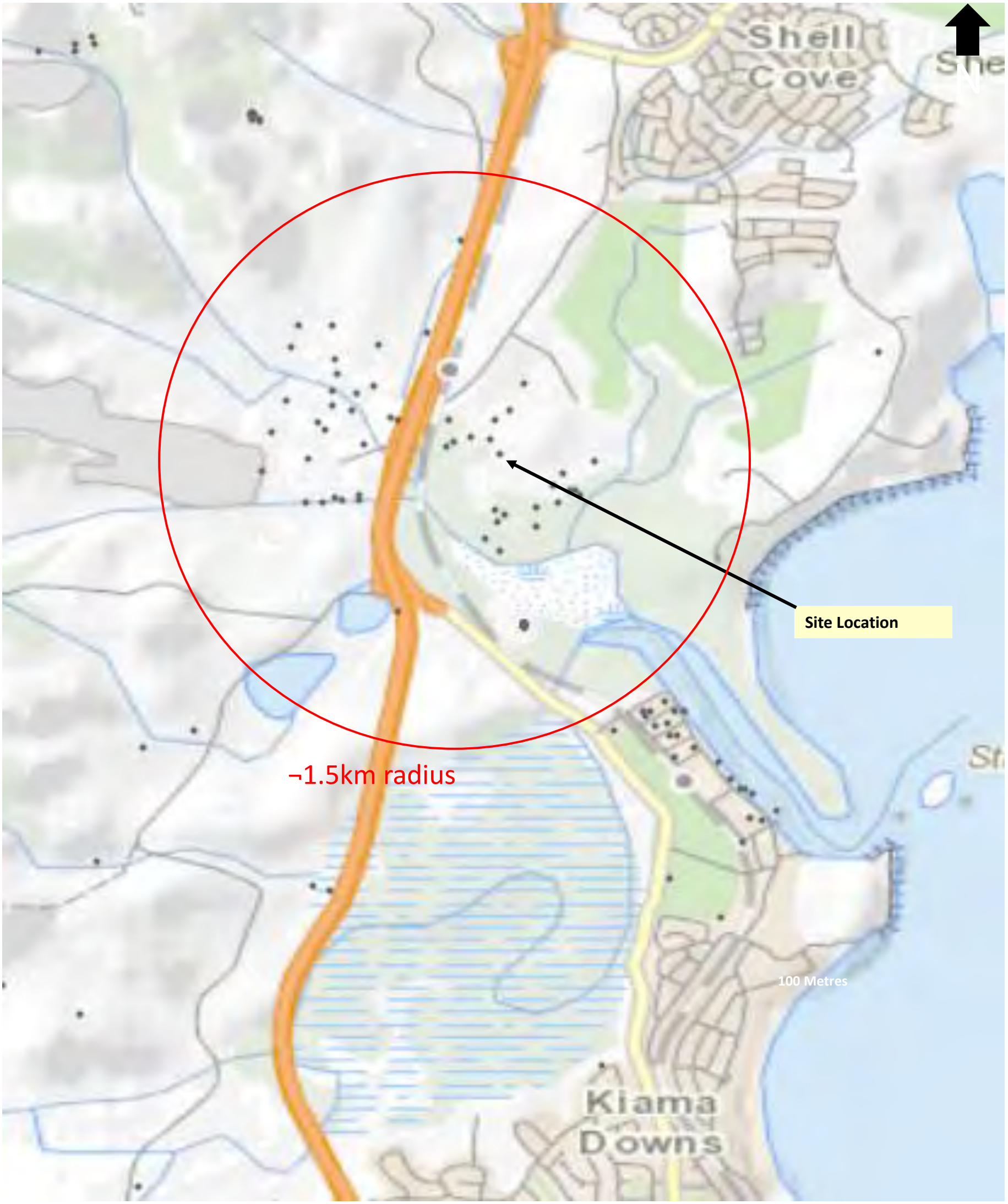
			Status:	**Rev 1**		



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 7: Total Concentration Results

Quarterly Water Monitoring Results - December 2021: 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)	-	0	-	-	-	-	-	-	-	-	-	-	-	-	
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	Dec 2021	939	134			197	0.12		12.10	0.2	371.00	< 0.01	< 0.01	160	2,390	2,390	< 10					7.10	7,370	23.9	3.15	
	BH3	Groundwater	5	Dec 2021	284	147			34	0.15		3.56	0.1	29.50	0.06	2.46	16	377	377	98					7.50	1,810	18.2	3.09	
	BH4	Groundwater	6	Dec 2021	254	238			21	0.21		5.01	< 0.1	14.70	< 0.01	0.01	16	491	491	133					7.10	2,140	18.8	4.29	
	BH9	Groundwater	18	Dec 2021	626	242			73	0.58		4.82	0.4	90.40	< 0.01	< 0.01	64	1,290	1,290	114					7.00	4,700	18.4	3.10	
	BH12r	Groundwater	17	Dec 2021	296	223			56	0.50		3.67	0.2	6.51	0.04	1.65	21	448	448	247					6.80	2,170	21.7	4.29	
	BH13	Groundwater	10	Dec 2021	228	249			26	0.29		1.14	0.2	4.05	0.02	1.31	20	589	589	225					6.90	2,100	20.6	4.29	
	BH14	Groundwater	11	Dec 2021	124	121			14	0.10		0.19	0.4	1.17	0.04	0.97	19	418	418	121					6.70	1,380	21.4	4.72	
	BH15	Groundwater	7	Dec 2021	402	96			182	0.25		7.05	0.2	14.70	0.02	0.04	29	290	290	478					7.00	2,740	17.6	0.69	
	BH18	Groundwater	25	Dec 2021	16	48			4	0.18		2.13	0.2	0.72	< 0.01	< 0.01	10	175	175	3					6.70	414	19.1	2.18	
	BH19r	Groundwater	16	Dec 2021	268	166			24	0.14		1.05	0.1	4.90	< 0.01	< 0.01	16	430	430	178					7.20	1,880	18.6	4.45	
	BH21	Groundwater	23	Dec 2021	380	156			20	0.33		0.15	0.3	2.95	< 0.01	0.12	26	494	494	351					7.10	2,610	21.1	2.96	
	BH22	Groundwater	24	Dec 2021	274	160			23	0.06		0.27	0.3	1.54	< 0.01	< 0.01	23	433	433	255					7.10	2,030	17.9	2.57	
	SWP1	Surfacewater	1	Dec 2021	115	43	19	94	7	0.31	0.12	0.06	0.2	< 0.01	< 0.01	< 0.01	23	238	238	33	4.09		6	1.60	7.50	806	20.4		
	SWC_up	Surfacewater	20	Dec 2021	2,250	89	135	1,090	41	0.10	0.72	0.10	0.3	0.19	< 0.01	0.08	9	169	169	340	6.20		10	5.30	7.30	7,180	19.2		
	SWC_2	Surfacewater	19	Dec 2021	3,870	127	225	1,860	71	0.10	0.66	0.11	0.4	0.62	< 0.01	0.07	9	174	174	518	4.90		7	----	7.30	11,900	18.8		
	SWC_down	Surfacewater	21	Dec 2021	5,760	172	331	2,740	102	0.12	0.60	0.25	0.5	1.28	< 0.01	0.06	9	188	188	733	4.81		< 5	4.20	7.10	17,100	19.5		
	SWC_down_2	Surfacewater	22	Dec 2021	3,540	118	205	1,710	65	0.10	0.61	0.09	0.4	0.31	< 0.01	0.07	9	169	169	488	5.66		< 5	4.80	7.30	10,900	19.0		
	Leachate Storage Tank LP1	Leachate	2	Dec 2021	1,760	84			332	0.24	1.24		0.2	1150.00	< 0.10	< 0.10	500	4,180	4,350	< 10	3.38	42.1			8.40	12,400	24.9		
E Former NSW EPA (1994) Guidelines for Assessing Service Station Sites. Replaced by the				MIN	16.0	43.0	0.0	0.0	4.0	0.06	0.00	0.00	0.1	0.01	0.01	0.01	9.0	169.0	169.0	3.0	0.00	0.00	0.00	0.00	6.70	414.0	17.6	0.00	
				MAX	5760	249	331	2740	332	0.58	1.24	12.10	1	1150.00	0.10	2.46	500	4180	4350	733	6.20	42.10	10.00	5.30	8.40	17100	25	4.72	
				Mean	1188.1	145.2	50.8	416.3	71.8	0.22	0.22	2.32	0.3	94.14	0.02	0.39	54.4	719.1	728.5	240.8	1.61	2.34	1.83	0.94	7.17	5090.6	20.0	2.21	

Investigation Investigation levels apply to typical slightly-moderately disturbed systems. Trigger Levels for 95% of species. See ANZECC & ARMCANZ (2000) for guidance on applying these levels to different ecosystem conditions. Also the sames as the NEPM (2013) EILs.
ANZECC 2000 ANZG 2018 - pH Upper and Lower Limit for NSW Lowland Rivers (Table 3.3.2).
Investigation Investigation levels are taken from the health values of the Australian Drinking Water Guidelines (NHMRC 2018).
NEPM (2013) NEPM (2013 Table 1A(4) Groundwater HSLs for vapour intrusion (Sand 2m-4m)
Netherlands (Netherlands (2000) Circular on Target Values and Intervention Values for Soil Remediation. Ministry of Housing, Spatial Planning and the Environment, Netherlands Government (Dutch Intervention Value/Indicative of Serious Contamination).
Former NSW (Former NSW EPA (1994) Guidelines for Assessing Service Station Sites. Replaced by the Technical Note for Investigation of Service Station Sites (EPA;2014).

TABLE 8: Total Concentration Results

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

					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
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																								
				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	Mar 2022	855	124			205	0.12		12.20	0.2	347	< 0.01	< 0.01	182	2,330	2,330	< 10					7.00	7,420	23.0	2.47	
	BH3	Groundwater	5	Mar 2022	82	115			27	0.01		< 0.05	< 0.1	2.56	0.03	10.20	16	280	280	104					7.20	1,060	18.9	1.42	
	BH4	Groundwater	6	Mar 2022	86	80			7	0.07		0.54	< 0.1	2.77	0.03	0.63	12	252	252	58					7.00	831	19.5	2.83	
	BH9	Groundwater	18	Mar 2022	484	215			69	0.54		5.15	0.3	76.8	< 0.01	0.01	63	1,630	1,630	73					7.00	4,360	18.6	2.32	
	BH12r	Groundwater	17	Mar 2022	405	229			50	0.52		11.40	0.2	4.98	0.10	5.20	25	465	465	240					6.70	2,460	21.1	3.58	
	BH13	Groundwater	10	Mar 2022	28	101			6	0.04		0.33	0.2	0.22	0.09	4.00	13	297	297	46					6.60	727	21.0	2.93	
	BH14	Groundwater	11	Mar 2022	18	75			41	0.07		0.09	0.6	0.29	0.01	46.10	43	76	76	85					6.00	796	21.0	2.85	
	BH15	Groundwater	7	Mar 2022	296	59			152	0.19		6.12	0.2	9.17	0.02	0.10	34	317	317	261					7.00	2,140	18.5	0.49	
	BH18	Groundwater	25	Mar 2022	7	30			3	0.06		0.81	0.2	0.20	< 0.01	< 0.01	6	113	113	4					6.90	236	20.1	1.52	
	BH19r	Groundwater	16	Mar 2022	91	83			22	0.04		0.48	0.1	1.67	0.05	0.52	27	258	258	98					7.20	924	19.4	3.43	
	BH21	Groundwater	23	Mar 2022	349	125			18	0.44		0.39	0.3	2.60	< 0.01	< 0.01	28	502	502	332					7.20	2,460	21.2	2.39	
	BH22	Groundwater	24	Mar 2022	186	129			22	0.08		0.41	0.3	2.13	< 0.01	< 0.01	21	428	428	230					7.10	1,740	18.6	2.13	
	SWP1	Surfacewater	1	Mar 2022	184	42	32	187	8	0.18	0.49	< 0.05	0.4	2.21	0.08	0.05	20	276	276	192	3.33		11	10.60	7.60	1,470	18.1		
	SWC_up	Surfacewater	20	Mar 2022	564	39	44	317	18	0.68	1.73	0.86	0.2	2.69	< 0.01	< 0.01	28	148	148	123	2.43		11	14.30	7.20	2,360	16.6		
	SWC_2	Surfacewater	19	Mar 2022	362	33	31	218	18	0.29	1.53	0.80	0.2	1.95	< 0.01	0.06	27	135	135	84	3.34		10		7.10	1,620	17.0		
	SWC_down	Surfacewater	21	Mar 2022	110	15	11	70	6	0.09	1.32	0.32	0.1	0.36	< 0.01	0.17	14	67	67	29	7.17		10	15.00	7.20	555	15.4		
	SWC_down_2	Surfacewater	22	Mar 2022	135	16	13	82	7	0.10	1.39	0.30	0.1	0.32	0.02	0.22	15	70	70	34	6.46		12	14.80	7.10	642	17.4		
	Leachate Storage Tank LP1	Leachate	2	Mar 2022	1,290	69			367	0.13	1.08		0.2	1020	< 0.10	< 0.10	498	3,620	4,030	< 10	1.32	15.7			8.80	11,200	22.0		

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 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: 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	Sep 2022	940	125			208	0.11		7.76	0.4	376	< 0.01	< 0.01	194	2,540	2,540	< 10					6.80	7,360	25.3	2.91	
	BH3	Groundwater	5	Sep 2022	78	117			49	0.02		0.07	0.2	2.18	0.13	6.37	15	317	317	118					7.40	984	17.6	3.07	
	BH4	Groundwater	6	Sep 2022	109	113			19	0.13		2.90	0.1	2.76	0.01	0.05	14	361	361	69					7.30	1,000	18.1	4.25	
	BH9	Groundwater	18	Sep 2022	381	177			65	0.53		0.70	0.4	130.0	0.05	0.02	85	1,650	1,650	12					7.20	3,330	15.9	2.85	
	BH12r	Groundwater	17	Sep 2022	123	149			26	0.50		7.24	0.2	4.75	< 0.01	< 0.01	22	554	554	92					6.80	1,410	19.7	4.14	
	BH13	Groundwater	10	Sep 2022	199	176			15	0.29		3.26	0.2	1.78	0.02	0.01	31	754	754	47					6.70	1,740	20.5	4.15	
	BH14	Groundwater	11	Sep 2022	58	100			15	0.09	< 0.05		0.5	0.59	0.02	1.91	25	409	409	52					6.70	970	20.2	4.56	
	BH15	Groundwater	7	Sep 2022	442	104			190	0.29		9.45	0.2	10.20	0.01	< 0.01	42	420	420	473					7.10	2,350	14.8	0.64	
	BH18	Groundwater	25	Sep 2022	65	88			12	0.09		2.34	0.2	1.09	< 0.01	< 0.01	19	412	412	< 10					6.70	822	18.3	1.91	
	BH19r	Groundwater	16	Sep 2022	101	88			36	0.08		1.19	0.2	3.11	0.02	0.04	21	308	308	51					7.40	838	17.6	4.60	
	BH21	Groundwater	23	Sep 2022	400	135			20	0.60		0.44	0.3	4.85	< 0.01	< 0.01	37	667	667	204					7.10	2,430	20.8	2.86	
	BH22	Groundwater	24	Sep 2022	240	117			30	0.11		0.14	0.2	24.40	< 0.01	< 0.01	50	646	646	113					7.00	1,810	17.3	2.45	
	SWP1	Surfacewater	1	Sep 2022	93	52	19	77	10	0.07	0.05		0.1	1.82	0.40	2.06	19	225	225	44	8.70		9	17.90	7.60	585	12.1		
	SWC_up	Surfacewater	20	Sep 2022	469	38	37	262	11	0.07	0.05		0.2	0.15	0.01	0.88	8	107	107	74	9.60		8	27.40	7.40	1,370	11.8		
	SWC_2	Surfacewater	19	Sep 2022	671	43	47	338	15	0.06	0.05		0.2	0.46	0.01	0.85	8	106	106	95	9.01		8	27.20	7.40	1,740	12.7		
	SWC_down	Surfacewater	21	Sep 2022	614	41	44	312	14	0.06	< 0.05		0.2	0.35	0.01	0.86	8	105	105	88	9.37		6	26.60	7.40	1,690	12.5		
	SWC_down_2	Surfacewater	22	Sep 2022	754	43	52	381	16	0.05	< 0.05		0.2	0.19	0.01	0.84	8	103	103	104	9.54		9	25.90	7.40	1,990	12.5		
	Leachate Storage Tank LP1	Leachate	2	Sep 2022	1,840	44			350	0.11	1.29		0.2	877	< 1.00	< 1.00	401	2,760	3,700	< 10	7.14	68.8			8.90	8,230	13.0		
	SWP1	Surfacewater	1	21/10/2022	214	63	37	193	20		1.99	< 0.05	0.4	16.40	0.81	0.98	28	469	469	115	5.77		23		7.90	1,760	21.5		Overflow Sample
	SWP1	Surfacewater	1	25/10/2022	178	62	33	175	20		0.76	< 0.05	0.4	15.80	0.67	1.04	23	361	361	104	4.24		17	14.20	7.90	1,550	18.9		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)

SAMPLING QC DATA

TABLE 11: Duplicate Groundwater Sample Results and QC Data

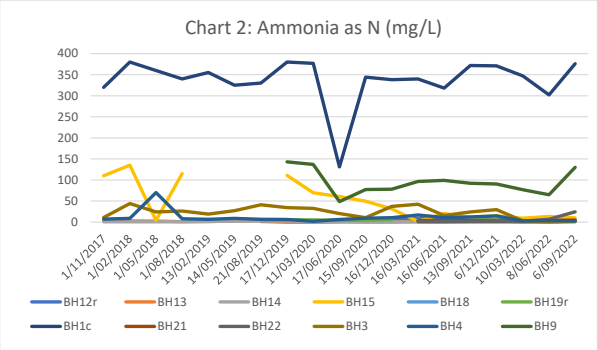
Lab Report.						RPD
Sample No.				BH22	GWDuplicate	
Sample type				Groundwater	GWQC	
EPA No,				24	QC1	
Date Sampled				6/09/2022	6/09/2022	
Analyte	Units	PQL	5 x PQL	Result	Result	
Chloride	mg/L	1	5	240	244	2.48
Calcium	mg/L	1	5	117	127	12.30
Potassium	mg/L	1	5	30	32	9.68
Manganese	mg/L	0.001	0.005	0.108	0.119	14.54
Dissolved Iron	mg/L	0.05	0.25	0.14	0.15	10.34
Fluoride	mg/L	0.1	0.5	0.2	0.2	0.00
Ammonia as N	mg/L	0.01	0.05	24.40	24.20	1.23
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	50	51	2.97
Bicarbonate Alkalinity as CaCO3	mg/L	1	5	646	652	1.39
Total Alkalinity as CaCO3	mg/L	1	5	646	652	1.39
Sulfate as SO4 - Turbidimetric	mg/L	1	5	113	112	1.33
pH	pH	0.01	0.05	7.00	7.00	0.00
Electrical Conductivity (Non Compensated)	µS/cm	1	5	1,810	1,810	0.00
Temperature	°C	0.1	0.5	17.3	17.3	0.00
Standing Water Level	mbgl	-		2.5	2.5	0.00

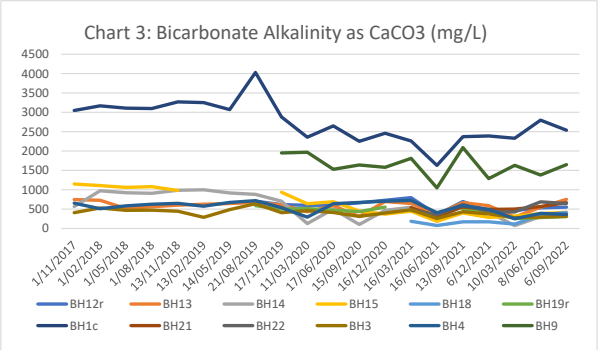
TABLE 12: Duplicate Surface Water Results and QC Data

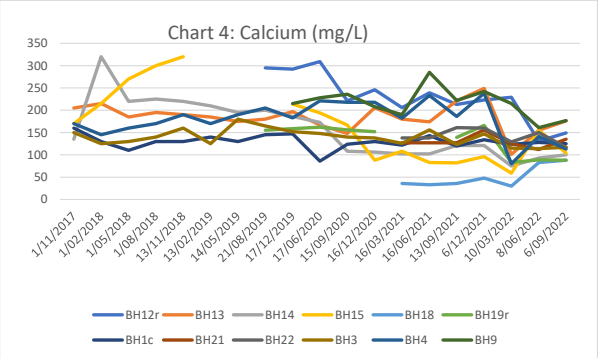
Lab Report.						RPD
Sample No.				SWC_UP	SWDuplicate	
Sample type				Surfacewater	OffSiteSWQC	
EPA No,				20	QC2	
Date Sampled				5/09/2022	5/09/2022	
Analyte	Units	PQL	5 x PQL	Result	Result	
Chloride	mg/L	1	5	469	637	45.57
Calcium	mg/L	1	5	38	43	18.52
Potassium	mg/L	1	5	11	15	46.15
Manganese	mg/L	0.001	0.005	0.068	0.058	23.81
Total Iron	mg/L	0.05	0.25	0.05	0.06	27.27
Dissolved Iron	mg/L	0.05	0.25			
Fluoride	mg/L	0.1	0.5	0.2	0.2	0.00
Ammonia as N	mg/L	0.01	0.05	0.15	0.46	152.46
Nitrite as N	mg/L	0.01	0.05	0.01	0.01	0.00
Nitrate as N	mg/L	0.01	0.05	0.88	0.86	3.45
Nitrite + Nitrate as N	mg/L	0.01	0.05	0.89	0.87	3.41
Total Organic Carbon	mg/L	1	5	8	8	0.00
Bicarbonate Alkalinity as CaCO3	mg/L	1	5	107	112	6.85
Total Alkalinity as CaCO3	mg/L	1	5	107	112	6.85
Sulfate as SO4 - Turbidimetric	mg/L	1	5	74	93	34.13
Dissolved Oxygen	mg/L	0.01	0.05	9.60	9.60	0.00
pH	pH	0.01	0.05	7.40	7.40	0.00
Electrical Conductivity (Non Compensated)	µS/cm	1	5	1,370	1,370	0.00
Temperature	°C	0.1	0.5	11.8	11.8	0.00

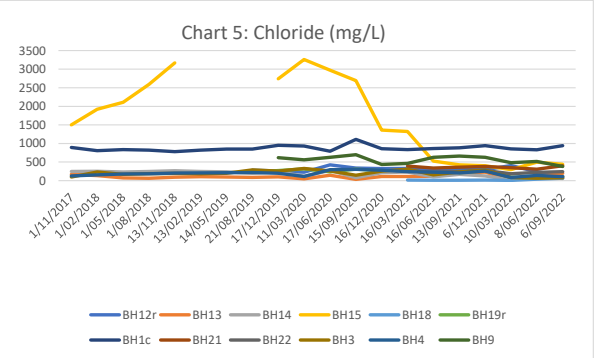
CHARTS

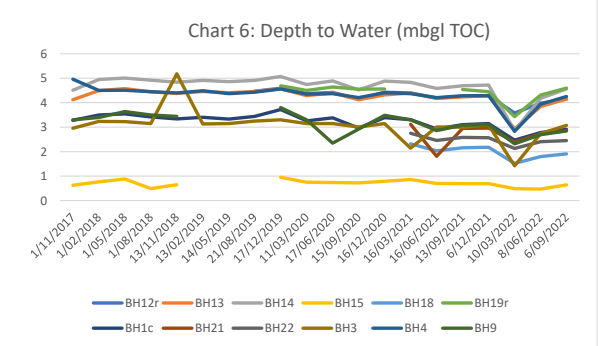
Charts 2-17: Groundwater Charts

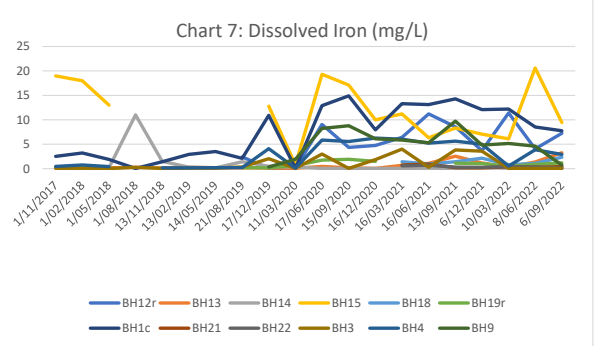


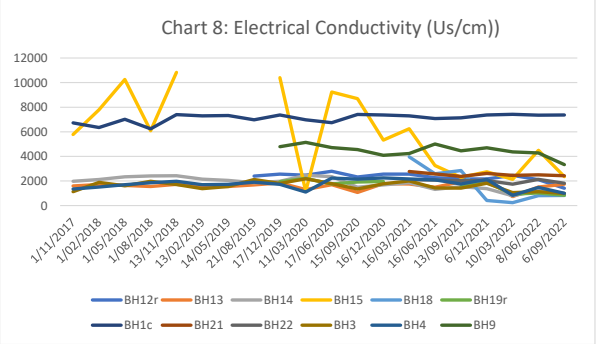


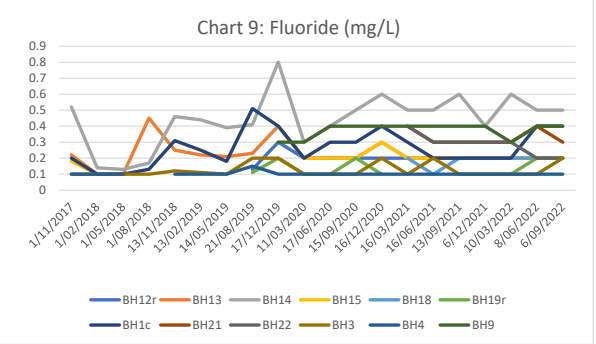












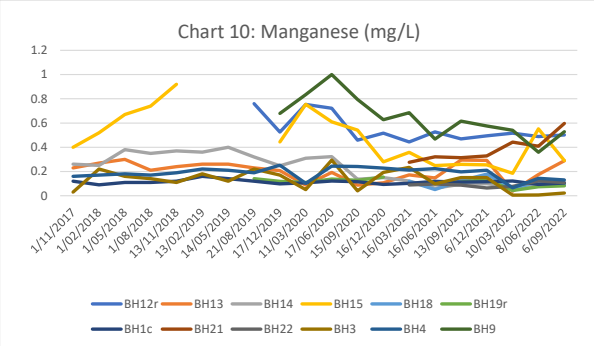


Chart 10: Manganese (mg/L)
1.2
1
0.8
0.6
0.4
0.2
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
16/12/2020
16/03/2021
16/06/2021
13/09/2021
6/12/2021
10/03/2022
8/06/2022
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BH19r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

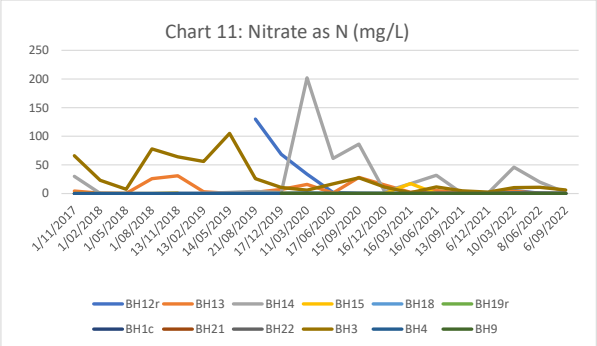


Chart 11: Nitrate as N (mg/L)
250
200
150
100
50
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
16/12/2020
16/03/2021
16/06/2021
13/09/2021
6/12/2021
10/03/2022
8/06/2022
6/09/2022
BH12r
BH13
BH14
BH15
BH18
BH19r
BH1c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

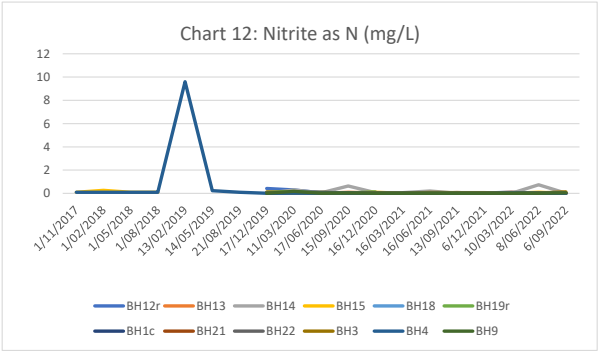


Chart 12: Nitrite as N (mg/L)
12
10
8
6
4
2
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
16/12/2020
16/03/2021
16/06/2021
13/09/2021
6/12/2021
10/03/2022
8/06/2022
6/09/2022
BH12r
BH13
BH14
BH15
BH18
BH19r
BH1c
BH21
BH22
BH3
BH4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

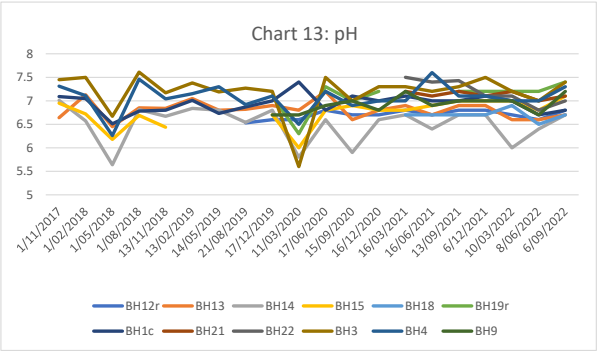


Chart 13: pH
8
7.5
7
6.5
6
5.5
5
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
16/12/2020
16/03/2021
16/06/2021
13/09/2021
6/12/2021
10/03/2022
8/06/2022
6/09/2022
BH12r
BH13
BH14
BH15
BH18
BH19r
BH1c
BH21
BH22
BH3
BH4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

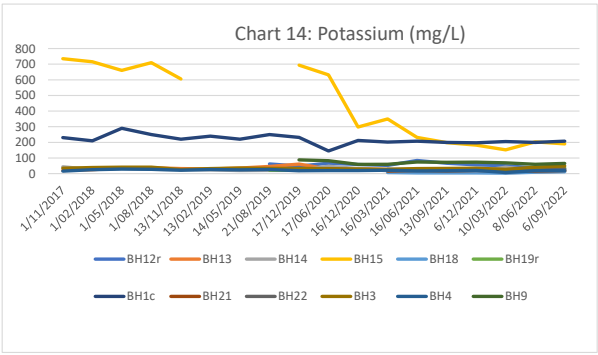


Chart 14: Potassium (mg/L)
800
700
600
500
400
300
200
100
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
17/06/2020
16/12/2020
16/03/2021
16/06/2021
13/09/2021
6/12/2021
10/03/2022
8/06/2022
6/09/2022
BH12r
BH13
BH14
BH15
BH18
BH19r
BH1c
BH21
BH22
BH3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

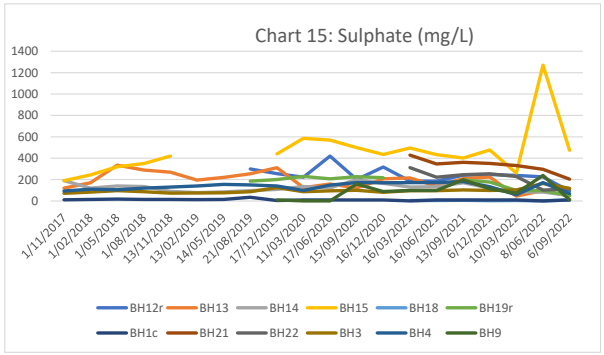


Chart 15: Sulphate (mg/L)
1400
1200
1000
800
600
400
200
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
16/12/2020
16/03/2021
16/06/2021
13/09/2021
6/12/2021
10/03/2022
8/06/2022
6/09/2022
BH12r
BH13
BH14
BH15
BH18
BH19r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

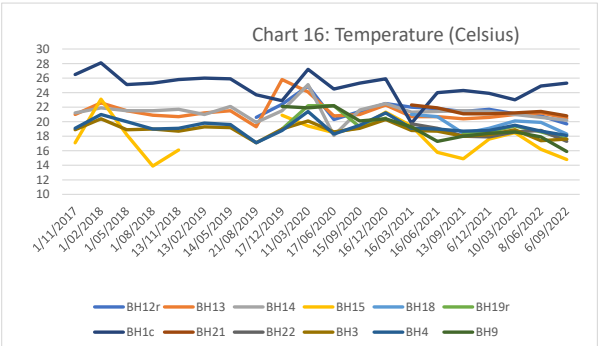


Chart 16: Temperature (Celsius)
30
28
26
24
22
20
18
16
14
12
10
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
16/12/2020
16/03/2021
16/06/2021
13/09/2021
6/12/2021
10/03/2022
8/06/2022
6/09/2022
BH12r
BH13
BH14
BH15
BH18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

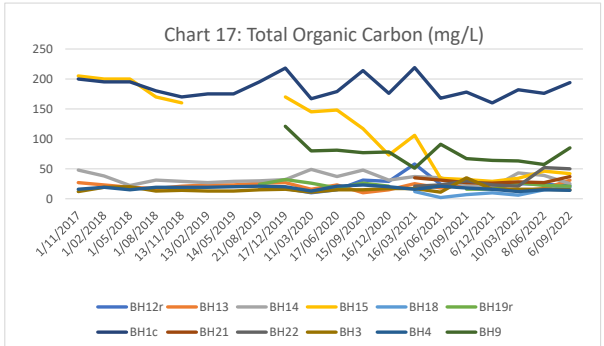
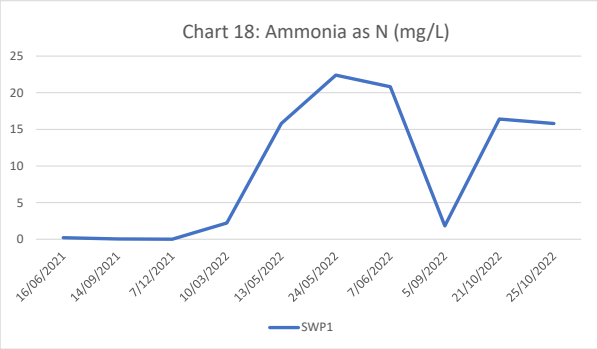
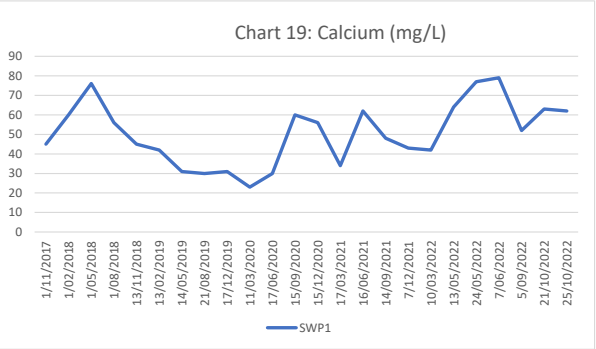
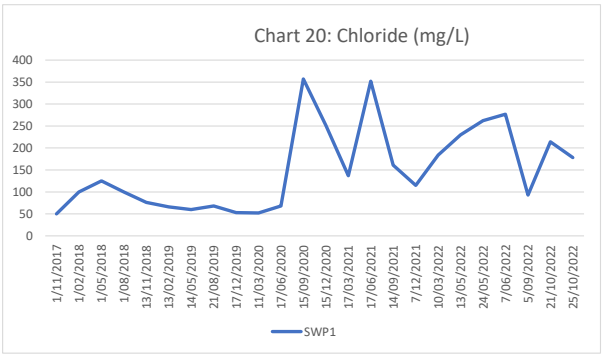


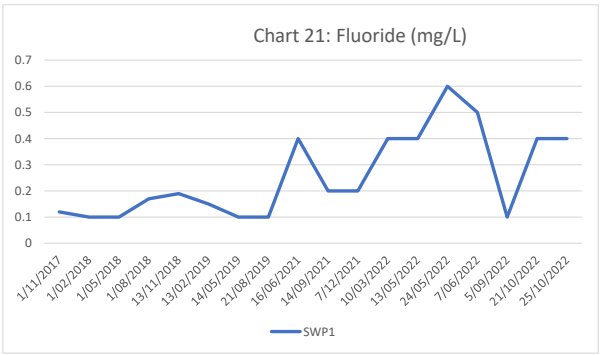
Chart 17: Total Organic Carbon (mg/L)
250
200
150
100
50
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
16/12/2020
16/03/2021
16/06/2021
13/09/2021
6/12/2021
10/03/2022
8/06/2022
6/09/2022
BH12r
BH13
BH14
BH15
BH18
BH19r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

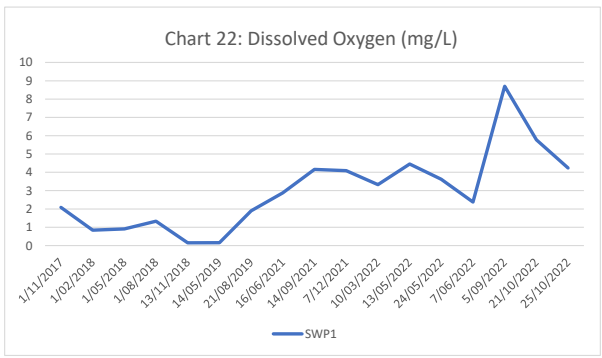
Charts 18-33: Onsite Surface Water Charts

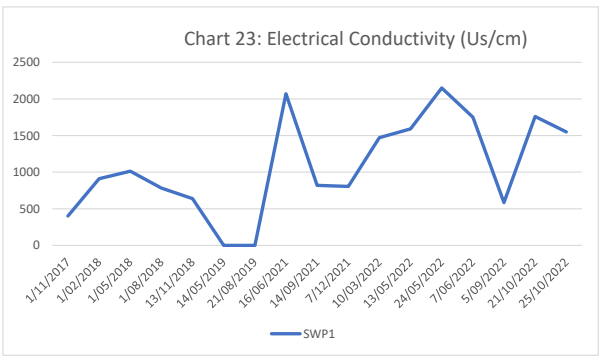


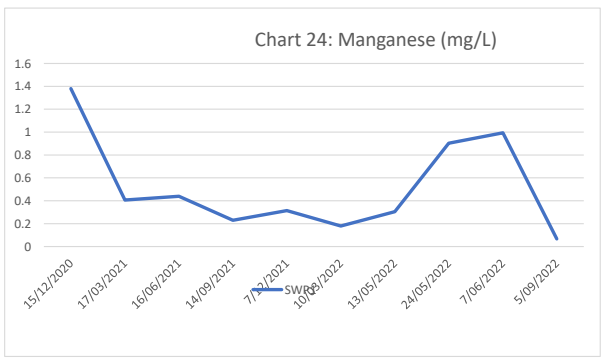


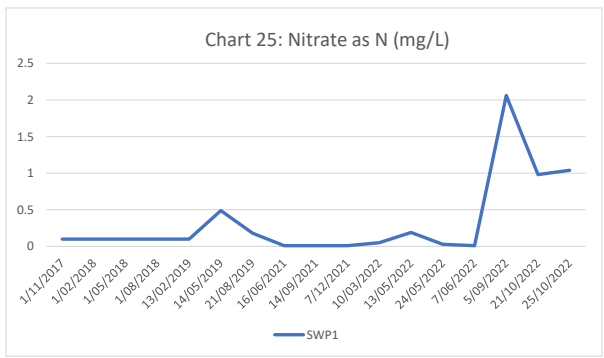












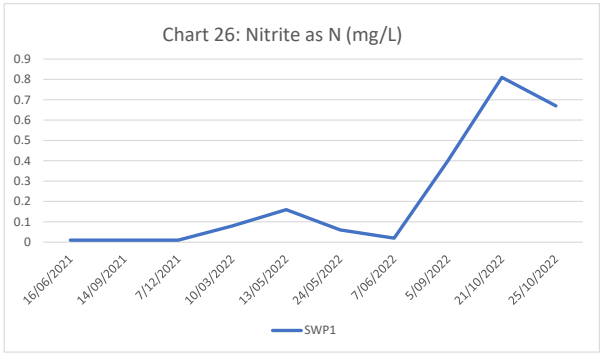


Chart 26: Nitrite as N (mg/L)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
16/06/2021
14/09/2021
7/12/2021
10/03/2022
13/05/2022
24/05/2022
7/06/2022
5/09/2022
21/10/2022
25/10/2022
SWP1

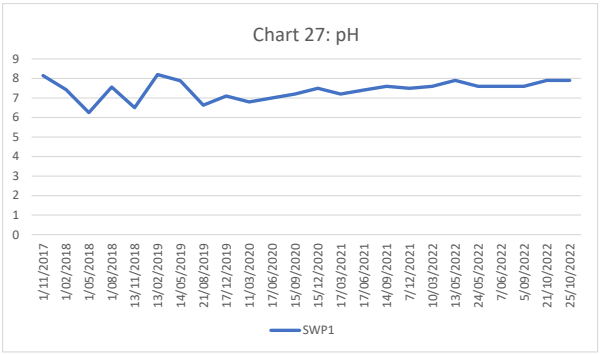


Chart 27: pH
9
8
7
6
5
4
3
2
1
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
17/06/2021
14/09/2021
7/12/2021
10/03/2022
13/05/2022
24/05/2022
7/06/2022
5/09/2022
21/10/2022
25/10/2022
SWP1

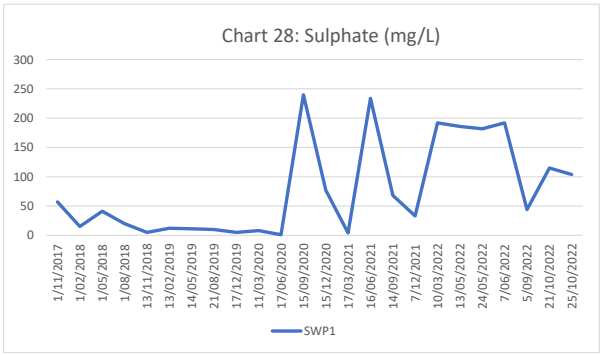


Chart 28: Sulphate (mg/L)
300
250
200
150
100
50
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
16/06/2021
14/09/2021
7/12/2021
10/03/2022
13/05/2022
24/05/2022
7/06/2022
5/09/2022
21/10/2022
25/10/2022
SWP1

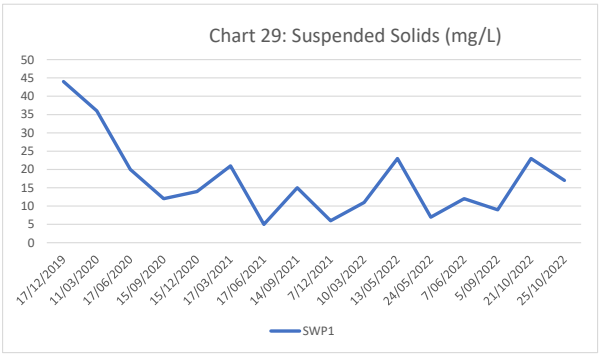


Chart 29: Suspended Solids (mg/L)
50
45
40
35
30
25
20
15
10
5
0
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
17/06/2021
14/09/2021
7/12/2021
10/03/2022
13/05/2022
24/05/2022
7/06/2022
5/09/2022
21/10/2022
25/10/2022
SWP1

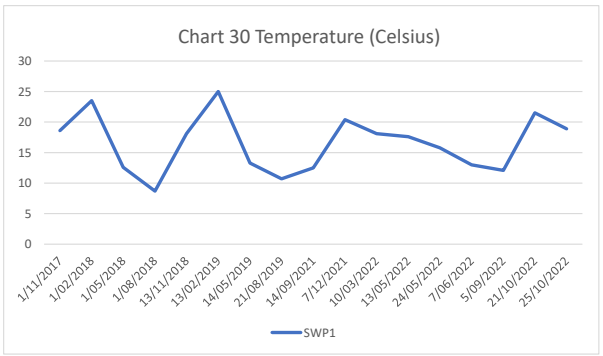


Chart 30 Temperature (Celsius)
30
25
20
15
10
5
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
14/09/2021
7/12/2021
10/03/2022
13/05/2022
24/05/2022
7/06/2022
5/09/2022
21/10/2022
25/10/2022
SWP1

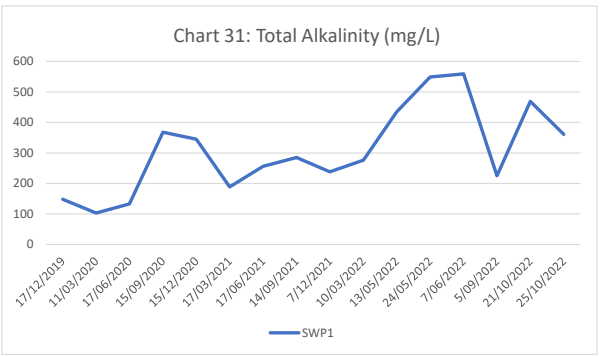


Chart 31: Total Alkalinity (mg/L)
600
500
400
300
200
100
0
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
17/06/2021
14/09/2021
7/12/2021
10/03/2022
13/05/2022
24/05/2022
7/06/2022
5/09/2022
21/10/2022
25/10/2022
SWP1

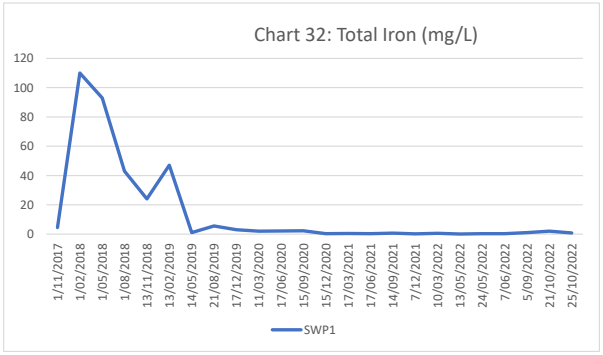


Chart 32: Total Iron (mg/L)
120
100
80
60
40
20
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
17/06/2021
14/09/2021
7/12/2021
10/03/2022
13/05/2022
24/05/2022
7/06/2022
5/09/2022
21/10/2022
25/10/2022
SWP1

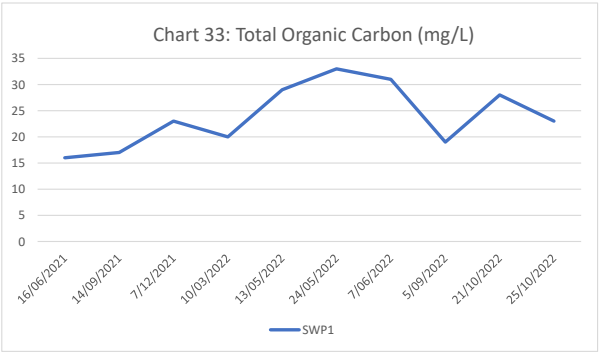
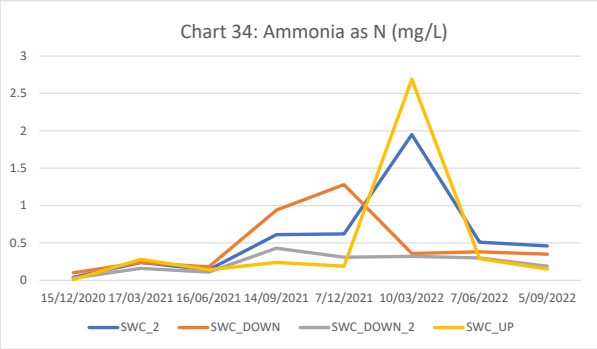
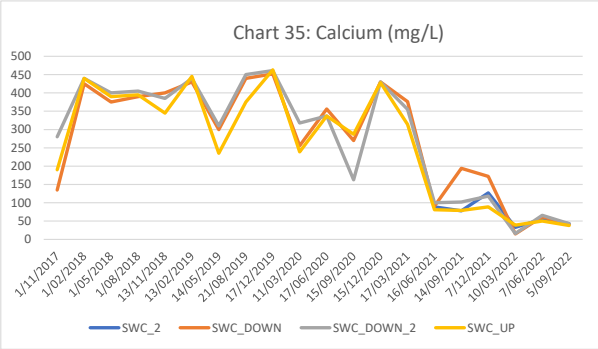
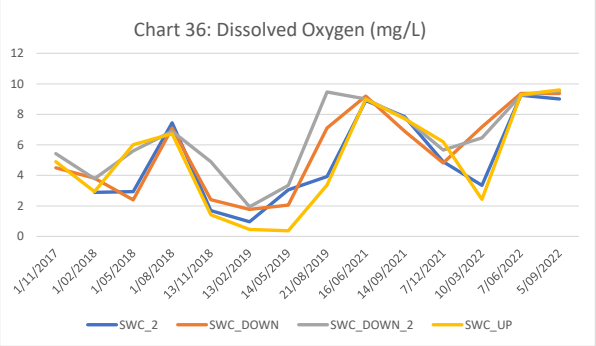


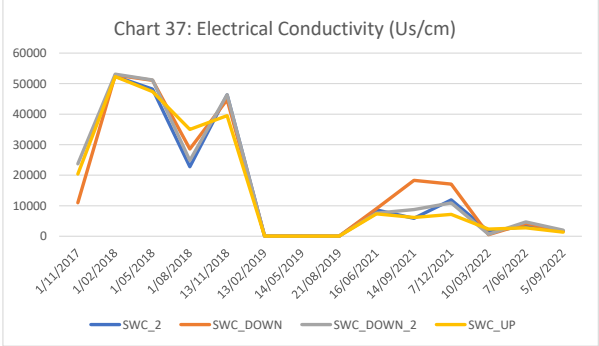
Chart 33: Total Organic Carbon (mg/L)
35
30
25
20
15
10
5
0
16/06/2021
14/09/2021
7/12/2021
10/03/2022
13/05/2022
24/05/2022
7/06/2022
5/09/2022
21/10/2022
25/10/2022
SWP1

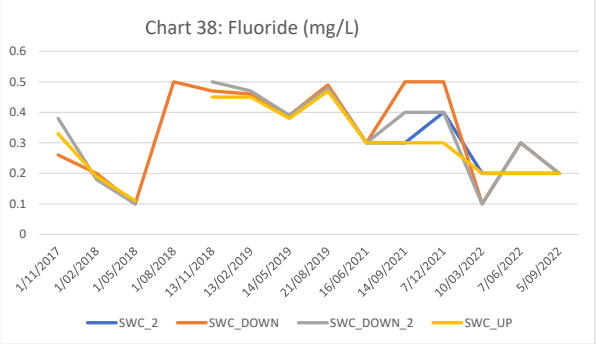
Charts 34-45: Rocklow Creek Surface Water Charts

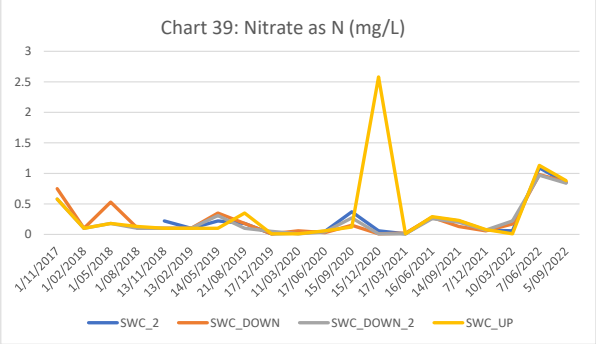


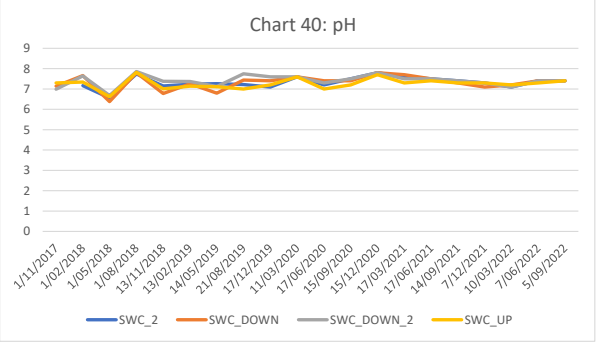


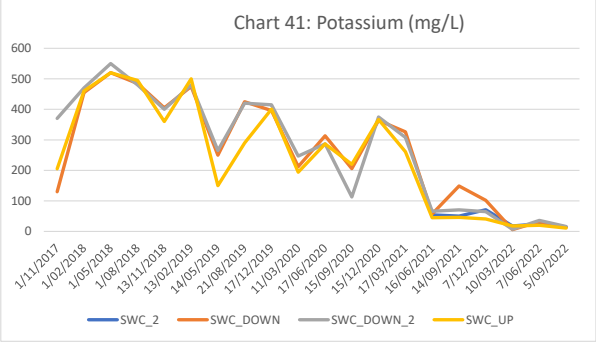












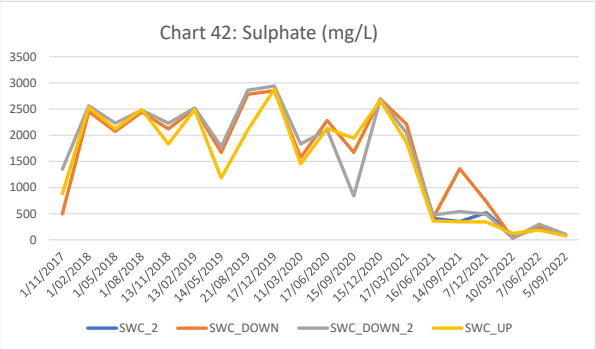


Chart 42: Sulphate (mg/L)
3500
3000
2500
2000
1500
1000
500
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
16/06/2021
14/09/2021
7/12/2021
10/03/2022
7/06/2022
5/09/2022
SWC_2
SWC_DOWN
SWC_DOWN_2
SWC_UP

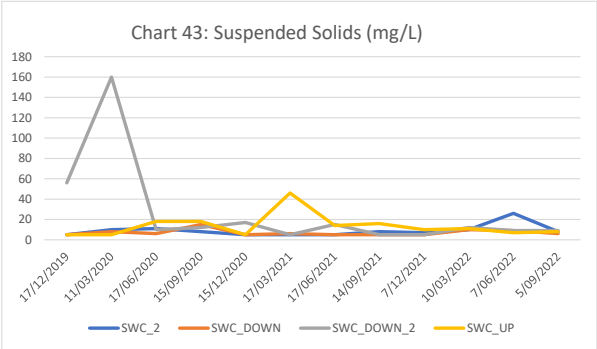


Chart 43: Suspended Solids (mg/L)
180
160
140
120
100
80
60
40
20
0
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
17/06/2021
14/09/2021
7/12/2021
10/03/2022
7/06/2022
5/09/2022
SWC_2
SWC_DOWN
SWC_DOWN_2
SWC_UP

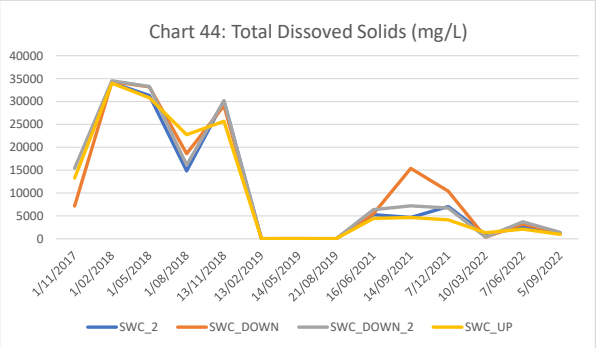


Chart 44: Total Dissoved Solids (mg/L)
40000
35000
30000
25000
20000
15000
10000
5000
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
16/06/2021
14/09/2021
7/12/2021
10/03/2022
7/06/2022
5/09/2022
SWC_2
SWC_DOWN
SWC_DOWN_2
SWC_UP

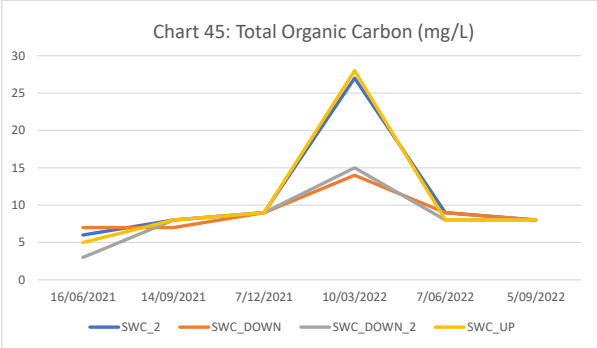
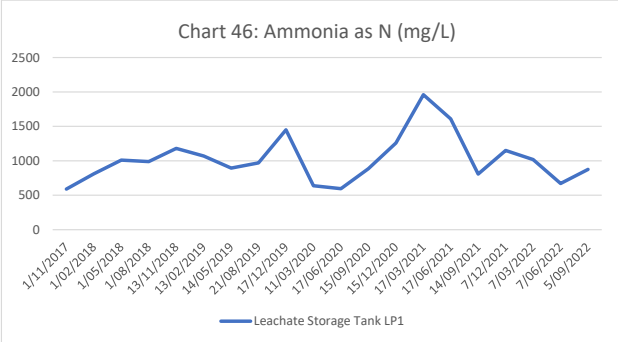
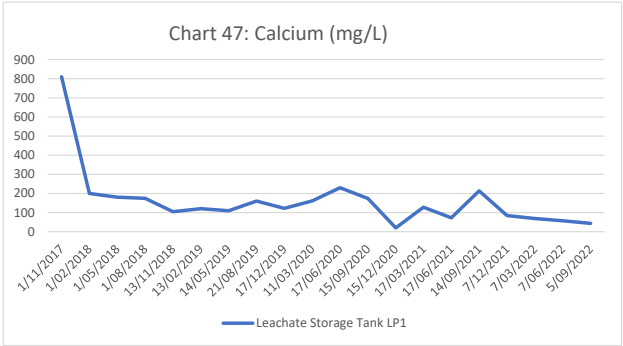
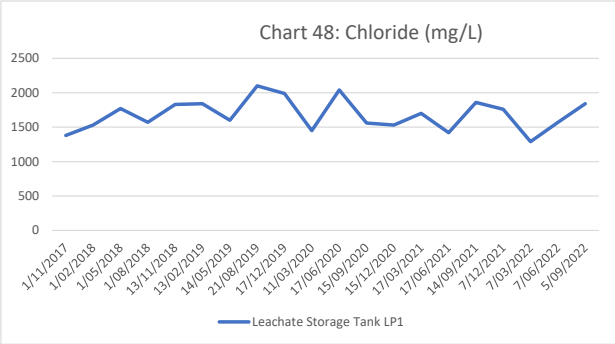


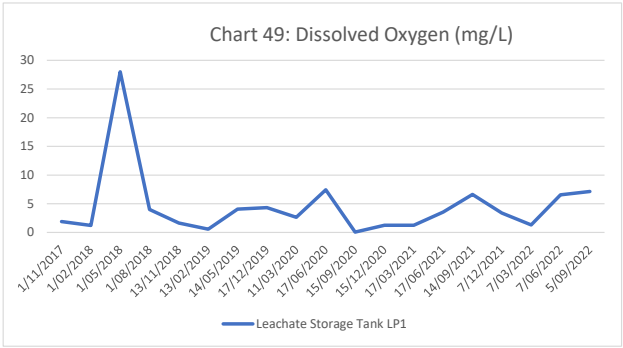
Chart 45: Total Organic Carbon (mg/L)
30
25
20
15
10
5
0
16/06/2021
14/09/2021
7/12/2021
10/03/2022
7/06/2022
5/09/2022
SWC_2
SWC_DOWN
SWC_DOWN_2
SWC_UP

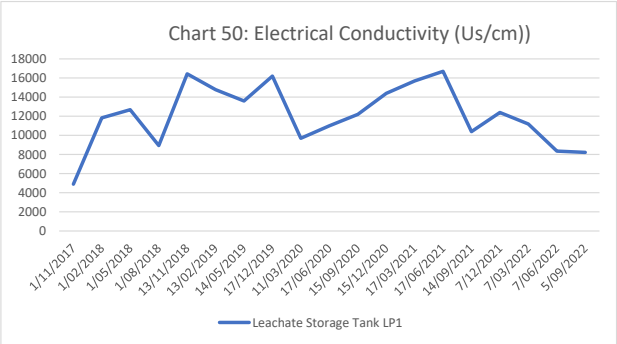
Charts 46-60 Leachate Water Quality Charts

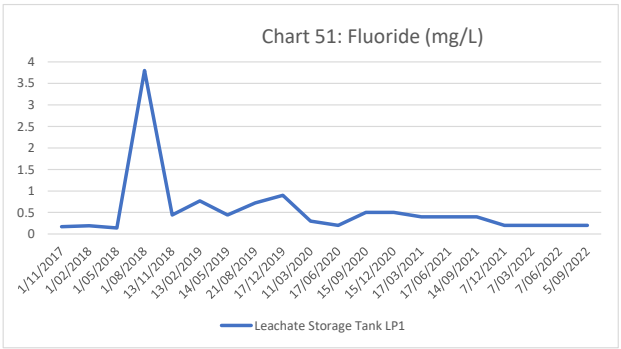


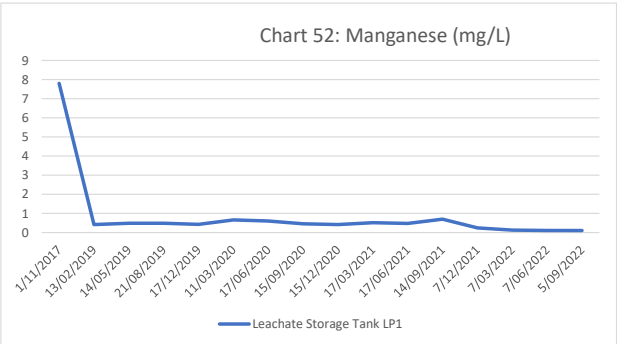


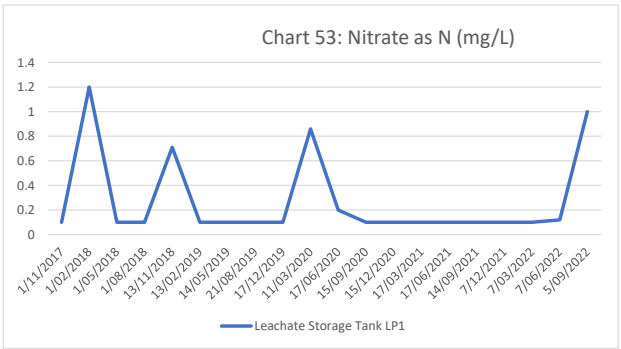












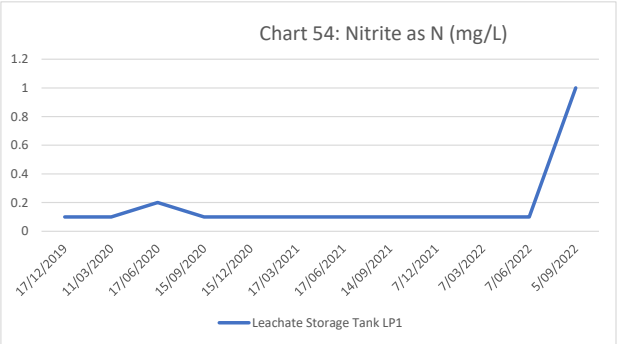


Chart 54: Nitrite as N (mg/L)
1.2
1
0.8
0.6
0.4
0.2
0
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
17/06/2021
14/09/2021
7/12/2021
7/03/2022
7/06/2022
5/09/2022
Leachate Storage Tank LP1

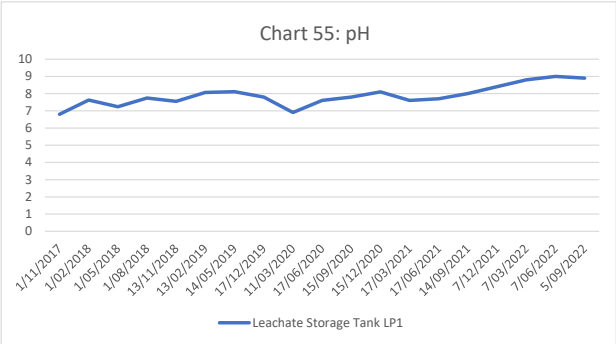


Chart 55: pH
10
9
8
7
6
5
4
3
2
1
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
17/06/2021
14/09/2021
7/12/2021
7/03/2022
7/06/2022
5/09/2022
Leachate Storage Tank LP1

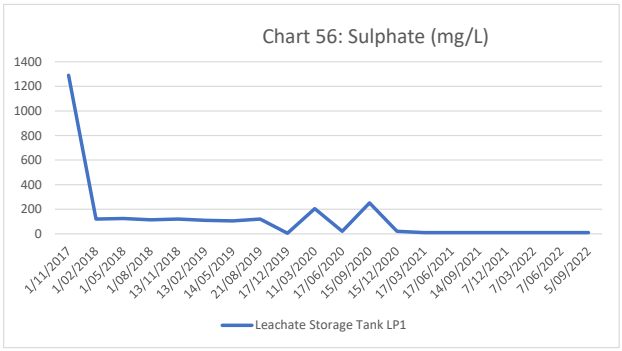


Chart 56: Sulphate (mg/L)
1400
1200
1000
800
600
400
200
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
17/06/2021
14/09/2021
7/12/2021
7/03/2022
7/06/2022
5/09/2022
Leachate Storage Tank LP1

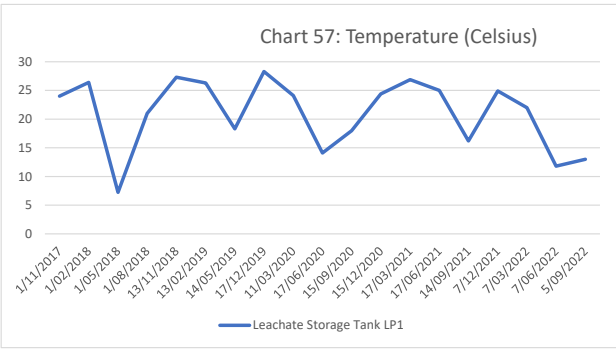


Chart 57: Temperature (Celsius)
30
25
20
15
10
5
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
17/06/2021
14/09/2021
7/12/2021
7/03/2022
7/06/2022
5/09/2022
Leachate Storage Tank LP1

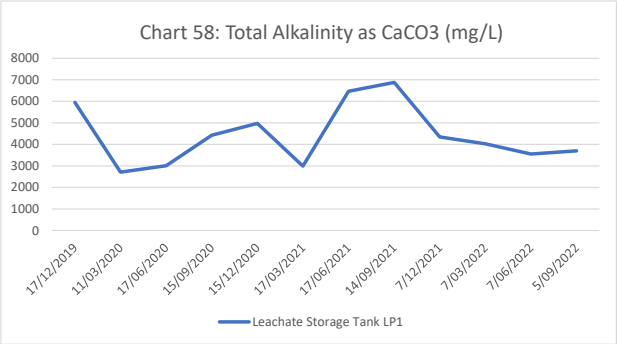


Chart 58: Total Alkalinity as CaCO3 (mg/L)
8000
7000
6000
5000
4000
3000
2000
1000
0
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
17/06/2021
14/09/2021
7/12/2021
7/03/2022
7/06/2022
5/09/2022
Leachate Storage Tank LP1

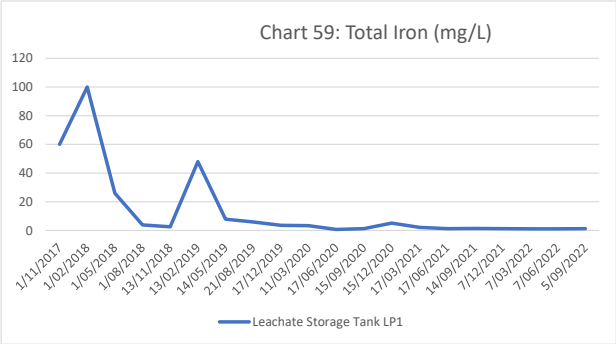


Chart 59: Total Iron (mg/L)
120
100
80
60
40
20
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
17/06/2021
14/09/2021
7/12/2021
7/03/2022
7/06/2022
5/09/2022
Leachate Storage Tank LP1

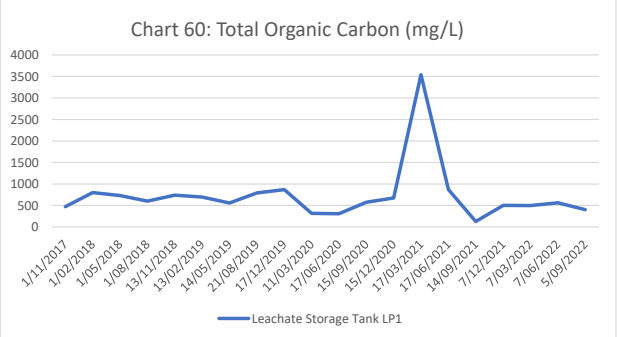


Chart 60: Total Organic Carbon (mg/L)
4000
3500
3000
2500
2000
1500
1000
500
0
1/11/2017
1/02/2018
1/05/2018
1/08/2018
13/11/2018
13/02/2019
14/05/2019
21/08/2019
17/12/2019
11/03/2020
17/06/2020
15/09/2020
15/12/2020
17/03/2021
17/06/2021
14/09/2021
7/12/2021
7/03/2022
7/06/2022
5/09/2022
Leachate Storage Tank LP1

APPENDICES

Appendix A

EPL 5984 Sampling Point Summary (NSW EPA, 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) 4958 9630 E samples.newcast@alsenviro.com
☐ Townsville, 14-15 Desma Ct, Bohle QLD 4818 Ph (07) 4796 0600 E samples.townsville@alsenviro.com
☐ Adelaide, 21 Burma Rd, Pooraka SA 5095 Ph (08) 8359 0890 E samples.adelaide@alsenviro.com
☐ Launceston, 27 Wellington St, Launceston TAS 7250 Ph (03) 6331 2158 E samples.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		

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	4.2 °C		
Other comment:			

SAMPLER: Robert Dalio	SAMPLER MOBILE:	RELINQUISHED BY: Robert Dalio	RECEIVED BY: Anets
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default):	DATE/TIME: 6/9/22	DATE/TIME: 6/9/22
Email Reports to :		RELINQUISHED BY:	RECEIVED BY:
Email Invoice to :		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.
	BH1C	6.9.22 8:30	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
	BH3	12:50	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
	BH4	13:05	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
	BH9	8:00	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
	BH12R	11:25	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
	BH13	11:45	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
	BH14	12:30	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
	BH15	11:00	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
	BH19R	13:25	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
	BH18	10:10	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
	BH21	10:35	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
	BH22	9:00	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
	Duplicate	9:00	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & SWL
	Triplicate	9:00	W								✓			

Environmental Division
Wollongong
Work Order Reference
EW2204038

Telephone : 02 42253125

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; A
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

s Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
er Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2204038**	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	: 06-Sep-2022 15:47
Order number	: 147649	Date Analysis Commenced	: 06-Sep-2022
C-O-C number	: ----	Issue Date	: 23-Sep-2022 15:52
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.**
- ED041G: LOR raised for Sulfate on sample 1 & 10 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 High Flow & Bailer Method.
- Temperature performed by ALS Wollongong via in-house method EA116 and EN67 PK.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.
- 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	06-Sep-2022 08:30	06-Sep-2022 12:50	06-Sep-2022 13:05	06-Sep-2022 08:00	06-Sep-2022 11:25
Compound	CAS Number	LOR	Unit	EW2204038-001	EW2204038-002	EW2204038-003	EW2204038-004	EW2204038-005
				Result	Result	Result	Result	Result
EA005FD: Field pH								
pH	----	0.1	pH Unit	6.8	7.4	7.3	7.2	6.8
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	7360	984	1000	3330	1410
EA116: Temperature								
Temperature	----	0.5	°C	25.3	17.6	18.1	15.9	19.7
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	2540	317	361	1650	554
Total Alkalinity as CaCO3	----	1	mg/L	2540	317	361	1650	554
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<10	118	69	12	92
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	940	78	109	381	123
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	125	117	113	177	149
Potassium	7440-09-7	1	mg/L	208	49	19	65	26
EG020F: Dissolved Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	0.105	0.022	0.130	0.528	0.502
Iron	7439-89-6	0.05	mg/L	7.76	0.07	2.90	0.70	7.24
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.4	0.2	0.1	0.4	0.2
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	376	2.18	2.76	130	4.75
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.13	0.01	0.05	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	6.37	0.05	0.02	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	6.50	0.06	0.07	<0.01
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	194	15	14	85	22

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	BH1C	BH3	BH4	BH9	BH12R
			Sampling date / time	06-Sep-2022 08:30	06-Sep-2022 12:50	06-Sep-2022 13:05	06-Sep-2022 08:00	06-Sep-2022 11:25
Compound	*CAS Number*	*LOR*	*Unit*	**EW2204038-001**	**EW2204038-002**	**EW2204038-003**	**EW2204038-004**	**EW2204038-005**
				Result	Result	Result	Result	Result
QWI-EN 67.11 Sampling of Groundwaters								
Standing Water Level	----	0.01	m AHD	**2.91**	**3.07**	**4.25**	**2.85**	**4.14**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	BH13	BH14	BH15	BH19R	BH18
			Sampling date / time	06-Sep-2022 11:45	06-Sep-2022 12:30	06-Sep-2022 11:00	06-Sep-2022 13:25	06-Sep-2022 10:10
Compound	CAS Number	LOR	Unit	EW2204038-006	EW2204038-007	EW2204038-008	EW2204038-009	EW2204038-010
				Result	Result	Result	Result	Result
EA005FD: Field pH								
pH	----	0.1	pH Unit	6.7	6.7	7.1	7.4	6.7
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	1740	970	2350	838	822
EA116: Temperature								
Temperature	----	0.5	°C	20.5	20.2	14.8	17.6	18.3
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	754	409	420	308	412
Total Alkalinity as CaCO3	----	1	mg/L	754	409	420	308	412
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	47	52	473	51	<10
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	199	58	442	101	65
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	176	100	104	88	88
Potassium	7440-09-7	1	mg/L	15	15	190	36	12
EG020F: Dissolved Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	0.288	0.094	0.290	0.082	0.087
Iron	7439-89-6	0.05	mg/L	3.26	<0.05	9.45	1.19	2.34
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	1.78	0.59	10.2	3.11	1.09
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	0.02	0.02	0.01	0.02	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	0.01	1.91	<0.01	0.04	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.03	1.93	0.01	0.06	<0.01
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	31	25	42	21	19

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**BH13**	**BH14**	**BH15**	**BH19R**	**BH18**
			Sampling date / time	06-Sep-2022 11:45	06-Sep-2022 12:30	06-Sep-2022 11:00	06-Sep-2022 13:25	06-Sep-2022 10:10
Compound	*CAS Number*	*LOR*	*Unit*	**EW2204038-006**	**EW2204038-007**	**EW2204038-008**	**EW2204038-009**	**EW2204038-010**
				Result	Result	Result	Result	Result
QWI-EN 67.11 Sampling of Groundwaters								
Standing Water Level	----	0.01	m AHD	**4.15**	**4.56**	**0.64**	**4.60**	**1.91**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	BH21	BH22	Duplicate	----	----
			Sampling date / time	06-Sep-2022 10:35	06-Sep-2022 09:00	06-Sep-2022 09:00	----	----
Compound	CAS Number	LOR	Unit	EW2204038-011	EW2204038-012	EW2204038-013	--------	--------
				Result	Result	Result	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	7.1	7.0	7.0	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	2430	1810	1810	----	----
EA116: Temperature								
Temperature	----	0.5	°C	20.8	17.3	17.3	----	----
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	667	646	652	----	----
Total Alkalinity as CaCO3	----	1	mg/L	667	646	652	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	204	113	112	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	400	240	244	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	135	117	127	----	----
Potassium	7440-09-7	1	mg/L	20	30	32	----	----
EG020F: Dissolved Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	0.597	0.108	0.119	----	----
Iron	7439-89-6	0.05	mg/L	0.44	0.14	0.15	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.3	0.2	0.2	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	4.85	24.4	24.2	----	----
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	37	50	51	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	BH21	BH22	Duplicate	----	----
			Sampling date / time	06-Sep-2022 10:35	06-Sep-2022 09:00	06-Sep-2022 09:00	----	----
Compound	CAS Number	LOR	Unit	EW2204038-011	EW2204038-012	EW2204038-013	--------	--------
				Result	Result	Result	----	----
QWI-EN 67.11 Sampling of Groundwaters								
Standing Water Level	----	0.01	m AHD	**2.86**	**2.45**	**2.45**	**----**	**----**

Inter-Laboratory Testing

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

(WATER) ED093F: Dissolved Major Cations

(WATER) EP005: Total Organic Carbon (TOC)

(WATER) EK055G: Ammonia as N by Discrete Analyser

(WATER) EG020F: Dissolved Metals by ICP-MS

(WATER) EK057G: Nitrite as N by Discrete Analyser

(WATER) EK058G: Nitrate as N by Discrete Analyser

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

(WATER) ED045G: Chloride by Discrete Analyser

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) EK040P: Fluoride by PC Titrator

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

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ Sydney 277-289 Woodpark Rd, Smithfield NSW 2164 Ph: 02 8784 8555 E: sample.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: samples.townsville@alsenviro.com

☐ Melbourne 3-4 Westall Rd, Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsenviro.com

☐ Adelaide 21 Burma Rd, Pooraka SA 5095 Ph: 08 8359 0890 E: samples.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 6324 2748 E: samples.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 Leachate	ALS QUOTE NO.:	WO/030/19 TENDER
ORDER NUMBER:			
PROJECT MANAGER:	Joel Culton		

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: 4.5 °C

Other comment:

SAMPLER: Robert Dahn	SAMPLER MOBILE:	RELINQUISHED BY: Robert Dahn	RECEIVED BY: Aneta
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default):	DATE/TIME: 5.9.22 12:15	DATE/TIME: 5.9.22
Email Reports to :		RELINQUISHED BY:	RECEIVED BY:
Email Invoice to :		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	Total Fe & Mn	NT-4 (NO2, NO3)				Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	Leachate Storage Tank - LP1	5.9.22 9:45	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & DO
				TOTAL	10									

Environmental Division Wollongong

Work Order Reference

EW2204034

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	: **EW2204034**	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	: 05-Sep-2022 13:15
Order number	: 147649	Date Analysis Commenced	: 05-Sep-2022
C-O-C number	: ----	Issue Date	: 12-Sep-2022 19:42
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.**
- EK059G: LOR raised for NOx on sample 1 due to sample matrix.
- ED041G: LOR raised for Sulfate due to sample matrix
- EK057G: LOR raised for Nitrite 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**)

Compound	CAS Number	LOR	Unit	Sample ID	Leachate Storage Tank LP1	----	----	----	----
				Sampling date / time	05-Sep-2022 09:40	----	----	----	----
					EW2204034-001	--------	--------	--------	--------
					Result	----	----	----	----
EA005FD: Field pH									
pH	----	0.1	pH Unit		**8.9**	----	----	----	----
EA010FD: Field Conductivity									
Electrical Conductivity (Non Compensated)	----	1	µS/cm		**8230**	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		**5210**	----	----	----	----
EA116: Temperature									
Temperature	----	0.5	°C		**13.0**	----	----	----	----
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		**946**	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		**2760**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		**3700**	----	----	----	----
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		**1840**	----	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		**44**	----	----	----	----
Potassium	7440-09-7	1	mg/L		**350**	----	----	----	----
EG020T: Total Metals by ICP-MS									
Manganese	7439-96-5	0.001	mg/L		**0.106**	----	----	----	----
Iron	7439-89-6	0.05	mg/L		**1.29**	----	----	----	----
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		**877**	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<1.00	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		<1.00	----	----	----	----
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	05-Sep-2022 09:40	----	----	----	----
Compound	CAS Number	LOR	Unit		EW2204034-001	--------	--------	--------	--------
					Result	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser - Continued									
Nitrite + Nitrate as N	----	0.01	mg/L		<1.00	----	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**401**	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		**7.14**	----	----	----	----
Dissolved Oxygen - % Saturation	----	0.1	% saturation		**68.8**	----	----	----	----

Inter-Laboratory Testing

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

(WATER) ED093F: Dissolved Major Cations

(WATER) EP005: Total Organic Carbon (TOC)

(WATER) EK055G: Ammonia as N by Discrete Analyser

(WATER) EG020T: Total Metals by ICP-MS

(WATER) EK057G: Nitrite as N by Discrete Analyser

(WATER) EK058G: Nitrate as N by Discrete Analyser

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

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

(WATER) ED045G: Chloride by Discrete Analyser

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) EK040P: Fluoride by PC Titrator

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

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ Sydney, 277 Woodpark Rd, Smithfield NSW 2164 Ph: 02 8784 8555 E: environmental.sydney@alsenviro.com
☐ Newcastle, 5 Rosegum Rd, Warabrook NSW 2304 Ph: 02 4968 9433 E: environmental.newcastle@alsenviro.com
☐ Brisbane, 32 Shand St, Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsenviro.com
☐ Townsville, 14-15 Desma Cr, Bohle QLD 4818 Ph: 07 4796 0600 E: townsville@environmental.com.au
☐ Melbourne, 3 Westall Rd, Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsenviro.com
☐ Adelaide, 21 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 2548 E: launceston@alsenviro.com

CLIENT:	Shellharbour City Council	TURNAROUND REQUIREMENTS: ☐ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE:	41 Burelli St WOLLONGONG NSW 2500	(Standard TAT may be longer for some tests e.g., Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes No N/A
PROJECT:	Dunmore Quarterly Leachate	ALS QUOTE NO.: WO/030/19 TENDER	Free ice / frozen ice bricks present upon receipt? Yes No N/A
ORDER NUMBER:		COC SEQUENCE NUMBER (Circle) COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: 8 °C
PROJECT MANAGER:	Joel Culton	OF: 1 2 3 4 5 6 7	Other comments: 45

SAMPLER: Robert Dahlo	SAMPLER MOBILE:	RELINQUISHED BY: Robert Dahlo	RECEIVED BY: Anela
COC emailed to ALS? (YES / NO)	EDD FORMAT (or default):	DATE/TIME: 5.9.22 12:15.	DATE/TIME: 5/9/22
Email Reports to :		RELINQUISHED BY:	RECEIVED BY:
Email Invoice to :		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	Total Fe & Mn	NT-4 (NO2, NO3)				Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	Leachate Sump	5.9.22 9:35	W			✓	✓	✓	✓	✓				Field Tests - pH, EC, Temp & DO
					TOTAL	10								

Environmental Division Wollongong
Work Order Reference
EW2204033

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	: **EW2204033**	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	Date Samples Received	: 05-Sep-2022 13:16
Order number	: 147649	Date Analysis Commenced	: 05-Sep-2022
C-O-C number	: ----	Issue Date	: 12-Sep-2022 19:42
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 Sump	----	----	----	----
			Sampling date / time	05-Sep-2022 09:35	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2204033-001	--------	--------	--------	--------
				Result	----	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	**8.8**	----	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	**8570**	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**5320**	----	----	----	----
EA116: Temperature								
Temperature	----	0.5	°C	**14.2**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	**896**	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**2760**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**3660**	----	----	----	----
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	**1840**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**49**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**369**	----	----	----	----
EG020T: Total Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	**0.127**	----	----	----	----
Iron	7439-89-6	0.05	mg/L	**1.33**	----	----	----	----
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	**792**	----	----	----	----
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	**124**	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**124**	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Leachate Sump	----	----	----	----
				Sampling date / time	05-Sep-2022 09:35	----	----	----	----
Compound	CAS Number	LOR	Unit		EW2204033-001	--------	--------	--------	--------
					Result	----	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**467**	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		**2.00**	----	----	----	----
Dissolved Oxygen - % Saturation	----	0.1	% saturation		**19.7**	----	----	----	----

Inter-Laboratory Testing

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

(WATER) ED093F: Dissolved Major Cations

(WATER) EP005: Total Organic Carbon (TOC)

(WATER) EK055G: Ammonia as N by Discrete Analyser

(WATER) EG020T: Total Metals by ICP-MS

(WATER) EK057G: Nitrite as N by Discrete Analyser

(WATER) EK058G: Nitrate as N by Discrete Analyser

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

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

(WATER) ED045G: Chloride by Discrete Analyser

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) EK040P: Fluoride by PC Titrator

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

CHAIN OF CUSTODY

ALS Laboratory: please tick →

☐ Sydney: 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 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 EPL	ALS QUOTE NO.: WO/030/19 TENDER	
ORDER NUMBER:			
PROJECT MANAGER:	Joel Culton		
SAMPLER:	Robert Dalio	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:	4.5 °C		
Other comment:			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Robert Dalio	Aneta		
DATE/TIME: 5.9.22. 12:15	DATE/TIME: 5-9-22.	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	Turbidity	NH3, NH4 & NO3	TSS, TDS, TOC, Total Mn		Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
	SWP1	5/9/22 10:05	W			✓	✓	✓	✓					Field Tests - pH, EC, DO & Temp
	SWC_2	8:50	W				✓		✓	✓	✓	✓		Field Tests - pH, EC, DO & Temp
	SWC_UP	8:00	W				✓		✓	✓	✓	✓		Field Tests - pH, EC, DO & Temp
	SWC_DOWN	8:20	W				✓		✓	✓	✓	✓		Field Tests - pH, EC, DO & Temp
	SWC_DOWN_2	8:15	W				✓		✓	✓	✓	✓		Field Tests - pH, EC, DO & Temp
	Duplicate	8:00	W				✓		✓	✓	✓	✓		Field Tests - pH, EC, DO & Temp
				TOTAL	10									

Environmental Division
Wollongong
Work Order Reference
EW2204032

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 Unp 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 bott Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

ved Glass:

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EW2204032**	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	: 05-Sep-2022 13:20
Order number	: 147649	Date Analysis Commenced	: 05-Sep-2022
C-O-C number	: ----	Issue Date	: 12-Sep-2022 19:41
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

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Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW

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- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/67.6 Rivers and Streams.
- Temperature performed by ALS Wollongong via in-house method EA116 and EN67 PK.
- Dissolved oxygen (DO) performed by ALS Wollongong via in-house method EA025FD and EN67 PK.
- All field analysis performed by ALS Wollongong were completed at the time of sampling.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/67.4 Lakes and Reservoirs
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	SWP1 Point 1	SWC_2 Point 19	SWC_UP Point 20	SWC_Down Point 21	SWC_DOWN_2 Point 22
			Sampling date / time	05-Sep-2022 10:05	05-Sep-2022 08:50	05-Sep-2022 08:00	05-Sep-2022 08:20	05-Sep-2022 08:15
Compound	CAS Number	LOR	Unit	EW2204032-001	EW2204032-002	EW2204032-003	EW2204032-004	EW2204032-005
				Result	Result	Result	Result	Result
EA005FD: Field pH								
pH	----	0.1	pH Unit	7.6	7.4	7.4	7.4	7.4
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	585	1740	1370	1690	1990
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	----	1270	990	1260	1410
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	9	8	8	6	9
EA045: Turbidity								
Turbidity	----	0.1	NTU	17.9	27.2	27.4	26.6	25.9
EA116: Temperature								
Temperature	----	0.5	°C	12.1	12.7	11.8	12.5	12.5
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	225	106	107	105	103
Total Alkalinity as CaCO3	----	1	mg/L	225	106	107	105	103
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	44	95	74	88	104
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	93	671	469	614	754
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	52	43	38	41	43
Magnesium	7439-95-4	1	mg/L	19	47	37	44	52
Sodium	7440-23-5	1	mg/L	77	338	252	312	381
Potassium	7440-09-7	1	mg/L	10	15	11	14	16
EG020F: Dissolved Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	0.05	0.05	0.05	<0.05	<0.05
EG020T: Total Metals by ICP-MS								
Manganese	7439-96-5	0.001	mg/L	0.067	0.060	0.068	0.058	0.050
Iron	7439-89-6	0.05	mg/L	0.96	1.71	2.01	1.84	1.24
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	0.1	0.2	0.2	0.2	0.2

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	SWP1 Point 1	SWC_2 Point 19	SWC_UP Point 20	SWC_Down Point 21	SWC_DOWN_2 Point 22
			Sampling date / time	05-Sep-2022 10:05	05-Sep-2022 08:50	05-Sep-2022 08:00	05-Sep-2022 08:20	05-Sep-2022 08:15
Compound	CAS Number	LOR	Unit	EW2204032-001	EW2204032-002	EW2204032-003	EW2204032-004	EW2204032-005
				Result	Result	Result	Result	Result
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	1.82	0.46	0.15	0.35	0.19
EK055G-NH4: Ammonium as N by DA								
Ammonium as N	14798-03-9_N	0.01	mg/L	1.80	0.46	0.15	0.35	0.19
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	0.40	0.01	0.01	0.01	0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	2.06	0.85	0.88	0.86	0.84
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	2.46	0.86	0.89	0.87	0.85
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	8.04	23.0	16.9	21.2	25.5
ø Total Cations	----	0.01	meq/L	7.76	21.1	16.2	19.6	23.4
ø Ionic Balance	----	0.01	%	1.72	4.36	2.19	4.05	4.26
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	19	8	8	8	8
EP025FD: Field Dissolved Oxygen								
Dissolved Oxygen	----	0.01	mg/L	8.70	9.01	9.60	9.37	9.54

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	Duplicate	----	----	----	----
			Sampling date / time	05-Sep-2022 08:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2204032-006	--------	--------	--------	--------
				Result	----	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	**7.4**	----	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	**1370**	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	**1280**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**9**	----	----	----	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	**26.3**	----	----	----	----
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	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**112**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**112**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**93**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**637**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**43**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**47**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**337**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**15**	----	----	----	----
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	**0.058**	----	----	----	----
Iron	7439-89-6	0.05	mg/L	**1.65**	----	----	----	----
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	05-Sep-2022 08:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EW2204032-006	--------	--------	--------	--------
					Result	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**0.46**	----	----	----	----
EK055G-NH4: Ammonium as N by DA									
Ammonium as N	14798-03-9_N	0.01	mg/L		**0.46**	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		**0.01**	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**0.86**	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**0.87**	----	----	----	----
EN055: Ionic Balance									
ø Total Anions	----	0.01	meq/L		**22.1**	----	----	----	----
ø Total Cations	----	0.01	meq/L		**21.0**	----	----	----	----
ø Ionic Balance	----	0.01	%		**2.52**	----	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**8**	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		**9.60**	----	----	----	----

Inter-Laboratory Testing

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

(WATER) EA045: Turbidity

(WATER) EP005: Total Organic Carbon (TOC)

(WATER) EG020F: Dissolved Metals by ICP-MS

(WATER) EG020T: Total Metals by ICP-MS

(WATER) EK057G: Nitrite as N by Discrete Analyser

(WATER) EK058G: Nitrate as N by Discrete Analyser

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

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

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

(WATER) EK055G: Ammonia as N by Discrete Analyser

(WATER) EN055: Ionic Balance

(WATER) ED045G: Chloride by Discrete Analyser

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

(WATER) EK040P: Fluoride by PC Titrator

(WATER) ED037P: Alkalinity by PC Titrator

(WATER) ED093F: Dissolved Major Cations

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

Appendix C

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

CHAIN OF CUSTODY

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 Dalco	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:	1.2 °C		
Other comment:			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Robert Dalco	Anele		
DATE/TIME: 7.9.2L	DATE/TIME: 719122.	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	7.9.2L 10:40	AIR			✓								
	DDG2	10:50	AIR			✓								
	DDG3	8:40	AIR			✓								
	DDG4	9:00	AIR			✓								
				TOTAL	10									

Environmental Division Wollongong
Work Order Reference
EW2204040

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	: **EW2204040**	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-Sep-2022 15:10
Order number	: 147649	Date Analysis Commenced	: 09-Sep-2022
C-O-C number	: ----	Issue Date	: 16-Sep-2022 15:18
Sampler	: Robert DaLio		
Site	: DUNMORE LANDFILL TENDER		
Quote number	: WO/030/19 TENDER DUST		
No. of samples received	: 4		
No. of samples analysed	: 4		

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

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Accreditation Category*
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.**
- Analysis as per AS3580.10.1-2016. Samples passed through a 1mm sieve prior to analysis. NATA accreditation does not apply for results reported in g/m².mth.
- Sample exposure period is 35 days which is outside the typical exposure period of 30 +/- 2 days as per AS3580.10.1.
- Sampling completed by ALS Wollongong in accordance with in-house sampling method EN/66.1 Sampling and Siting of Dust Depositon Gauges.
- For dust analysis, the Limit of Reporting (LOR) referenced in the reports for deposited matter parameters represents the reporting increment rather than reporting limit.

Analytical Results

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

			Sample ID	**DDG1 03/08/2022 - 07/09/2022**	**DDG2 03/08/2022 - 07/09/2022**	**DDG3 03/08/2022 - 07/09/2022**	**DDG4 03/08/2022 - 07/09/2022**	**----**
			Sampling date / time	07-Sep-2022 10:40	07-Sep-2022 10:50	07-Sep-2022 08:40	07-Sep-2022 08:00	----
Compound	*CAS Number*	*LOR*	*Unit*	**EW2204040-001**	**EW2204040-002**	**EW2204040-003**	**EW2204040-004**	**--------**
				Result	Result	Result	Result	----
EA120: Ash Content								
Ash Content	----	0.1	g/m².month	**0.5**	**0.3**	**0.4**	**1.1**	**----**
Ash Content (mg)	----	2	mg	**10**	**6**	**8**	**23**	**----**
EA125: Combustible Matter								
Combustible Matter	----	0.1	g/m².month	**0.1**	**0.3**	**0.2**	**0.6**	**----**
Combustible Matter (mg)	----	2	mg	**3**	**6**	**5**	**12**	**----**
EA141: Total Insoluble Matter								
Total Insoluble Matter	----	0.1	g/m².month	**0.6**	**0.6**	**0.6**	**1.7**	**----**
Total Insoluble Matter (mg)	----	2	mg	**13**	**12**	**13**	**35**	**----**

Inter-Laboratory Testing

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

(AIR) EA125: Combustible Matter

(AIR) EA120: Ash Content

(AIR) EA141: Total Insoluble Matter

Appendix D

Surface Gas (Methane) Field Sheets

CHAIN OF CUSTODY

ALS Environmental

ALS Laboratory: please tick →

❑ADELAIDE 21 Burma Road Pooraka SA 5095 Ph: 08 8359 0890 E: adelaide@alsglobal.com
❑BRISBANE 32 Shand Street Stafford QLD 4053 Ph: 07 3243 7222 E: samples.brisbane@alsglobal.com
❑GLADSTONE 46 Callemondah Drive Clinton QLD 4680 Ph: 07 7471 5600 E: gladstone@alsglobal.com
❑MACKAY 78 Harbour Road Mackay QLD 4740 Ph: 07 4944 0177 E: mackay@alsglobal.com
❑MELBOURNE 2-4 Westall Road Springvale VIC 3171 Ph: 03 8549 9600 E: samples.melbourne@alsglobal.com
❑MUDGEE 27 Sydney Road Mudgee NSW 2850 Ph: 02 6372 6735 E: mudgee.mail@alsglobal.com
❑NEWCASTLE 5 Rose Gum Road Warabrook NSW 2304 Ph: 02 4968 9433 E: samples.newcastle@alsglobal.com
❑NOWRA 4/13 Geary Place North Nowra NSW 2541 Ph: 024423 2063 E: nowra@alsglobal.com
❑PERTH 10 Hod Way Malaga WA 6090 Ph: 08 9209 7655 E: samples.perth@alsglobal.com
❑SYDNEY 277-289 Woodpark Road Smithfield NSW 2164 Ph: 02 8784 8555 E: samples.sydney@alsglobal.com
❑TOWNSVILLE 14-15 Desma Court Bohle QLD 4818 Ph: 07 4796 0600 E: townesville.environmental@alsglobal.com
❑WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: Shoalhaven City Council	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g., Ultra Trace Organics)	☐ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle)
OFFICE: Deering Street Ulladulla NSW 2539		☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes No N/A
DIVISION: City Services	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle)	Free ice / frozen ice bricks present upon receipt? Yes No N/A
PROJECT: Ulladulla Methane Gas		COC: 1 2 3 4 5 6 7	Random Sample Temperature on Receipt: °C
ORDER NUMBER: 15455 99999	AUTHORISED BY: David Hojem	OF: 1 2 3 4 5 6 7	Other comment:
PROJECT MANAGER: Kristin Holt	CONTACT PH: 02 4429 3554		
SAMPLER: ALS	SAMPLER MOBILE: 0407626331		
Email Reports to: Kristin.Holt@shoalhaven.nsw.gov.au; lab@enrs.com.au			
Email Invoice to: nowra.lab@alsglobal.com			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Tom Roose	Aneta		
DATE/TIME: 18/8/22	DATE/TIME: 18/8/22	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Send Results to:

ALS USE	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	COUNCIL SAMPLE ID	DATE / TIME SAMPLED	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS PER SAMPLE	Methane								
	Ulladulla landfill	18/8/22			1	✓								Sampled by ALS
				TOTAL										

Environmental Division
Wollongong
Work Order Reference
EW2204294

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 = Sulfu
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

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 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 Methane Testing	**ALS QUOTE NO.:**	WO/030/19 TENDER
ORDER NUMBER:			
PROJECT MANAGER:	Joel Culton		
SAMPLER:		**SAMPLER MOBILE:**	
COC emailed to ALS? (YES / NO)		**EDD FORMAT (or default):**	
Email Reports to :			
Email Invoice to :			

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 comments:			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Robert	Anete		
DATE/TIME: 19/9/22	DATE/TIME: 19/9/22	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	Surface Methane Testing								Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc.
1	Methane	13/9/22.	W			✓	✓							
				TOTAL	10									

Environmental Division Wollongong
Work Order Reference
EW2204304

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 Landfill Emissions Report

Client:	Shellharbour City Council	Date:	13/09/2022
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 222	302 436	0.0	
B	2	6168 267	302 436	0.0	
B	3	6168 305	302 438	0.0	
B	4	6168 328	302 440	0.0	
B	5	6168 354	302 439	0.0	
B	6	6168 377	302 437	0.0	
C	1	6168 433	302 377	0.0	
C	2	6168 364	302 402	0.0	
C	3	6168 290	302 417	0.0	
C	4	6167 230	302 424	0.0	
C	5	6167 163	302 426	0.0	
C	6	6168 095	302 414	0.0	
C	7				No Access Overgrown
D	1	6168 142	302 387	0.0	
D	2	6168 149	302 386	0.0	
D	3	6168 159	302 382	0.0	
D	4	6168 173	302 380	0.0	
D	4	6168 186	302 376	0.0	
D					No Access , Heavy Vegetation
E	1	6168 237	302 331	0.0	
E	2	6168 234	302 333	0.0	
E	3	6168 226	302 334	0.0	
E	4	6168 216	302 336	0.0	
E	5	6168 203	302 341	0.0	
E	6	6168 184	302 347	0.0	
E	7	6168 171	302 352	0.0	
E	8	6168 150	302 366	0.0	
F	1	6168 148	302 356	0.0	
F	2	6168 155	302 345	0.0	
F	3	6168 160	302 347	0.0	
F	4	6168 167	302 344	0.0	
F	5	6168 181	302 324	0.0	
F	5	6168 191	302 320	0.0	
G	1	6168 409	302 259	0.0	
G	2	6168 413	302 269	0.0	
G	3	6168 427	302 290	0.0	
G	4	6168 446	302 335	0.0	

H	1	6168 414	302 557	0.0	
H	2	6168 372	302 555	0.0	
H	3	6168 331	302 546	0.0	
H	4	6168 225	302 560	0.0	
H	5	6168 194	302 578	0.0	
H	6	6168 176	302 593	0.0	
H	7	6168 133	301 608	0.0	
H	8	6168 071	301 601	0.0	
H	9	6168 093	302 573	0.0	
H	10	6168 124	302 460	0.0	
H	11	6168 171	302 530	0.0	
H	12	6168 070	302 073	0.0	
H	13	6168 045	302 098	1.2	
H	14	6167 997	302 125	1.1	
H	15	6167 970	302 156	0.0	
H	16	6167 900	302 235	0.0	
H	17	6167 898	302 284	0.0	
H	18	6167 874	302 296	0.0	
H	19	6167 881	302 397	0.0	
H	20	6168 900	302 470	0.0	
H	21	6168 951	302 493	0.0	
H	22	6168 023	302 504	0.0	
H	23	6168 058	302 502	0.0	
H	24	6168 132	302 514	0.0	
H	25	6167 181	302 519	0.0	
H	26	6168 228	302 523	0.0	
H	27	6168 288	302 535	0.0	
H	28	6168 348	302 537	0.0	
H	29	6168 452	301 502	0.0	
H	30	6168 487	302 325	0.0	
H	31	6168 444	302 273	0.0	
H	32	6168 376	302 208	0.0	
H	33	6168 325	301 157	0.0	
H	34	6168 276	302 109	0.0	
H	35	6168 248	302 088	0.0	
I	1				NO ACCESS EXCLUSION ZONE
J	1	6168 286	302 227	0.0	
J	2	6168 264	302 235	0.0	
J	3	6168 225	302 248	1.7	
J	4	6167 184	302 257	1.0	
K	1	6168 531	302 394	0.0	
K	2	6168 541	302 430	0.0	
K	3	6168 574	302 451	0.0	
K	4	6168 580	302 403	0.0	
K	5	6168 574	302 369	0.0	
K	5	6168 545	302 383	0.0	
L	1	6168 755	302 332	1.0	
L	2	6168 739	302 321	0.0	
L	3	6168 700	302 399	0.0	
L	4	6168 676	302 282	0.0	
L	5	6168 641	302 274	0.0	
L	6	6168 632	302 251	0.0	
Compressor Shed	1			0.0	
Office	1			0.0	
Community Recycling Centre	1			0.0	
OLD Weighbridge	1			0.0	
OLD Weighbridge Toilet	1			0.0	
Revolve Shop	1			0.0	
Building Truckwash	1			0.0	
New Weighbridge	1			0.0	
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 Dalton	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: 6.3 °C
Other comment:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Robert Dalton	Anela		
DATE/TIME: 25.10.22	DATE/TIME: 25/10/22	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.
	SWP1	25.10.22 7:53	W			✓	✓	✓	✓				Field Tests - pH, EC, DO & Temp
				TOTAL	10								

Environmental Division Wollongong
Work Order Reference
EW2204898

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	: **EW2204898**	Page	: 1 of 4
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Ryan Stirling	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Surface Water SWP01 Overflow	Date Samples Received	: 25-Oct-2022 12:16
Order number	: 147649	Date Analysis Commenced	: 25-Oct-2022
C-O-C number	: ----	Issue Date	: 02-Nov-2022 18:16
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*
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Robert DaLio	Sampler	Laboratory - Wollongong, NSW

General Comments

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

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

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

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

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

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

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- Temperature performed by ALS Wollongong via in-house method EA116 and EN67 PK.
- Dissolved oxygen (DO) performed by ALS Wollongong via in-house method 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	25-Oct-2022 07:53	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2204898-001	--------	--------	--------	--------
				Result	----	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	**7.9**	----	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	**1550**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**17**	----	----	----	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	**14.2**	----	----	----	----
EA116: Temperature								
Temperature	----	0.5	°C	**18.9**	----	----	----	----
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	**361**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**361**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**104**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**178**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**62**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**33**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**175**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**20**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----
EG020T: Total Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	**0.76**	----	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.4**	----	----	----	----
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								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SWP1 Point 1	----	----	----	----
				Sampling date / time	25-Oct-2022 07:53	----	----	----	----
Compound	CAS Number	LOR	Unit		EW2204898-001	--------	--------	--------	--------
					Result	----	----	----	----
EK055G-NH4: Ammonium as N by DA - Continued									
Ammonium as N	14798-03-9_N	0.01	mg/L		**15.3**	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		**0.67**	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**1.04**	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**1.71**	----	----	----	----
EN055: Ionic Balance									
ø **Total Anions**	----	0.01	meq/L		**14.4**	----	----	----	----
ø **Total Cations**	----	0.01	meq/L		**13.9**	----	----	----	----
ø **Ionic Balance**	----	0.01	%		**1.64**	----	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		**23**	----	----	----	----
EP025FD: Field Dissolved Oxygen									
Dissolved Oxygen	----	0.01	mg/L		**4.24**	----	----	----	----

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

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 Dabo	**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 packs present upon receipt?	Yes	No	N/A
Random Sample Temperature on Receipt			°C
Other comments			

RELINQUISHED BY:	**RECEIVED BY:**	**RELINQUISHED BY:**	**RECEIVED BY:**
Robert Dabo	Anati		
DATE/TIME: 21/10/22	DATE/TIME: 21/10/22.	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.
	SWP1	21/10/22 19:30	W			✓	✓	✓	✓					Field Tests - pH, EC, DO & Temp
				TOTAL	10									

Environmental Division Wollongong
Work Order Reference
EW2204854

Telephone : 02 42253126

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG =,Amber Glass Unpreserved; AP - Airfreight 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	: **EW2204854**	Page	: 1 of 4
Client	: **SHELLHARBOUR CITY COUNCIL**	Laboratory	: Environmental Division NSW South Coast
Contact	: Ryan Stirling	Contact	: Aneta Prosaroski
Address	: LAMERTON HOUSE, LAMERTON CRESCENT SHELL HARBOUR CITY CENTRE NSW, AUSTRALIA 2529	Address	: 1/19 Ralph Black Dr, North Wollongong 2500 NSW Australia
Telephone	: ----	Telephone	: +61 2 4225 3125
Project	: Dunmore Surface Water SWP01 Overflow	Date Samples Received	: 21-Oct-2022 15:55
Order number	: 147649	Date Analysis Commenced	: 21-Oct-2022
C-O-C number	: ----	Issue Date	: 28-Oct-2022 16:40
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

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.

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

- **Analytical work for this work order will be conducted at ALS Sydney.**
- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- pH performed by ALS Wollongong via in-house method EA005FD and EN67 PK.
- Electrical conductivity performed by ALS Wollongong via in-house method EA010FD and EN67 PK.
- Temperature performed by ALS Wollongong via in-house method EA116 and EN67 PK.
- Dissolved oxygen (DO) performed by ALS Wollongong via in-house method 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	21-Oct-2022 14:30	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2204854-001	--------	--------	--------	--------
				Result	----	----	----	----
EA005FD: Field pH								
pH	----	0.1	pH Unit	**7.9**	----	----	----	----
EA010FD: Field Conductivity								
Electrical Conductivity (Non Compensated)	----	1	µS/cm	**1760**	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	**23**	----	----	----	----
EA045: Turbidity								
Turbidity	----	0.1	NTU	**40.0**	----	----	----	----
EA116: Temperature								
Temperature	----	0.5	°C	**21.5**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**469**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**469**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**115**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**214**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**63**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**37**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**193**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**20**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	<0.05	----	----	----	----
EG020T: Total Metals by ICP-MS								
Iron	7439-89-6	0.05	mg/L	**1.99**	----	----	----	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.4**	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**16.4**	----	----	----	----
EK055G-NH4: Ammonium as N by DA								

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	SWP1 Point 1	----	----	----	----
			Sampling date / time	21-Oct-2022 14:30	----	----	----	----
Compound	CAS Number	LOR	Unit	EW2204854-001	--------	--------	--------	--------
				Result	----	----	----	----
EK055G-NH4: Ammonium as N by DA - Continued								
Ammonium as N	14798-03-9_N	0.01	mg/L	**15.9**	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	**0.81**	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.98**	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**1.79**	----	----	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**17.8**	----	----	----	----
ø Total Cations	----	0.01	meq/L	**15.1**	----	----	----	----
ø Ionic Balance	----	0.01	%	**8.23**	----	----	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	**28**	----	----	----	----
EP025FD: Field Dissolved Oxygen								
Dissolved Oxygen	----	0.01	mg/L	**5.77**	----	----	----	----

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

Appendix F

Calibration Certificates

Gas Verification Certificate

Instrument Laser Inspectra
Serial No. 3810912
Sensors Laser

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments			
Battery	Charge Condition	✓				
	Fuses	✓				
	Capacity	✓				
	Recharge OK?	✓				
Switch/keypad	Operation	✓				
Display	Intensity	✓				
	Operation (segments)	✓				
Grill Filter	Condition	✓				
	Seal	✓				
Pump	Operation					
	Filter					
	Flow					
	Valves, Diaphragm					
PCB	Condition	✓				
Connectors	Condition	✓				
			Low	**High**	**TWA**	**STEL**
Sensor	Laser	✓				
		✓				
		✓				
		✓				
		✓				
Alarms	Beeper	✓				
	Settings	✓				
Software	Version					
Datalogger	Operation					
Download	Operation					
Other tests:						

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Diffusion mode Aspirated mode

Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No	Instrument Reading
Laser		500ppm CH4	NIST	999412	495 ppm CH4

Bump Test by: **Kylie Rawlings**

Date: **1/2/21**

Appendix G

Gas Flare Reports

FOCUS YOUR ENERGY

PEOPLE ENGINEERING A ZERO CARBON, CLEAN ENERGY FUTURE.

WWW.LGI.COM.AU

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
23.4 million m3	222 thousand tonnes (t CO2e - environmental benefit)	92 thousand Australian Carbon Credit Units	3.7 million seedlings planted for 10 years (t CO2e)	6,093 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 November 2022

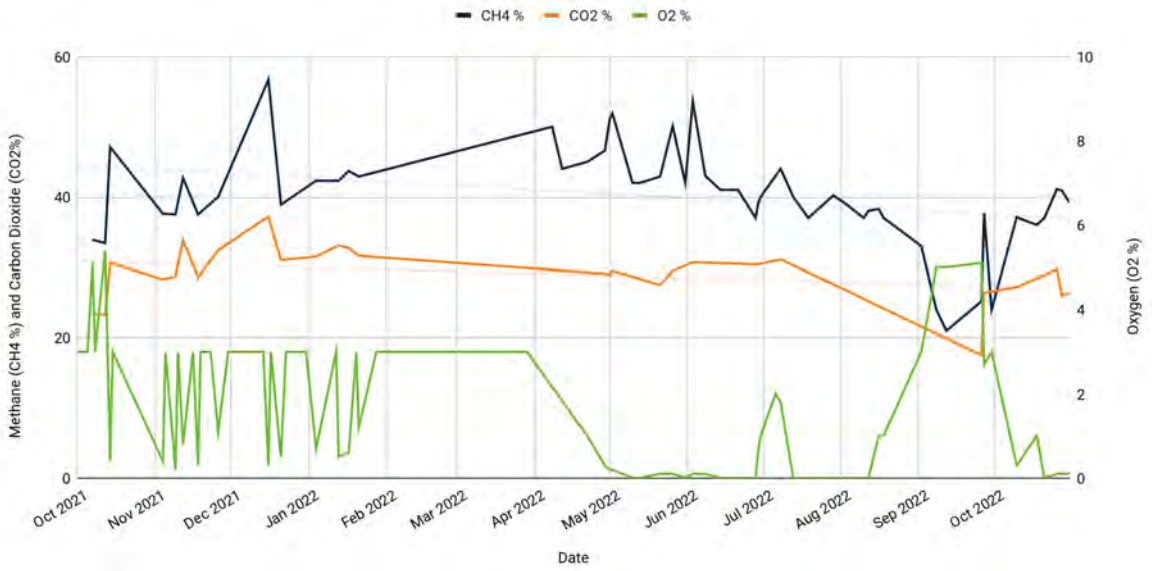
Site:	Dunmore	**Report issue date:**	14/11/2022
Report month:	October 2022	**Prepared by:**	Grace Tap
Prepared for:	Shellharbour City Council	**Checked by:**	Jessica North

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 **August 2022 -** LGI repaired the 225mm mainline and adjacent submain to allow for intermediate capping to continue across the top of cell 3
Comments on operation / maintenance:	Availability - 99.38% Down Time: 4.58hrs Field Tuned: - 31/10/2022
Recommendations:	After discussion with Council, LGI will re investigate options for leachate pumping out of gas extraction wells

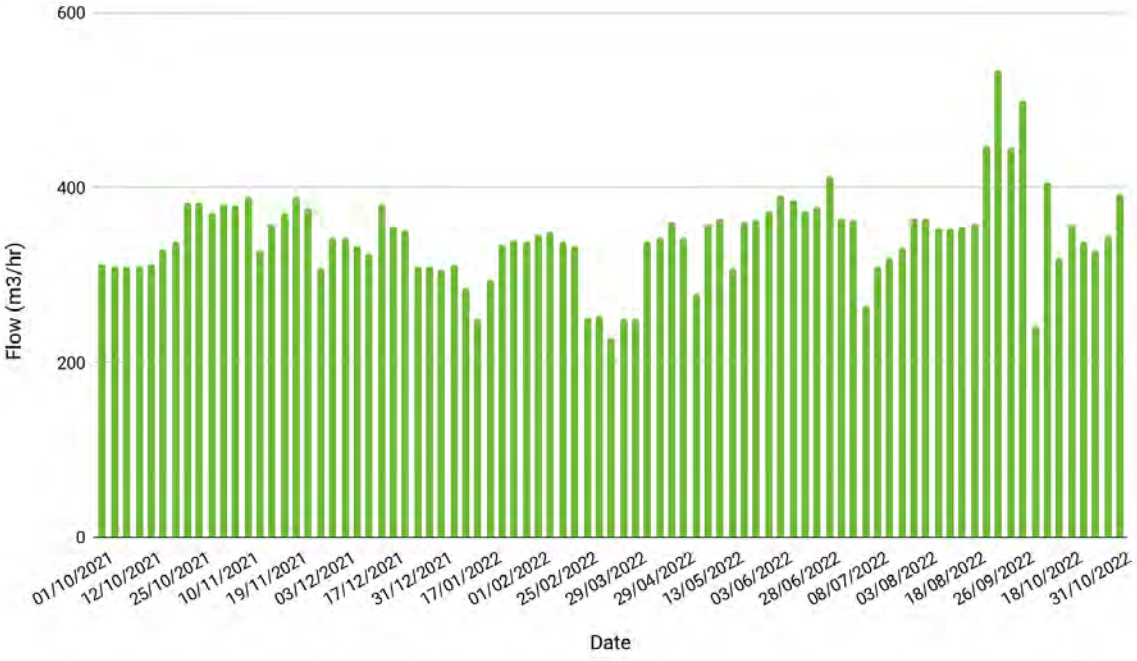
Flare Operational Data:

Date	CH4 %	CO2 %	O2 %	FLOW m3/h	STACK TEMP C	CUMULATIVE FLOW m3
10/10/2022	37.1	27.2	0.3	320	769	23,176,716
18/10/2022	36	-	1	357	614	23,243,922
26/10/2022	41.1	29.7	0.1	327	662	23,311,015
31/10/2022	39.2	26.4	0.1	392	767	23,355,257
Average	38.35	27.77	0.37	349	703	-

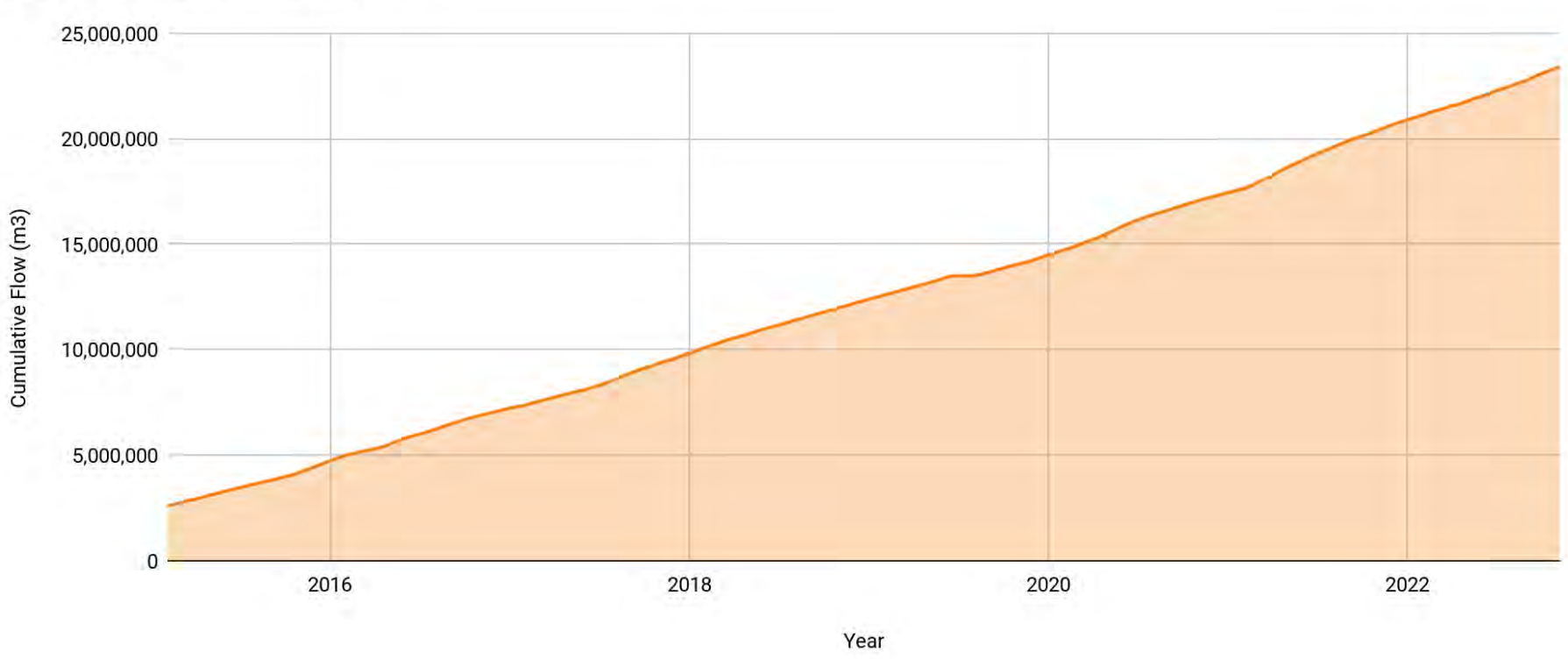
Dunmore- Methane, Carbon Dioxide & Oxygen



Dunmore - Flow Rate



Dunmore - Cumulative Flow



- 23,360,830 of combusted landfill gas up to 1 November 2022, which represents;
    - 221,872 tonnes of CO2 equivalent (total methane abated by gas capture system to date).
    - 3,697,864 seedlings planted for 10 years
    - 6,093 (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.

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
23.1 million m3	219 thousand tonnes (t CO2e - environmental benefit)	92 thousand Australian Carbon Credit Units	3.7 million seedlings planted for 10 years (t CO2e)	6,068 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 October 2022

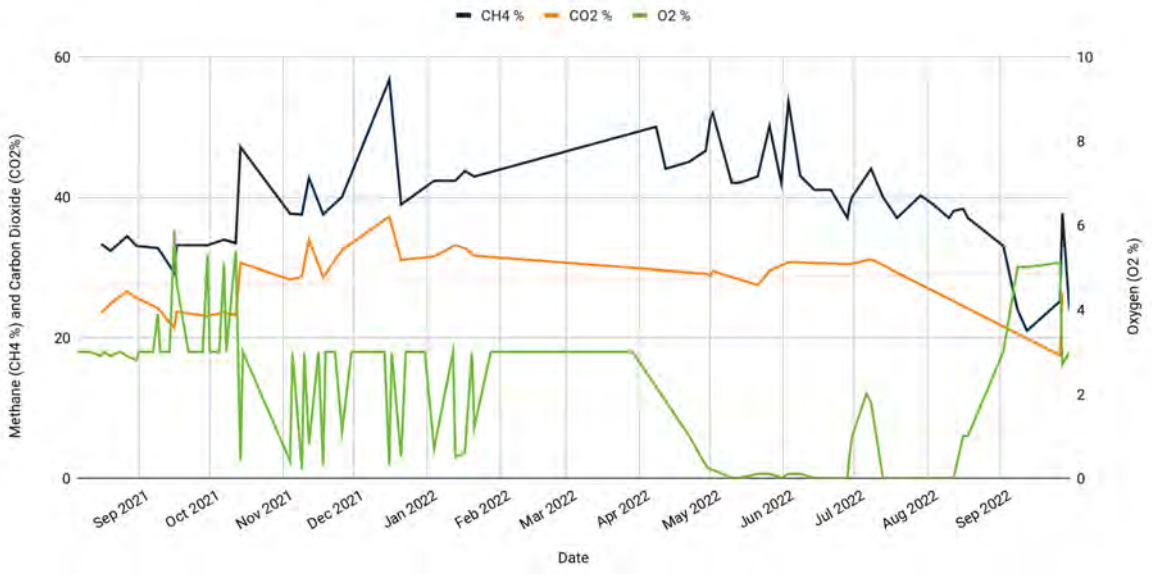
Site:	Dunmore	**Report issue date:**	13/10/2022
Report month:	September 2022	**Prepared by:**	Grace Tap
Prepared for:	Shellharbour City Council	**Checked by:**	Jessica North

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 **August 2022 -** LGI repaired the 225mm mainline and and adjacent submain to allow for intermediate capping to continue across the top of cell 3
Comments on operation / maintenance:	Availability - 99.44% Down Time: 4.00hrs
Recommendations:	After discussion with Council, LGI will re investigate options for leachate pumping out of gas extraction wells

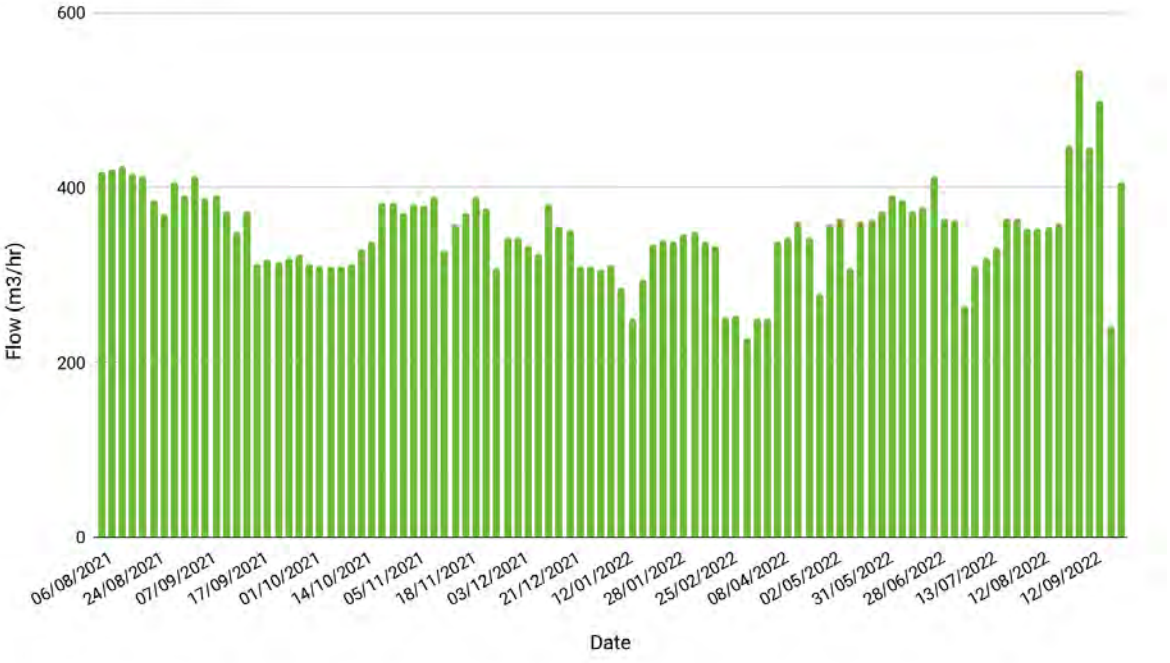
Flare Operational Data:

Date	CH4 %	CO2 %	O2 %	FLOW m3/h	STACK TEMP C	CUMULATIVE FLOW m3
02/09/2022	33	-	3	448	600	22,786,355
08/09/2022	24	-	5	533	575	22,859,609
26/09/2022	25.2	17.5	5.1	498	538	23,064,267
30/09/2022	24	-	3	405	633	23,088,664
Average	26.55	17.5	4.025	471	587	-

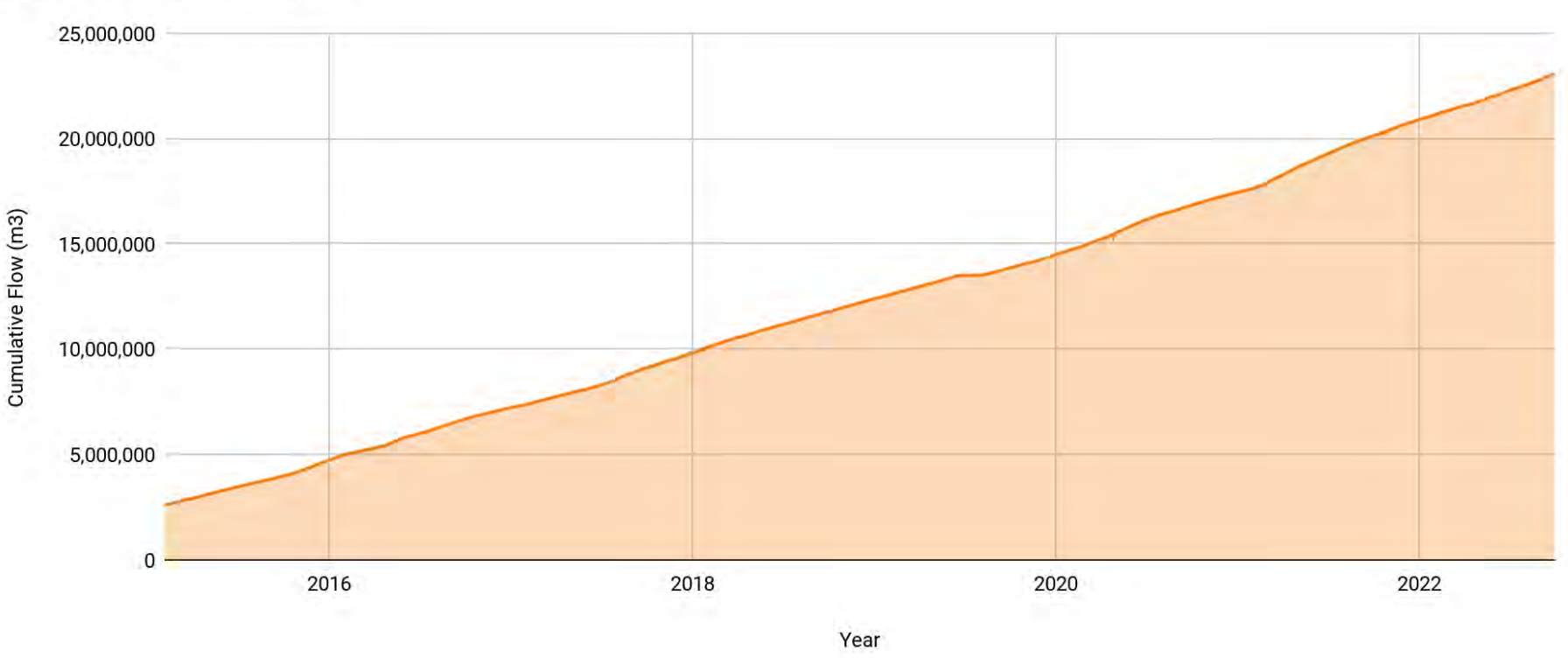
Dunmore- Methane, Carbon Dioxide & Oxygen



Dunmore - Flow Rate



Dunmore - Cumulative Flow



- 23,095,070 of combusted landfill gas up to 1 October 2022, which represents;
    - 219,348 tonnes of CO2 equivalent (total methane abated by gas capture system to date).
    - 3,655,796 seedlings planted for 10 years
    - 6,068 (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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Results Achieved since the Project Commenced*

BIOGAS CAPTURED	CARBON ABATEMENT	ACCUs CREATED	SEEDLINGS PLANTED	CARS OFF THE ROAD
22.8 million m3	216 thousand tonnes (t CO2e - environmental benefit)	92 thousand Australian Carbon Credit Units	3.6 million seedlings planted for 10 years (t CO2e)	5,908 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.
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* ACCUs created to 15 May 2022. Other Results Achieved to 1 September 2022

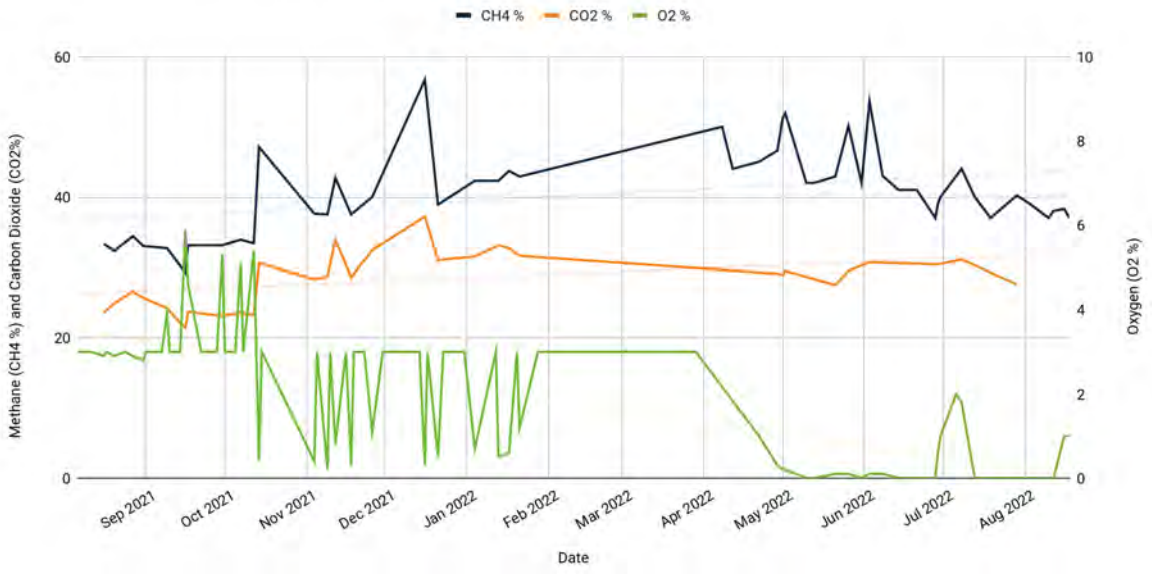
Site:	Dunmore	**Report issue date:**	13/09/2022
Report month:	August 2022	**Prepared by:**	Grace Tap
Prepared for:	Shellharbour City Council	**Checked by:**	Jessica North

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 **August 2022 -** LGI repaired the 225mm mainline and and adjacent submain to allow for intermediate capping to continue across the top of cell 3
Comments on operation / maintenance:	Availability - 99.25% Down Time: 5.58hrs
Recommendations:	After discussion with Council, LGI will re investigate options for leachate pumping out of gas extraction wells

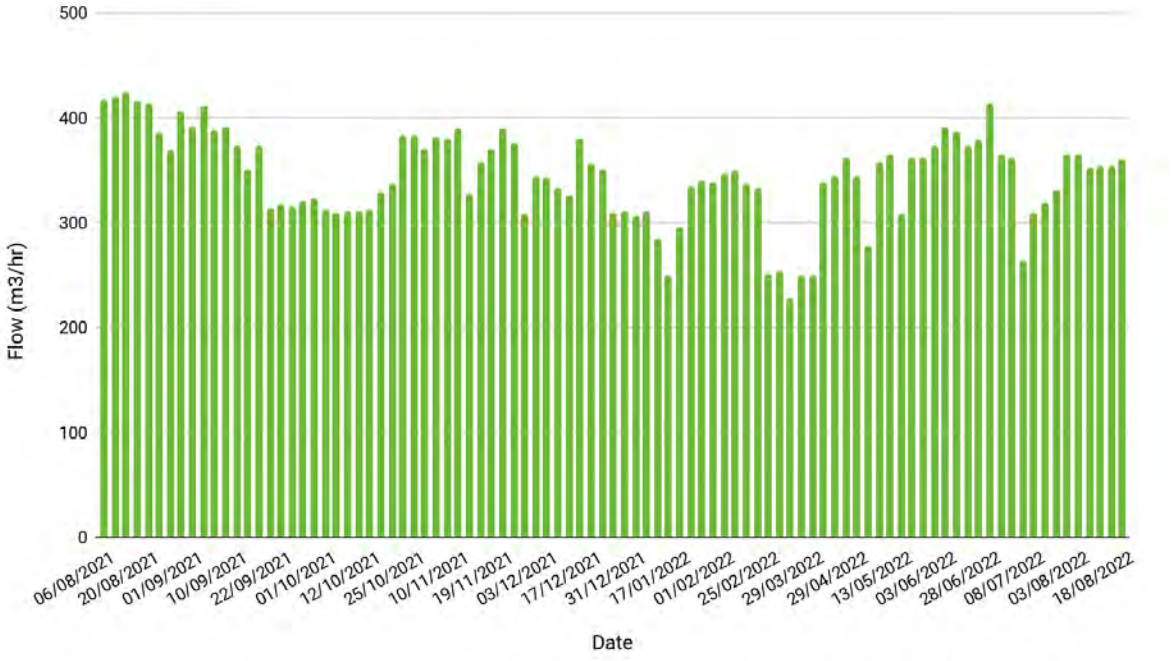
Flare Operational Data:

Date	CH4 %	CO2 %	O2 %	FLOW m3/h	STACK TEMP C	CUMULATIVE FLOW m3
03/08/2022	39	-	0	365	809	22,545,594
10/08/2022	37	-	0	352	778	22,605,557
16/08/2022	38.3	-	1	354	745	22,657,263
18/08/2022	37	-	1	360	776	22,676,123
Average	37.825	-	0.5	358	777	-

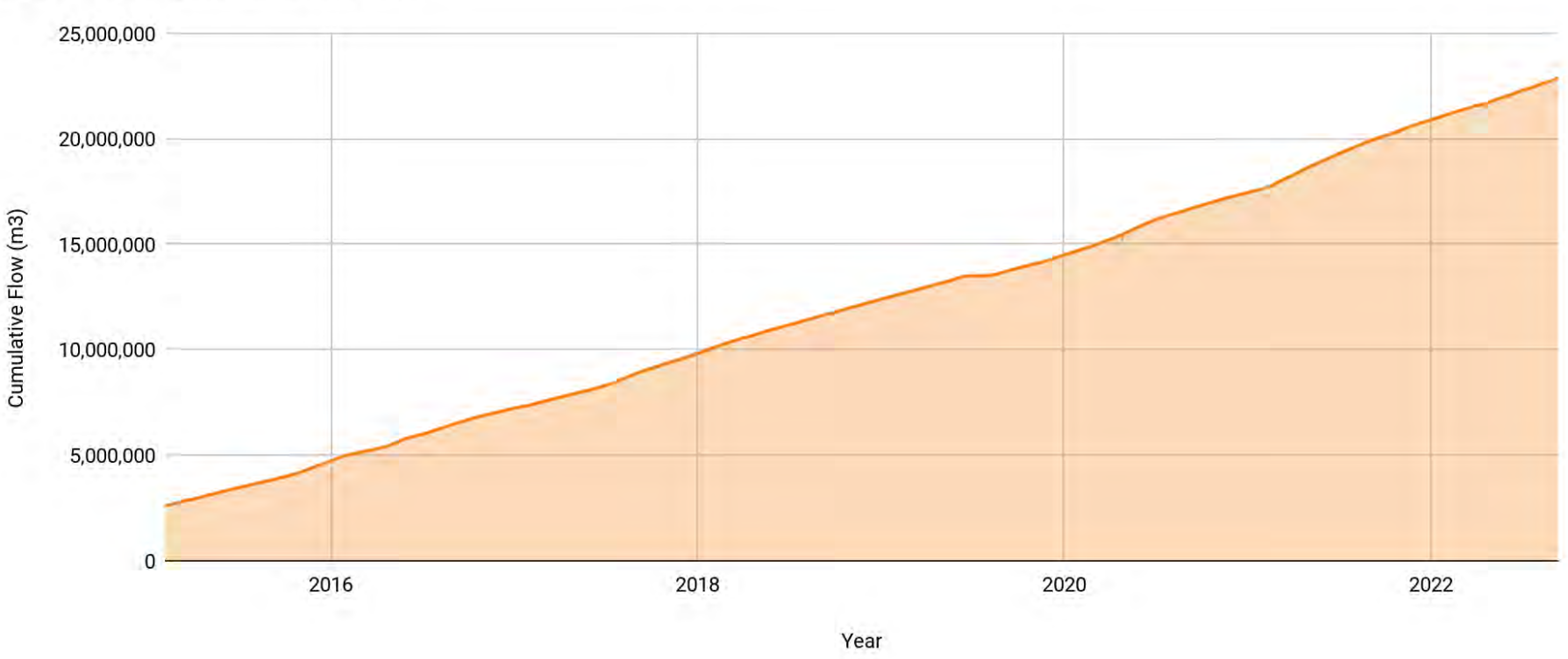
Dunmore- Methane, Carbon Dioxide & Oxygen



Dunmore - Flow Rate



Dunmore - Cumulative Flow



- 22,772,663 of combusted landfill gas up to 1 September 2022, which represents;
    - 216,286 tonnes of CO2 equivalent (total methane abated by gas capture system to date).
    - 3,604,761 seedlings planted for 10 years
    - 5,908 (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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Results Achieved since the Project Commenced*

BIOGAS CAPTURED	CARBON ABATEMENT	ACCUs CREATED	SEEDLINGS PLANTED	CARS OFF THE ROAD
22.5 million m3	214 thousand tonnes (t CO2e - environmental benefit)	92 thousand Australian Carbon Credit Units	3.6 million seedlings planted for 10 years (t CO2e)	6,025 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.
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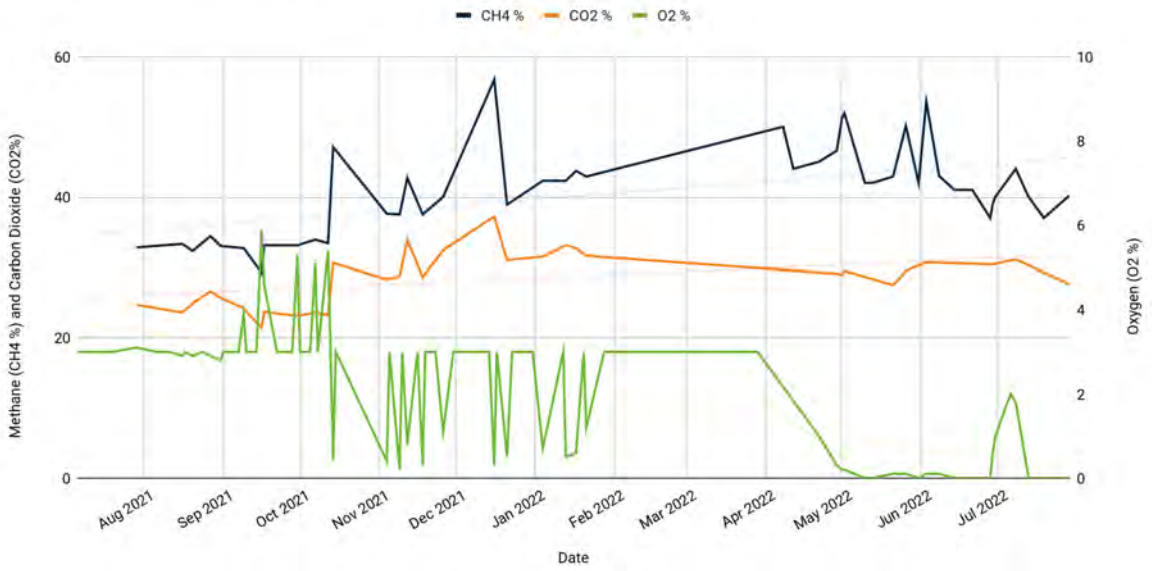
Site:	Dunmore	**Report issue date:**	17/08/2022
Report month:	July 2022	**Prepared by:**	Grace Tap
Prepared for:	Shellharbour City Council	**Checked by:**	Jessica North

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 - 99.92% Down Time: 0.58hrs Causes: 0.58hrs - PO repairs to gas field Field Tuned: - 08/07/2022 - 29/07/2022
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 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 repaired damaged well head connection in July 2022

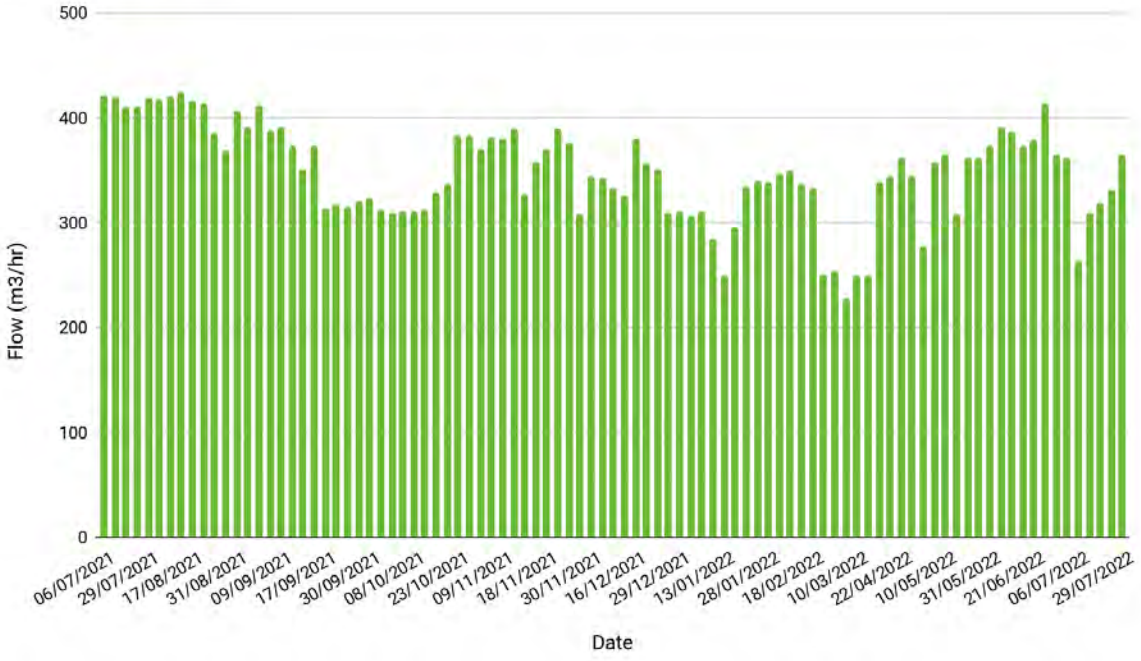
Flare Operational Data:

Date	CH4 %	CO2 %	O2 %	FLOW m3/h	STACK TEMP C	CUMULATIVE FLOW m3
08/07/2022	44	31.1	1.8	309	786	22,335,444
13/07/2022	40	-	0	319	745	22,374,665
19/07/2022	37	-	0	331	715	22,423,412
29/07/2022	40.2	27.6	0	364	832	22,503,217
Average	40.3	29.35	0.45	331	770	-

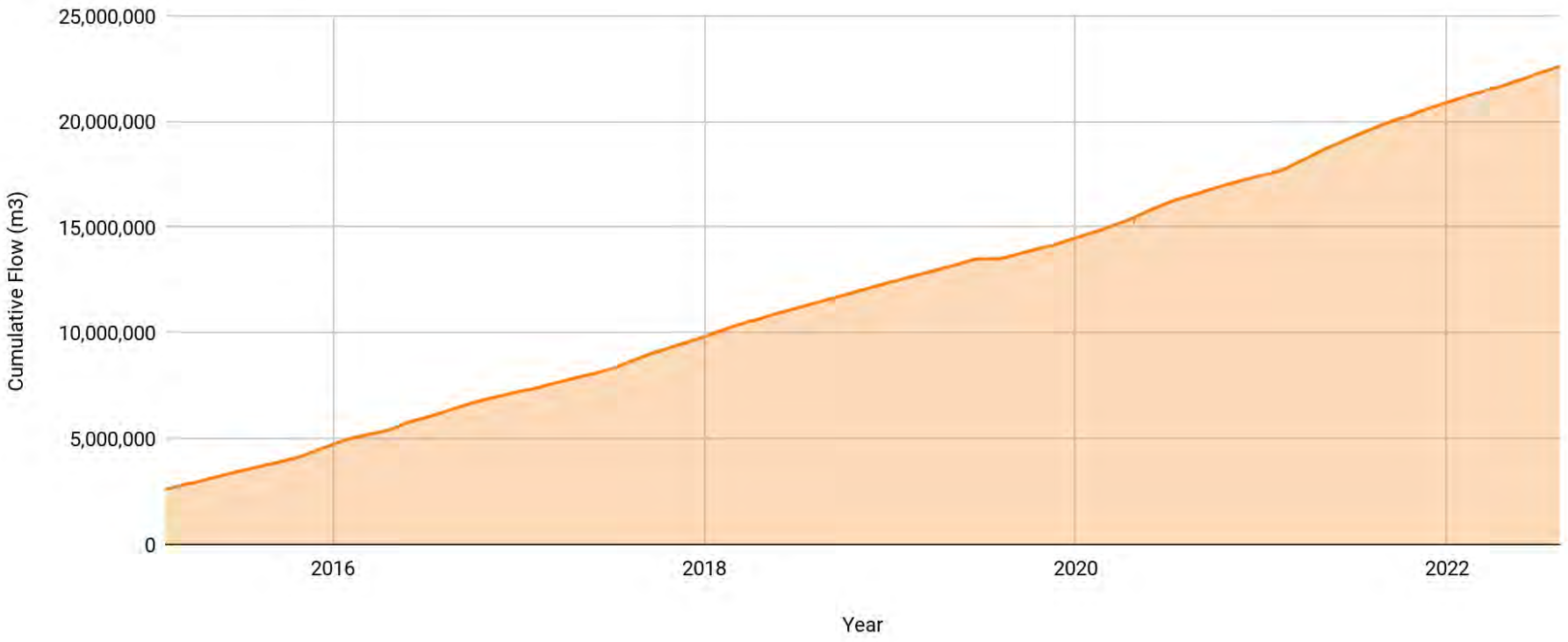
Dunmore- Methane, Carbon Dioxide & Oxygen



Dunmore - Flow Rate



Dunmore - Cumulative Flow



- 22,525,328 of combusted landfill gas up to 1 August 2022, which represents;
    - 213,937 tonnes of CO2 equivalent (total methane abated by gas capture system to date).
    - 3,565,609 seedlings planted for 10 years
    - 6,025 (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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Appendix H

Albion Park Weather Data Ex Bureau of Meteorology September 2022

Albion Park, New South Wales
October 2022 Daily Weather Observations

Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C	mm	mm	hours		km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Sa	11.4	16.7	19.0			SSE	28	14:32	14.6	80	8	SSW	11	1025.3	14.2	82	8	SSE	9	1022.3
2	Su	8.3	18.1	4.2			E	28	12:57	13.2	84	8		Calm	1020.8	15.6	74	8	E	19	1018.3
3	Mo	6.6	19.6	1.2			NE	26	14:09	13.9	77	4		Calm	1023.1	18.5	53	1	NE	19	1020.2
4	Tu	8.0	21.5	0			S	31	17:56	16.0	71	5	NE	6	1022.0	19.0	70	3	SE	15	1021.2
5	We	13.5	16.7	1.0			E	44	13:28	16.2	75	8	ESE	17	1028.5	15.2	85	8	E	26	1025.9
6	Th	13.7	18.7	28.8			ENE	50	09:44	15.2	99	8	NE	24	1024.3	15.8	99	6	NE	17	1021.2
7	Fr	13.2	21.0	28.0			NE	26	12:53	18.7	83	7	NNW	9	1016.9	18.9	91	8	NE	15	1013.6
8	Sa	14.0	23.1	1.8			SW	37	22:36	20.1	77		ESE	4	1014.4	18.2	90	8	SSE	17	1014.3
9	Su	9.1	16.5	40.2			SW	69	04:29	10.4	78	8	SW	26	1021.0	15.5	56	8	S	15	1021.2
10	Mo	10.2	17.5	1.0			ENE	31	11:00	14.0	72	4	SSW	9	1027.8	16.6	57	7	NE	13	1025.9
11	Tu	10.2	18.9	0			ENE	30	13:08	15.4	76	8	WNW	6	1026.2	17.2	63	7	ENE	17	1023.9
12	We	11.4	19.7	0			NE	37	14:18	16.8	75	4	W	7	1024.2	18.2	77	8	NE	24	1022.5
13	Th	14.3	21.0	0			NE	52	17:10	17.5	77	8	NNE	13	1021.4	19.7	66	8	NE	22	1017.4
14	Fr	16.8	23.0	2.4			W	65	17:55	17.2	94	8	E	9	1008.0	22.5	37	1	W	31	1010.5
15	Sa	11.9	21.5	0			WSW	46	02:26	18.5	51		SW	6	1019.2	20.3	54		ENE	19	1017.4
16	Su	8.7	21.6	0			E	26	13:45	17.8	53	7	SSE	6	1019.8	19.3	70	5	ESE	15	1018.2
17	Mo	13.6	18.3	0			SSW	31	00:18	16.6	72	8	SSW	13	1023.2	17.5	68	8	SSE	9	1022.2
18	Tu	12.9	21.6	0			NE	31	16:04	16.0	82	8	SW	4	1022.8	18.4	73	8	NE	19	1019.9
19	We	15.2	24.7	1.0			SSE	35	12:16	21.5	68		WSW	2	1017.8	22.3	70	1	SSE	19	1016.9
20	Th	14.6	21.1	0			ENE	39	21:21	20.2	83	2	N	2	1018.1	19.5	99	8	SSE	7	1016.2
21	Fr	18.7	22.0	52.2			NE	37	18:59	19.9	100	8	NE	19	1015.4	21.0	95	8	NE	22	1012.5
22	Sa	18.3	23.9	0.2			NE	46	15:30	21.6	77	8	NNW	11	1013.1	21.5	88	7	NE	26	1009.9
23	Su	17.8	20.3	6.8			S	30	13:27	19.2	91	8	SSE	7	1014.3	18.3	90	8	SSW	13	1014.1
24	Mo	15.5	20.9	4.8			NE	39	02:17	17.7	100	8	E	13	1014.2	18.3	100	8	S	7	1009.2
25	Tu	17.5	24.9	60.0			WSW	56	14:29	20.9	92	4	S	4	1004.2	24.1	76		NE	13	1001.5
26	We	15.8	27.5	19.4			W	52	12:00	21.3	67	7	NW	22	1001.5	25.7	46		WNW	35	999.4
27	Th	16.6	27.5	0.2			WNW	57	15:20	21.2	56	8	NW	11	1001.5	23.3	51	8	WNW	31	1000.1
28	Fr	15.7	23.6	0			WNW	74	12:20	19.9	44		WNW	33	1002.6	22.9	30		WNW	43	1000.0
29	Sa	14.9	24.8	0			WNW	57	00:20	18.5	45		W	35	1004.2	23.9	32		W	37	1003.3
30	Su	12.0	22.7	0			WNW	41	00:39	19.1	43		N	6	1010.9	20.3	51		ENE	20	1009.5
31	Mo	13.4	27.1	0			NW	59	12:35	22.0	53	8	NNW	19	1001.8	25.1	66	3	NNW	11	995.0
Statistics for October 2022																					
	Mean	13.3	21.5							17.8	74	6		11	1016.4	19.6	69	6		19	1014.3
	Lowest	6.6	16.5							10.4	43	2		Calm	1001.5	14.2	30	1	#	7	995.0
	Highest	18.7	27.5	60.0			WNW	74		22.0	100	8	W	35	1028.5	25.7	100	8	WNW	43	1025.9
	Total			272.2																	

Observations were drawn from Albion Park (Shellharbour Airport) {station 068241}

Some cloud observations are from automated equipment; these are different to those made by a human observer and may not appear every day.

IDCJDW2001.202210 Prepared at 13:00 UTC on 21 Nov 2022

Appendix I

Concentration Monitoring Summary 2021-2022

B2 Concentration Monitoring Summary

For each monitoring point identified in your licence complete all the details for each pollutant listed in the tables provided below.

If concentration monitoring is not required by your licence, no tables will appear below.

Note that this does not exclude the need to conduct appropriate concentration monitoring of assessable pollutants as required by load-based licensing (if applicable).

EPA Monitoring Point number (EPL5984)	Site Monitoring Name	Pollutant	Unit of measure	No. of samples required by licence	No. of samples you collected and analysed	Lowest sample value	Mean of sample	Highest sample value
1	SWP1	Ammonia as N	mg/L	4	8	0.01	11.91	22.40
1	SWP1	Calcium	mg/L	4	8	42.00	60.25	79.00
1	SWP1	Chloride	mg/L	4	8	93.00	194.13	277.00
1	SWP1	Dissolved Oxygen	mg/L	4	8	2.38	4.57	8.70
1	SWP1	ectrical Conductivity (Non Compensate	µS/cm	4	8	585.00	1457.63	2150.00
1	SWP1	Fluoride	mg/L	4	8	0.10	0.38	0.60
1	SWP1	Manganese	mg/L	4	6	0.07	0.46	0.99
1	SWP1	Nitrate as N	mg/L	4	8	0.01	0.55	2.06
1	SWP1	Nitrite as N	mg/L	4	8	0.01	0.28	0.81
1	SWP1	pH	pH Unit	4	8	7.50	7.70	7.90
1	SWP1	Sulfate as SO4 - Turbidimetric	mg/L	4	8	33.00	131.00	192.00
1	SWP1	Suspended Solids (SS)	mg/L	4	8	6.00	13.50	23.00
1	SWP1	Temperature	°C	4	8	12.10	17.18	21.50
1	SWP1	Total Alkalinity as CaCO3	mg/L	4	8	225.00	389.00	559.00
1	SWP1	Total Iron	mg/L	4	8	0.05	0.62	1.99
1	SWP1	Total Organic Carbon	mg/L	4	8	19.00	25.75	33.00
2	Leachate Storage Tank LP1	Ammonia as N	mg/L	4	4	670.00	929.25	1150.00
2	Leachate Storage Tank LP1	Calcium	mg/L	4	4	44.00	63.50	84.00
2	Leachate Storage Tank LP1	Chloride	mg/L	4	4	1290.00	1615.00	1840.00
2	Leachate Storage Tank LP1	Dissolved Oxygen	mg/L	4	4	1.32	4.60	7.14
2	Leachate Storage Tank LP1	ectrical Conductivity (Non Compensate	µS/cm	4	4	8230.00	10047.50	12400.00
2	Leachate Storage Tank LP1	Fluoride	mg/L	4	4	0.20	0.20	0.20
2	Leachate Storage Tank LP1	Manganese	mg/L	4	4	0.11	0.15	0.24
2	Leachate Storage Tank LP1	Nitrate as N	mg/L	4	4	0.10	0.33	1.00
2	Leachate Storage Tank LP1	Nitrite as N	mg/L	4	4	0.10	0.33	1.00
2	Leachate Storage Tank LP1	pH	pH Unit	4	4	8.40	8.78	9.00
2	Leachate Storage Tank LP1	Sulfate as SO4 - Turbidimetric	mg/L	4	4	10.00	10.00	10.00
2	Leachate Storage Tank LP1	Temperature	°C	4	4	11.80	17.93	24.90
2	Leachate Storage Tank LP1	Total Alkalinity as CaCO3	mg/L	4	4	3550.00	3907.50	4350.00
2	Leachate Storage Tank LP1	Total Iron	mg/L	4	4	1.08	1.19	1.29
2	Leachate Storage Tank LP1	Total Organic Carbon	mg/L	4	4	401.00	490.50	563.00
3	BH1c	Ammonia as N	mg/L	4	4	302.00	349.00	376.00
3	BH1c	Bicarbonate Alkalinity as CaCO3	mg/L	4	4	2330.00	2515.00	2800.00
3	BH1c	Calcium	mg/L	4	4	124.00	127.75	134.00
3	BH1c	Chloride	mg/L	4	4	831.00	891.25	940.00
3	BH1c	Dissolved Iron	mg/L	4	4	7.76	10.15	12.20
3	BH1c	ectrical Conductivity (Non Compensate	µS/cm	4	4	7350.00	7375.00	7420.00
3	BH1c	Fluoride	mg/L	4	4	0.20	0.30	0.40
3	BH1c	Manganese	mg/L	4	4	0.09	0.11	0.12
3	BH1c	Nitrate as N	mg/L	4	4	0.01	0.03	0.10
3	BH1c	Nitrite as N	mg/L	4	4	0.01	0.01	0.02
3	BH1c	pH	pH Unit	4	4	6.70	6.90	7.10
3	BH1c	Potassium	mg/L	4	4	197.00	202.50	208.00
3	BH1c	Standing Water Level	m AHD	4	4	2.47	2.83	3.15
3	BH1c	Sulfate as SO4 - Turbidimetric	mg/L	4	4	1.00	7.75	10.00
3	BH1c	Temperature	°C	4	4	23.00	24.28	25.30

3	BH1c	Total Organic Carbon	mg/L	4	4	160.00	178.00	194.00
5	BH3	Ammonia as N	mg/L	4	4	0.29	8.63	29.50
5	BH3	Bicarbonate Alkalinity as CaCO3	mg/L	4	4	280.00	316.75	377.00
5	BH3	Calcium	mg/L	4	4	114.00	123.25	147.00
5	BH3	Chloride	mg/L	4	4	65.00	127.25	284.00
5	BH3	Dissolved Iron	mg/L	4	4	0.05	0.93	3.56
5	BH3	ectrical Conductivity (Non Compensate	µS/cm	4	4	984.00	1246.00	1810.00
5	BH3	Fluoride	mg/L	4	4	0.10	0.13	0.20
5	BH3	Manganese	mg/L	4	4	0.01	0.05	0.15
5	BH3	Nitrate as N	mg/L	4	4	2.46	7.51	11.00
5	BH3	Nitrite as N	mg/L	4	4	0.03	0.07	0.13
5	BH3	pH	pH Unit	4	4	7.00	7.28	7.50
5	BH3	Potassium	mg/L	4	4	27.00	37.75	49.00
5	BH3	Standing Water Level	m AHD	4	4	1.42	2.58	3.09
5	BH3	Sulfate as SO4 - Turbidimetric	mg/L	4	4	98.00	121.00	164.00
5	BH3	Temperature	°C	4	4	17.40	18.03	18.90
5	BH3	Total Organic Carbon	mg/L	4	4	15.00	15.75	16.00
6	BH4	Ammonia as N	mg/L	4	4	2.76	5.97	14.70
6	BH4	Bicarbonate Alkalinity as CaCO3	mg/L	4	4	252.00	373.50	491.00
6	BH4	Calcium	mg/L	4	4	80.00	143.00	238.00
6	BH4	Chloride	mg/L	4	4	86.00	147.75	254.00
6	BH4	Dissolved Iron	mg/L	4	4	0.54	3.08	5.01
6	BH4	ectrical Conductivity (Non Compensate	µS/cm	4	4	831.00	1362.75	2140.00
6	BH4	Fluoride	mg/L	4	4	0.10	0.10	0.10
6	BH4	Manganese	mg/L	4	4	0.07	0.14	0.21
6	BH4	Nitrate as N	mg/L	4	4	0.01	0.21	0.63
6	BH4	Nitrite as N	mg/L	4	4	0.01	0.02	0.03
6	BH4	pH	pH Unit	4	4	7.00	7.10	7.30
6	BH4	Potassium	mg/L	4	4	7.00	16.25	21.00
6	BH4	Standing Water Level	m AHD	4	4	2.83	3.83	4.29
6	BH4	Sulfate as SO4 - Turbidimetric	mg/L	4	4	58.00	108.00	172.00
6	BH4	Temperature	°C	4	4	18.10	18.78	19.50
6	BH4	Total Organic Carbon	mg/L	4	4	12.00	14.25	16.00
7	BH15	Ammonia as N	mg/L	4	4	9.17	11.82	14.70
7	BH15	Bicarbonate Alkalinity as CaCO3	mg/L	4	4	290.00	352.75	420.00
7	BH15	Calcium	mg/L	4	4	59.00	103.50	155.00
7	BH15	Chloride	mg/L	4	4	296.00	409.75	499.00
7	BH15	Dissolved Iron	mg/L	4	4	6.12	10.81	20.60
7	BH15	ectrical Conductivity (Non Compensate	µS/cm	4	4	2140.00	2930.00	4490.00
7	BH15	Fluoride	mg/L	4	4	0.20	0.20	0.20
7	BH15	Manganese	mg/L	4	4	0.19	0.32	0.55
7	BH15	Nitrate as N	mg/L	4	4	0.01	0.06	0.10
7	BH15	Nitrite as N	mg/L	4	4	0.01	0.04	0.10
7	BH15	pH	pH Unit	4	4	6.80	6.98	7.10
7	BH15	Potassium	mg/L	4	4	152.00	181.75	203.00
7	BH15	Standing Water Level	m AHD	4	4	0.47	0.57	0.69
7	BH15	Sulfate as SO4 - Turbidimetric	mg/L	4	4	261.00	620.50	1270.00
7	BH15	Temperature	°C	4	4	14.80	16.78	18.50
7	BH15	Total Organic Carbon	mg/L	4	4	29.00	37.75	46.00
10	BH13	Ammonia as N	mg/L	4	4	0.22	1.86	4.05
10	BH13	Bicarbonate Alkalinity as CaCO3	mg/L	4	4	297.00	546.75	754.00
10	BH13	Calcium	mg/L	4	4	101.00	170.25	249.00
10	BH13	Chloride	mg/L	4	4	28.00	140.00	228.00
10	BH13	Dissolved Iron	mg/L	4	4	0.33	1.53	3.26
10	BH13	ectrical Conductivity (Non Compensate	µS/cm	4	4	727.00	1519.25	2100.00

10	BH13	Fluoride	mg/L	4	4	0.20	0.20	0.20
10	BH13	Manganese	mg/L	4	4	0.04	0.20	0.29
10	BH13	Nitrate as N	mg/L	4	4	0.01	1.40	4.00
10	BH13	Nitrite as N	mg/L	4	4	0.01	0.04	0.09
10	BH13	pH	pH Unit	4	4	6.60	6.70	6.90
10	BH13	Potassium	mg/L	4	4	6.00	14.25	26.00
10	BH13	Standing Water Level	m AHD	4	4	2.93	3.80	4.29
10	BH13	Sulfate as SO4 - Turbidimetric	mg/L	4	4	46.00	103.75	225.00
10	BH13	Temperature	°C	4	4	20.50	20.83	21.20
10	BH13	Total Organic Carbon	mg/L	4	4	13.00	20.25	31.00
11	BH14	Ammonia as N	mg/L	4	4	0.29	0.64	1.17
11	BH14	Bicarbonate Alkalinity as CaCO3	mg/L	4	4	76.00	303.00	418.00
11	BH14	Calcium	mg/L	4	4	75.00	97.25	121.00
11	BH14	Chloride	mg/L	4	4	18.00	73.25	124.00
11	BH14	Dissolved Iron	mg/L	4	4	0.05	0.10	0.19
11	BH14	ectrical Conductivity (Non Compensate	µS/cm	4	4	796.00	1089.00	1380.00
11	BH14	Fluoride	mg/L	4	4	0.40	0.50	0.60
11	BH14	Manganese	mg/L	4	4	0.07	0.09	0.10
11	BH14	Nitrate as N	mg/L	4	4	0.97	17.27	46.10
11	BH14	Nitrite as N	mg/L	4	4	0.01	0.20	0.74
11	BH14	pH	pH Unit	4	4	6.00	6.45	6.70
11	BH14	Potassium	mg/L	4	4	14.00	22.75	41.00
11	BH14	Standing Water Level	m AHD	4	4	2.85	4.08	4.72
11	BH14	Sulfate as SO4 - Turbidimetric	mg/L	4	4	52.00	85.50	121.00
11	BH14	Temperature	°C	4	4	20.20	20.80	21.40
11	BH14	Total Organic Carbon	mg/L	4	4	19.00	31.50	43.00
16	BH19r	Ammonia as N	mg/L	4	4	1.67	3.00	4.90
16	BH19r	Bicarbonate Alkalinity as CaCO3	mg/L	4	4	258.00	320.00	430.00
16	BH19r	Calcium	mg/L	4	4	83.00	106.50	166.00
16	BH19r	Chloride	mg/L	4	4	80.00	135.00	268.00
16	BH19r	Dissolved Iron	mg/L	4	4	0.48	0.90	1.19
16	BH19r	ectrical Conductivity (Non Compensate	µS/cm	4	4	838.00	1165.50	1880.00
16	BH19r	Fluoride	mg/L	4	4	0.10	0.15	0.20
16	BH19r	Manganese	mg/L	4	4	0.04	0.08	0.14
16	BH19r	Nitrate as N	mg/L	4	4	0.01	0.15	0.52
16	BH19r	Nitrite as N	mg/L	4	4	0.01	0.03	0.05
16	BH19r	pH	pH Unit	4	4	7.20	7.25	7.40
16	BH19r	Potassium	mg/L	4	4	22.00	26.25	36.00
16	BH19r	Standing Water Level	m AHD	4	4	3.43	4.20	4.60
16	BH19r	Sulfate as SO4 - Turbidimetric	mg/L	4	4	51.00	106.00	178.00
16	BH19r	Temperature	°C	4	4	17.60	18.55	19.40
16	BH19r	Total Organic Carbon	mg/L	4	4	16.00	21.50	27.00
17	BH12r	Ammonia as N	mg/L	4	4	3.25	4.87	6.51
17	BH12r	Bicarbonate Alkalinity as CaCO3	mg/L	4	4	448.00	500.00	554.00
17	BH12r	Calcium	mg/L	4	4	131.00	183.00	229.00
17	BH12r	Chloride	mg/L	4	4	123.00	266.50	405.00
17	BH12r	Dissolved Iron	mg/L	4	4	3.67	6.59	11.40
17	BH12r	ectrical Conductivity (Non Compensate	µS/cm	4	4	1410.00	2037.50	2460.00
17	BH12r	Fluoride	mg/L	4	4	0.20	0.20	0.20
17	BH12r	Manganese	mg/L	4	4	0.49	0.50	0.52
17	BH12r	Nitrate as N	mg/L	4	4	0.01	1.89	5.20
17	BH12r	Nitrite as N	mg/L	4	4	0.01	0.05	0.10
17	BH12r	pH	pH Unit	4	4	6.60	6.73	6.80
17	BH12r	Potassium	mg/L	4	4	26.00	42.00	56.00
17	BH12r	Standing Water Level	m AHD	4	4	3.58	4.00	4.29

17	BH12r	Sulfate as SO4 - Turbidimetric	mg/L	4	4	92.00	201.25	247.00
17	BH12r	Temperature	°C	4	4	19.70	20.83	21.70
17	BH12r	Total Organic Carbon	mg/L	4	4	21.00	23.00	25.00
18	BH9	Ammonia as N	mg/L	4	4	64.80	90.50	130.00
18	BH9	Bicarbonate Alkalinity as CaCO3	mg/L	4	4	1290.00	1487.50	1650.00
18	BH9	Calcium	mg/L	4	4	161.00	198.75	242.00
18	BH9	Chloride	mg/L	4	4	381.00	501.50	626.00
18	BH9	Dissolved Iron	mg/L	4	4	0.70	3.82	5.15
18	BH9	ectrical Conductivity (Non Compensate	µS/cm	4	4	3330.00	4165.00	4700.00
18	BH9	Fluoride	mg/L	4	4	0.30	0.38	0.40
18	BH9	Manganese	mg/L	4	4	0.36	0.50	0.58
18	BH9	Nitrate as N	mg/L	4	4	0.01	0.02	0.02
18	BH9	Nitrite as N	mg/L	4	4	0.01	0.02	0.05
18	BH9	pH	pH Unit	4	4	6.70	6.98	7.20
18	BH9	Potassium	mg/L	4	4	60.00	66.75	73.00
18	BH9	Standing Water Level	m AHD	4	4	2.32	2.74	3.10
18	BH9	Sulfate as SO4 - Turbidimetric	mg/L	4	4	12.00	109.50	239.00
18	BH9	Temperature	°C	4	4	15.90	17.70	18.60
18	BH9	Total Organic Carbon	mg/L	4	4	57.00	67.25	85.00
19	SWC_2	Ammonia as N	mg/L	4	4	0.46	0.89	1.95
19	SWC_2	Calcium	mg/L	4	4	33.00	64.50	127.00
19	SWC_2	Dissolved Oxygen	mg/L	4	4	3.34	6.63	9.25
19	SWC_2	ectrical Conductivity (Non Compensate	µS/cm	4	4	1620.00	4635.00	11900.00
19	SWC_2	Fluoride	mg/L	4	4	0.20	0.25	0.40
19	SWC_2	Nitrate as N	mg/L	4	4	0.06	0.52	1.09
19	SWC_2	pH	pH Unit	4	4	7.10	7.30	7.40
19	SWC_2	Potassium	mg/L	4	4	15.00	32.25	71.00
19	SWC_2	Sulfate as SO4 - Turbidimetric	mg/L	4	4	84.00	227.25	518.00
19	SWC_2	Suspended Solids (SS)	mg/L	4	4	7.00	12.75	26.00
19	SWC_2	Total Dissolved Solids	mg/L	4	4	914.00	2936.00	7040.00
19	SWC_2	Total Organic Carbon	mg/L	4	4	8.00	13.25	27.00
20	SWC_UP	Ammonia as N	mg/L	4	4	0.15	0.83	2.69
20	SWC_UP	Calcium	mg/L	4	4	38.00	54.00	89.00
20	SWC_UP	Dissolved Oxygen	mg/L	4	4	2.43	6.88	9.60
20	SWC_UP	ectrical Conductivity (Non Compensate	µS/cm	4	4	1370.00	3412.50	7180.00
20	SWC_UP	Fluoride	mg/L	4	4	0.20	0.23	0.30
20	SWC_UP	Nitrate as N	mg/L	4	4	0.01	0.53	1.13
20	SWC_UP	pH	pH Unit	4	4	7.20	7.30	7.40
20	SWC_UP	Potassium	mg/L	4	4	11.00	22.50	41.00
20	SWC_UP	Sulfate as SO4 - Turbidimetric	mg/L	4	4	74.00	181.25	340.00
20	SWC_UP	Suspended Solids (SS)	mg/L	4	4	7.00	9.00	11.00
20	SWC_UP	Total Dissolved Solids	mg/L	4	4	990.00	2135.00	4130.00
20	SWC_UP	Total Organic Carbon	mg/L	4	4	8.00	13.25	28.00
21	SWC_DOWN	Ammonia as N	mg/L	4	4	0.35	0.59	1.28
21	SWC_DOWN	Calcium	mg/L	4	4	15.00	72.50	172.00
21	SWC_DOWN	Dissolved Oxygen	mg/L	4	4	4.81	7.68	9.37
21	SWC_DOWN	ectrical Conductivity (Non Compensate	µS/cm	4	4	555.00	5878.75	17100.00
21	SWC_DOWN	Fluoride	mg/L	4	4	0.10	0.28	0.50
21	SWC_DOWN	Nitrate as N	mg/L	4	4	0.06	0.52	0.98
21	SWC_DOWN	pH	pH Unit	4	4	7.10	7.28	7.40
21	SWC_DOWN	Potassium	mg/L	4	4	6.00	38.50	102.00
21	SWC_DOWN	Sulfate as SO4 - Turbidimetric	mg/L	4	4	29.00	278.75	733.00
21	SWC_DOWN	Suspended Solids (SS)	mg/L	4	4	5.00	7.50	10.00
21	SWC_DOWN	Total Dissolved Solids	mg/L	4	4	350.00	3812.50	10400.00
21	SWC_DOWN	Total Organic Carbon	mg/L	4	4	8.00	10.00	14.00

22	SWC_DOWN_2	Ammonia as N	mg/L	4	4	0.19	0.28	0.32
22	SWC_DOWN_2	Calcium	mg/L	4	4	16.00	60.75	118.00
22	SWC_DOWN_2	Dissolved Oxygen	mg/L	4	4	5.66	7.73	9.54
22	SWC_DOWN_2	ectrical Conductivity (Non Compensate	µS/cm	4	4	642.00	4550.50	10900.00
22	SWC_DOWN_2	Fluoride	mg/L	4	4	0.10	0.25	0.40
22	SWC_DOWN_2	Nitrate as N	mg/L	4	4	0.07	0.53	0.97
22	SWC_DOWN_2	pH	pH Unit	4	4	7.10	7.30	7.40
22	SWC_DOWN_2	Potassium	mg/L	4	4	7.00	31.00	65.00
22	SWC_DOWN_2	Sulfate as SO4 - Turbidimetric	mg/L	4	4	34.00	230.50	488.00
22	SWC_DOWN_2	Suspended Solids (SS)	mg/L	4	4	5.00	8.75	12.00
22	SWC_DOWN_2	Total Dissolved Solids	mg/L	4	4	388.00	3062.00	6720.00
22	SWC_DOWN_2	Total Organic Carbon	mg/L	4	4	8.00	10.00	15.00
23	BH21	Ammonia as N	mg/L	4	4	2.60	3.64	4.85
23	BH21	Bicarbonate Alkalinity as CaCO3	mg/L	4	4	494.00	557.75	667.00
23	BH21	Calcium	mg/L	4	4	112.00	132.00	156.00
23	BH21	Chloride	mg/L	4	4	308.00	359.25	400.00
23	BH21	Dissolved Iron	mg/L	4	4	0.15	0.32	0.44
23	BH21	ectrical Conductivity (Non Compensate	µS/cm	4	4	2430.00	2500.00	2610.00
23	BH21	Fluoride	mg/L	4	4	0.30	0.33	0.40
23	BH21	Manganese	mg/L	4	4	0.33	0.44	0.60
23	BH21	Nitrate as N	mg/L	4	4	0.01	0.04	0.12
23	BH21	Nitrite as N	mg/L	4	4	0.01	0.01	0.01
23	BH21	pH	pH Unit	4	4	7.00	7.10	7.20
23	BH21	Potassium	mg/L	4	4	16.00	18.50	20.00
23	BH21	Standing Water Level	m AHD	4	4	2.39	2.73	2.96
23	BH21	Sulfate as SO4 - Turbidimetric	mg/L	4	4	204.00	296.00	351.00
23	BH21	Temperature	°C	4	4	20.80	21.13	21.40
23	BH21	Total Organic Carbon	mg/L	4	4	26.00	29.50	37.00
24	BH22	Ammonia as N	mg/L	4	4	1.54	8.71	24.40
24	BH22	Bicarbonate Alkalinity as CaCO3	mg/L	4	4	428.00	548.75	688.00
24	BH22	Calcium	mg/L	4	4	117.00	139.00	160.00
24	BH22	Chloride	mg/L	4	4	186.00	231.00	274.00
24	BH22	Dissolved Iron	mg/L	4	4	0.14	0.29	0.41
24	BH22	ectrical Conductivity (Non Compensate	µS/cm	4	4	1740.00	1927.50	2130.00
24	BH22	Fluoride	mg/L	4	4	0.20	0.25	0.30
24	BH22	Manganese	mg/L	4	4	0.06	0.09	0.12
24	BH22	Nitrate as N	mg/L	4	4	0.01	0.01	0.01
24	BH22	Nitrite as N	mg/L	4	4	0.01	0.01	0.01
24	BH22	pH	pH Unit	4	4	6.80	7.00	7.10
24	BH22	Potassium	mg/L	4	4	22.00	24.25	30.00
24	BH22	Standing Water Level	m AHD	4	4	2.13	2.39	2.57
24	BH22	Sulfate as SO4 - Turbidimetric	mg/L	4	4	102.00	175.00	255.00
24	BH22	Temperature	°C	4	4	17.30	18.15	18.80
24	BH22	Total Organic Carbon	mg/L	4	4	21.00	36.50	52.00
25	BH18	Ammonia as N	mg/L	4	4	0.20	0.64	1.09
25	BH18	Bicarbonate Alkalinity as CaCO3	mg/L	4	4	113.00	262.25	412.00
25	BH18	Calcium	mg/L	4	4	30.00	62.25	88.00
25	BH18	Chloride	mg/L	4	4	7.00	32.25	65.00
25	BH18	Dissolved Iron	mg/L	4	4	0.81	1.60	2.34
25	BH18	ectrical Conductivity (Non Compensate	µS/cm	4	4	236.00	570.00	822.00
25	BH18	Fluoride	mg/L	4	4	0.20	0.20	0.20
25	BH18	Manganese	mg/L	4	4	0.06	0.11	0.18
25	BH18	Nitrate as N	mg/L	4	4	0.01	0.01	0.01
25	BH18	Nitrite as N	mg/L	4	4	0.01	0.01	0.01
25	BH18	pH	pH Unit	4	4	6.50	6.70	6.90

25	BH18	Potassium	mg/L	4	4	3.00	7.00	12.00
25	BH18	Standing Water Level	m AHD	4	4	1.52	1.85	2.18
25	BH18	Sulfate as SO4 - Turbidimetric	mg/L	4	4	1.00	4.50	10.00
25	BH18	Temperature	°C	4	4	18.30	19.35	20.10
25	BH18	Total Organic Carbon	mg/L	4	4	6.00	12.50	19.00